(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
19 September 2013 (19.09.2013)

WIPO | PCT

(10) International Publication Number
WO 2013/138622 A2

(51) International Patent Classification:
*E21B 47/10* (2012.01)

(21) International Application Number:
PCT/US2013/031491

(22) International Filing Date:
14 March 2013 (14.03.2013)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/611,495 15 March 2012 (15.03.2012) US

(71) Applicant *(for all designated States except US)*: **CHEVRON U.S.A. INC.** [US/US]; 6001 Bollinger Canyon Road, San Ramon, California 94583 (US).

(72) Inventors; and

(71) Applicants *(for US only)*: **HUNT, Daniel Francis Alan** [GB/US]; c/o CHEVRON U.S.A. Inc., 6001 Bollinger Canyon Road, San Ramon, California 94583 (US). **BIANCO, Luis Carlos Baralho** [BR/US]; c/o Chevron U.S.A. Inc., 6001 Bollinger Canyon Road, San Ramon, California 94583 (US). **ANDERSEN, Christian Andre** [NO/NO]; c/o Resman AS, North Sam Houston Pkwy E #1100, Houston, Texas 77060 (US). **SKALMERAS, Jomar** [NO/NO]; c/o Resman AS, North Sam Houston Pkwy E #1100, Houston, Texas 77060 (US).

(74) Agents: **ESPLIN, D. Benjamin** et al.; P.O. Box 10500, McLean, Virginia 22102 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

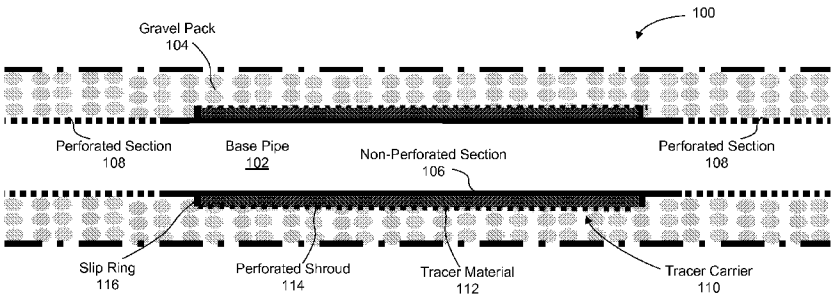
(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Published**:

— *without international search report and to be republished upon receipt of that report (Rule 48.2(g))*

WO 2013/138622 A2

(54) **Title**: OUTWARD VENTING OF INFLOW TRACER IN PRODUCTION WELLS




(57) **Abstract**: A localized inflow tracer may be flushed from a gravel pack surrounding a base pipe of a production well by outwardly venting the inflow tracer. The base pipe may include a non-perforated section disposed adjacent to one or more perforated sections. A tracer carrier may be disposed circumferentially about at least a portion of the non-perforated section of the base pipe. An inflow tracer may be released from the tracer carrier into production fluid within the gravel pack proximate to the non-perforated section of the base pipe such that the inflow tracer is flushed from the gravel pack into individual ones of the one or more perforated sections of the base pipe and transported with the production fluid. The inflow tracer may be prevented from being flushed directly from the tracer carrier into the base pipe due to a lack of permeability of the non-perforated section of the base pipe.

# OUTWARD VENTING OF INFLOW TRACER IN PRODUCTION WELLS

## *FIELD OF THE DISCLOSURE*

*(01)* The disclosure relates to systems and methods facilitating outward venting of inflow tracer in a production well such that inflow tracer is prevented from being communicated directly into a base pipe of the production well from a tracer medium configured to emit the inflow tracer.

## *BACKGROUND*

*(02)* Different tracers have been widely used by the oil industry in production wells to identify which zones are contributing and/or other information associated with a well. There are many types of tracer compounds and/or chemicals that can be used. The design and selection of a given tracer may be based upon health, safety, and/or environment requirements; reservoir and/or fluid properties; expected operating conditions; and/or other factors. Exemplary purposes of using tracers installed within tracer carrier systems of production wells include one or more of determining an estimate of a contributing length, inflow profile of oil, specific location(s) of water breakthrough, and/or other purposes. Such information helps to understand the reservoir and waterflood performance.

*(03)* Once a tracer has been installed in a well, it may be possible to collect samples either after a short shut down or during steady state production to analyze the well performance. This information can be used to improve an understanding of reservoir

properties, such as depletion and permeability, from pressure build up analysis. An opportunity to sample may arise when water breakthrough occurs. The results of this analysis can help to identify the location of water breakthrough and understand the waterflood performance in the reservoir.

*(04)* Gravel packing of completions is necessary in some sand control environments. Typically gravel packing is used when the uniformity and sorting of the sand grains in the reservoir rock is not favorable and where reliable long-term performance is required. Conventionally, tracers are installed inside a sand screen, which means the tracers can diffuse into the base pipe (i.e., inward venting). An inward vented system allows the tracer to diffuse into the base pipe during a shut down and in normal steady conditions. As such, the tracers can be detected at Earth's surface regardless of the region where the tracers are installed. In addition, the space between the sand screen mesh and the outer shroud may be very small meaning that many sand screens might need to be filled with tracers to meet the desired objectives of using the tracers. With existing approaches, estimating the contributing length can be very difficult as there are always tracers at the surface while another part of the well is contributing upstream of the tracer location. Furthermore, the spatial resolution of existing approaches is generally several tens of meters.

## *SUMMARY*

*(05)* One aspect of the disclosure relates to a system configured to facilitate flushing a localized inflow tracer from a gravel pack surrounding a base pipe of a production well by outwardly venting the inflow tracer. The system comprises a base pipe and tracer

carrier. The base pipe is configured to be disposed within a gravel pack. The base pipe includes a non-perforated section disposed adjacent to one or more perforated sections. Individual ones of the one or more perforated sections are configured to communicate production fluid from the gravel pack into the base pipe to facilitate transporting the production fluid to Earth's surface. The tracer carrier is configured to be disposed circumferentially about at least a portion of the non-perforated section of the base pipe. The tracer carrier is further configured to carry a tracer material. The tracer material is configured to release an inflow tracer into production fluid within the gravel pack proximate to the non-perforated section of the base pipe such that the inflow tracer is flushed from the gravel pack into individual ones of the one or more perforated sections of the base pipe and transported with the production fluid. The non-perforated section of the base pipe substantially prevents release of the tracer directly from the tracer carrier to within the base pipe.

*(06)* Another aspect of the disclosure relates to a method for constructing a system configured to facilitate flushing a localized inflow tracer from a gravel pack surrounding a base pipe of a production well by outwardly venting the inflow tracer. The method comprises disposing a tracer material circumferentially about at least a portion of a non-perforated section of a base pipe configured to be disposed within a gravel pack. The non-perforated section of the base pipe is adjacent to one or more perforated sections of the base pipe. Individual ones of the one or more perforated sections are configured to communicate production fluid from the gravel pack into the base pipe to facilitate transporting the production fluid to Earth's surface. The tracer material is configured to

release an inflow tracer. The method comprises surrounding the tracer material with a perforated shroud configured to communicate the inflow tracer from the tracer material into production fluid within the gravel pack proximate to the non-perforated section of the base pipe such that, in use, the inflow tracer is flushed from the gravel pack into individual ones of the one or more perforated sections of the base pipe and transported with the production fluid.

*(07)* Yet another aspect of the disclosure relates to a method for flushing a localized inflow tracer from a gravel pack surrounding a base pipe of a production well. The method comprises installing a base pipe such that the base pipe is disposed within a gravel pack. The base pipe includes a non-perforated section disposed adjacent to one or more perforated sections. Individual ones of the one or more perforated sections are configured to communicate production fluid from the gravel pack into the base pipe to facilitate transporting the production fluid to Earth's surface. The base pipe has a tracer carrier disposed circumferentially about at least a portion of the non-perforated section of the base pipe. The tracer carrier is configured to carry a tracer material. The tracer material is configured to release an inflow tracer. The method comprises, during production, flushing the inflow tracer within the gravel pack into individual ones of the one or more perforated sections of the base pipe. The method comprises transporting the production fluid with the flushed inflow tracers toward the Earth's surface via the base pipe.

*(08)* These and other objects, features, and characteristics of the present disclosure, as well as the methods of operation and functions of the related elements of structure

and the combination of parts and economies of manufacture, will become more apparent upon consideration of the following description and the appended claims with reference to the accompanying drawings, all of which form a part of this specification, wherein like reference numerals designate corresponding parts in the various figures. It is to be expressly understood, however, that the drawings are for the purpose of illustration and description only and are not intended as a definition of the limits of the disclosure. As used in the specification and in the claims, the singular form of "a", "an", and "the" include plural referents unless the context clearly dictates otherwise.

***BRIEF DESCRIPTION OF THE DRAWINGS***

*(09)* FIG. 1 illustrates a system configured to facilitate outward venting of inflow tracer such that inflow tracer is prevented from being communicated directly into a base pipe of a production well from a tracer medium configured to emit the inflow tracer, in accordance with one or more embodiments.

*(10)* FIGS. 2A, 2B, 2C, and 2D illustrate a flush out process of a system having outward vended inflow tracer, in accordance with one or more implementations.

*(11)* FIG. 3 illustrates a method for constructing a system configured to facilitate outward venting of inflow tracer such that inflow tracer is prevented from being communicated directly into a base pipe of a production well from a tracer medium configured to emit the inflow tracer, in accordance with one or more embodiments.

*(12)* FIG. 4 illustrates a method for outwardly venting inflow tracer such that inflow tracer is prevented from being communicated directly into a base pipe of a production

well from a tracer medium configured to emit the inflow tracer, in accordance with one or more embodiments.

***DETAILED DESCRIPTION***

*(13)* FIG. 1 illustrates a system 100 configured to facilitate outward venting of inflow tracer such that inflow tracer is prevented from being communicated directly into a base pipe of a production well from a tracer medium configured to emit the inflow tracer, in accordance with one or more embodiments. An outward vented system may improve technical analysis of a production well as the inflow tracer is flushed from the region surrounding the base pipe, which may include a gravel pack and/or other permeable material. For example, the manner in which the inflow tracer is flushed can help distinguish differences in inflow that would not be seen with an inward vented system. As another example, some embodiments include a relatively short tracer carrier (e.g., about 5-10 meters), which places the inflow tracer in a highly localized area. Existing approaches that place the tracer in a sand screen can result in the tracer being spread across 50 or more meters of reservoir interval. Having the tracer placed in a concentrated area can refine special resolution of the technical analysis and can allow for more tracer types to be used. Furthermore, some embodiments facilitate use of tracers having a relatively long lifetime.

*(14)* As depicted in FIG. 1, system 100 includes a base pipe 102 configured to be disposed within a gravel pack 104. In some embodiments, gravel pack 104 forms an annulus about base pipe 102. The gravel pack 104 may be replaced partially or wholly by one or more other permeable materials, according to some embodiments. The base

pipe 102 includes a non-perforated section 106 disposed adjacent to one or more perforated sections 108. The non-perforated section 106 of the base pipe 102 is not permeable to liquid. The perforated sections 108 are configured to communicate production fluid from the gravel pack into the base pipe to facilitate transporting the production fluid to Earth's surface. The production fluid can include one or more of oil, water, and/or other fluids.

*(15)* The system 100 includes a tracer carrier 110, in accordance with some embodiments. The tracer carrier 110 is configured to be disposed adjacent to non-perforated section 106 of base pipe 102. In some embodiments, tracer carrier 110 is configured to be disposed circumferentially about at least a portion of non-perforated section 106 of base pipe 102. The tracer carrier 110 is configured to carry a tracer material 112. The tracer material 112 is configured to release inflow tracer into production fluid within a region of gravel pack 104 proximate to non-perforated section 106 of base pipe 102. According to some embodiments, inflow tracer is released by tracer material 112 responsive to production flow and/or a component of the production fluid coming into direct contact with tracer material 112.

*(16)* In some embodiments, tracer carrier 110 comprises a perforated shroud 114 configured to be disposed circumferentially about at least a portion of non-perforated section 106 of base pipe 102. A gap is formed between an inner diameter of perforated shroud 114 and non-perforated section 106 of base pipe 102. The tracer material 112 is disposed within the gap. In some embodiments, tracer material 112 is wrapped around non-perforated section 106 of base pipe 102. The perforated shroud 114 is

configured to communicate inflow tracer from tracer material 112 into the production fluid within the gravel pack 104 proximate to non-perforated section 106 of base pipe 102. According to various embodiments, tracer carrier 110 has a longitudinal length less than about 10 meters, or even less than about 5 meters. In some embodiments, at least one slip ring 116 is disposed about non-perforated section 106 of base pipe 102. The slip ring 116 is configured to establish a gap between non-perforated section 106 of base pipe 102 and an inner diameter of perforated shroud 114. The tracer material 112 is disposed within the gap.

*(17)* During production, inflow tracer is flushed from gravel pack 104 into individual ones of the one or more perforated sections 108 of base pipe 102 and transported with the production fluid via base pipe 102. The inflow tracer is prevented from being flushed directly from tracer carrier 110 into base pipe 102 due to a lack of permeability of non-perforated section 106 of base pipe 102. According to some embodiments, the inflow tracer flushed into base pipe 102 and transported with the production fluid is detectable to determine one or more characteristics associated with the production well. Exemplary characteristics include one or more of identification of contributing zones of a reservoir, reservoir depletion, reservoir permeability, production fluid properties, expected operating conditions, contributing length, inflow profile of production fluid, location of water breakthrough, reservoir performance, waterflood performance, and/or other characteristics associated with the production well.

*(18)* FIGS. 2A, 2B, 2C, and 2D illustrate a flush out process of a system 200 having outward vended inflow tracer 202, in accordance with one or more implementations.

The system 200 may be the same as or similar to system 100 described in connection with FIG. 1. FIG. 2A illustrates system 200 subsequent to shut in. Shut in describes when a production well is not producing, but is capable of producing. Here, inflow tracer 202 is distributed similar as during production.

*(19)* FIG. 2B illustrates system 200 after a duration of time since shut in. Such a duration may be several hours or another amount of time. The depiction of system 200 in FIG. 2B assumes low flow activity in the gravel pack during shut in. During the shut-in period, inflow tracer 202 is released into the production fluid surrounding the tracer carrier 204, creating a high-concentration tracer shot as inflow tracer release is typically independent from the velocity of surrounding fluids. Generally, a concentration of inflow tracer within the base pipe remains about the same as for steady state production prior to shut in.

*(20)* FIG. 2C illustrates system 200 when production has begun after the shut-in period. Arrows 206 indicate a direction of flow of the production fluid being transported by system 200. During initial production, the high-concentration tracer shot will be flushed out through the gravel pack into the base pipe. This flush-out may be observed in technical analysis as a high-concentration peak of inflow tracer that declines over time. FIG. 2D illustrates system 200 after a period of stable production. Here, the concentration of inflow tracer stabilizes at a constant level.

*(21)* For technical analysis, samples of the production fluid are taken at the surface to determine the presence and/or concentration of a particular inflow tracer. The tracer response can be analyzed from the samples to understand how that particular inflow

tracer was flushed out. Using several different types of inflow tracers throughout the producing interval(s) of the production well allows an understanding of the inflow response throughout the production well. The space or gap included in exemplary embodiments of the tracer carrier 110 allows for a relatively large amount of tracer material to be used so that the inflow tracer can last for a period of time, which might extend to 5 or more years. As such, inflow tests can be repeated periodically to monitor the inflow characteristics with time, in accordance with some embodiments. It is possible to identify "no flow" of the production fluid (i.e., a flow rate of zero) because inflow tracer will enter the base pipe if it is flushed by production fluid coming in from the reservoir through the gravel pack. Keeping the longitudinal length of the tracer carrier relatively short (e.g., 5-10 meters) compared to existing approaches, where tracer material is distributed over lengths exceeding 30 meters, facilitates higher spatial resolution during technical analysis and/or allows for a greater number of different types of inflow tracer to be used, which may more clearly identify the location of a water break through.

*(22)* FIG. 3 illustrates a method 300 for constructing a system configured to facilitate outward venting of inflow tracer such that inflow tracer is prevented from being communicated directly into a base pipe of a production well from a tracer medium configured to emit the inflow tracer, in accordance with one or more embodiments. The operations of method 300 presented below are intended to be illustrative. In some embodiments, method 300 may be accomplished with one or more additional operations not described, and/or without one or more of the operations discussed.

Additionally, the order in which the operations of method 300 are illustrated in FIG. 3 and described below is not intended to be limiting.

*(23)* At an operation 302, a tracer material (e.g., tracer material 112) is disposed circumferentially about at least a portion a non-perforated section (e.g., non-perforated section 106) of a base pipe (e.g., base pipe 102). According to some embodiments, disposing the carrier material circumferentially about at least a portion of the non-perforated section of the base pipe includes wrapping the carrier material around the non-perforated section of the base pipe. The base pipe is configured to be disposed within a gravel pack (e.g., gravel pack 104). The gravel pack may form an annulus about the base pipe, in some embodiments. The non-perforated section of the base pipe is adjacent to one or more perforated sections (e.g., perforated sections 108) of the base pipe. Individual ones of the one or more perforated sections are configured to communicate production fluid from the gravel pack into the base pipe to facilitate transporting the production fluid to Earth's surface. The tracer material is configured to release an inflow tracer.

*(24)* At an operation 304, at least one slip ring (e.g., slip ring 116) is disposed about the non-perforated section of the base pipe. The at least one slip ring is configured to establish a gap between the non-perforated section of the base pipe and an inner diameter of a perforated shroud (e.g., perforated shroud 114). The tracer material is disposed within the gap.

*(25)* At an operation 306, the tracer material is surrounded with the perforated shroud. According to some embodiments, the perforated shroud has a longitudinal length less

than about 10 meters. The perforated shroud is configured to communicate the inflow tracer from the tracer material into production fluid within the gravel pack proximate to the non-perforated section of the base pipe. The inflow tracer is prevented from being flushed directly from the tracer carrier into the base pipe due to a lack of permeability of the non-perforated section of the base pipe.

*(26)* FIG. 4 illustrates a method 400 for outwardly venting inflow tracer such that inflow tracer is prevented from being communicated directly into a base pipe of a production well from a tracer medium configured to emit the inflow tracer, in accordance with one or more embodiments. The operations of method 400 presented below are intended to be illustrative. In some embodiments, method 400 may be accomplished with one or more additional operations not described, and/or without one or more of the operations discussed. Additionally, the order in which the operations of method 400 are illustrated in FIG. 4 and described below is not intended to be limiting.

*(27)* At an operation 402, a base pipe (e.g., base pipe 102) is installed such that the base pipe is disposed within a gravel pack (e.g., gravel pack 104). The gravel pack may form an annulus about the base pipe, in some embodiments. The base pipe includes a non-perforated section (e.g., non-perforated section 106) disposed adjacent to one or more perforated sections (e.g., perforated sections 108). Individual ones of the one or more perforated sections are configured to communicate production fluid from the gravel pack into the base pipe to facilitate transporting the production fluid to Earth's surface. The base pipe has a tracer carrier (e.g., tracer carrier 110) disposed circumferentially about at least a portion of the non-perforated section of the base pipe.

The tracer carrier is configured to carry a tracer material (e.g., tracer material 112). The tracer material is configured to release an inflow tracer.

*(28)* At an operation 404, during shut in of the production well, the inflow tracer is allowed to become concentrated in the gravel pack proximate to the non-perforated section of the base pipe.

*(29)* At an operation 406, during production, the inflow tracer within the gravel pack is flushed into individual ones of the one or more perforated sections of the base pipe. During initial production after a shut-it period, a high tracer concentration shot may be transported with the production fluid when the inflow tracer is first flushed from the gravel pack. The inflow tracer is prevented from being flushed directly from the tracer carrier into the base pipe due to a lack of permeability of the non-perforated section of the base pipe.

*(30)* At an operation 408, the production fluid with the flushed inflow tracer is transported toward the Earth's surface via the base pipe.

*(31)* At an operation 410, the inflow tracer transported with the production fluid is detected to determine one or more characteristics associated with the production well. Exemplary characteristics associated with the production well may include one or more of identification of contributing zones of a reservoir, reservoir depletion, reservoir permeability, production fluid properties, expected operating conditions, contributing length, inflow profile of production fluid, location of water breakthrough, reservoir performance, waterflood performance, and/or other characteristics.

*(32)* Although the disclosure has been described in detail for the purpose of illustration based on what is currently considered to be the most practical and preferred embodiments, it is to be understood that such detail is solely for that purpose and that the disclosure is not limited to the disclosed embodiments, but, on the contrary, is intended to cover modifications and equivalent arrangements that are within the spirit and scope of the appended claims. For example, it is to be understood that the present disclosure contemplates that, to the extent possible, one or more features of any embodiment can be combined with one or more features of any other embodiment.

**What is claimed is:**

1. A system configured to facilitate outward venting of inflow tracer such that inflow tracer is prevented from being communicated directly into a base pipe of a production well from a tracer medium configured to emit the inflow tracer, the system comprising:

a base pipe configured to be disposed within a gravel pack, the base pipe including a non-perforated section disposed adjacent to one or more perforated sections, individual ones of the one or more perforated sections being configured to communicate production fluid from the gravel pack into the base pipe to facilitate transporting the production fluid to Earth's surface; and

a tracer carrier configured to be disposed circumferentially about at least a portion the non-perforated section of the base pipe, the tracer carrier being further configured to carry a tracer material, the tracer material being configured to release inflow tracer into production fluid within the gravel pack proximate to the non-perforated section of the base pipe such that, during production, the inflow tracer is flushed from the gravel pack into individual ones of the one or more perforated sections of the base pipe and transported with the production fluid, wherein the non-perforated section of the base pipe substantially prevents release of the tracer directly from the tracer carrier to within the base pipe.

2. The system of claim 1, wherein the inflow tracer is prevented from being flushed directly from the tracer carrier into the base pipe due to a lack of permeability of the non-perforated section of the base pipe.

3. The system of claim 1, wherein the inflow tracer flushed into the base pipe and transported with the production fluid is detectable to determine one or more characteristics associated with the production well.

4. The system of claim 3, wherein the one or more characteristics associated with the production well include one or more of identification of contributing zones of a reservoir, reservoir depletion, reservoir permeability, production fluid properties, expected operating conditions, contributing length, inflow profile of production fluid, location of water breakthrough, reservoir performance, or waterflood performance.

5. The system of claim 1, wherein the tracer material is wrapped around the non-perforated section of the base pipe.

6. The system of claim 1, wherein the tracer carrier comprises a perforated shroud configured to be disposed circumferentially about at least a portion of the non-perforated section of the base pipe, a gap being formed between an inner diameter of the perforated shroud and the non-perforated section of the base pipe, the tracer material being disposed within the gap, the perforated shroud

being further configured to communicate the inflow tracer from the tracer material into the production fluid within the gravel pack proximate to the non-perforated section of the base pipe.

7. The system of claim 1, wherein the production fluid includes one or both of oil or water.

8. A method for constructing a system configured to facilitate outward venting of inflow tracer such that inflow tracer is prevented from being communicated directly into a base pipe of a production well from a tracer medium configured to emit the inflow tracer, the method comprising

disposing a tracer material circumferentially about at least a portion a non-perforated section of a base pipe configured to be disposed within a gravel pack, the non-perforated section of the base pipe being adjacent to one or more perforated sections of the base pipe, individual ones of the one or more perforated sections being configured to communicate production fluid from the gravel pack into the base pipe to facilitate transporting the production fluid to Earth's surface, the tracer material being configured to release an inflow tracer; and

surrounding the tracer material with a perforated shroud configured to communicate the inflow tracer from the tracer material into production fluid within the gravel pack proximate to the non-perforated section of the base pipe such that, during production, the inflow tracer is flushed from the gravel pack into

individual ones of the one or more perforated sections of the base pipe and transported with the production fluid.

9. The method of claim 8, wherein the inflow tracer is prevented from being flushed directly from the tracer carrier into the base pipe due to a lack of permeability of the non-perforated section of the base pipe.

10. The method of claim 8, wherein disposing the carrier material circumferentially about at least the portion of the non-perforated section of the base pipe includes wrapping the carrier material around at least the portion of the non-perforated section of the base pipe.

11. A method for outwardly venting inflow tracer such that inflow tracer is prevented from being communicated directly into a base pipe of a production well from a tracer medium configured to emit the inflow tracer, the method comprising:

installing a base pipe such that the base pipe is disposed within a gravel pack, the base pipe including a non-perforated section disposed adjacent to one or more perforated sections, individual ones of the one or more perforated sections being configured to communicate production fluid from the gravel pack into the base pipe to facilitate transporting the production fluid to Earth's surface, the base pipe having a tracer carrier disposed circumferentially about at least a portion of the non-perforated section of the base pipe, the tracer carrier being

configured to carry a tracer material, the tracer material being configured to release an inflow tracer;

during production, flushing the inflow tracer within the gravel pack into individual ones of the one or more perforated sections of the base pipe; and

transporting the production fluid with the flushed inflow tracer toward the Earth's surface via the base pipe.

12. The method of claim 11, wherein the inflow tracer is prevented from being flushed directly from the tracer carrier into the base pipe due to a lack of permeability of the non-perforated section of the base pipe.

13. The method of claim 11, further comprising, during shut in of the production well, allowing the inflow tracer to become concentrated in the gravel pack proximate to the non-perforated section of the base pipe such that, when the inflow tracer is flushed from the gravel pack during production, a high tracer concentration shot is transported with the production fluid.

14. The method of claim 11, further comprising detecting the inflow tracer transported with the production fluid to determine one or more characteristics associated with the production well.

15. The method of claim 14, wherein the one or more characteristics associated with the production well include one or more of identification of contributing zones of a

reservoir, reservoir depletion, reservoir permeability, production fluid properties, expected operating conditions, contributing length, inflow profile of production fluid, location of water breakthrough, reservoir performance, or waterflood performance.

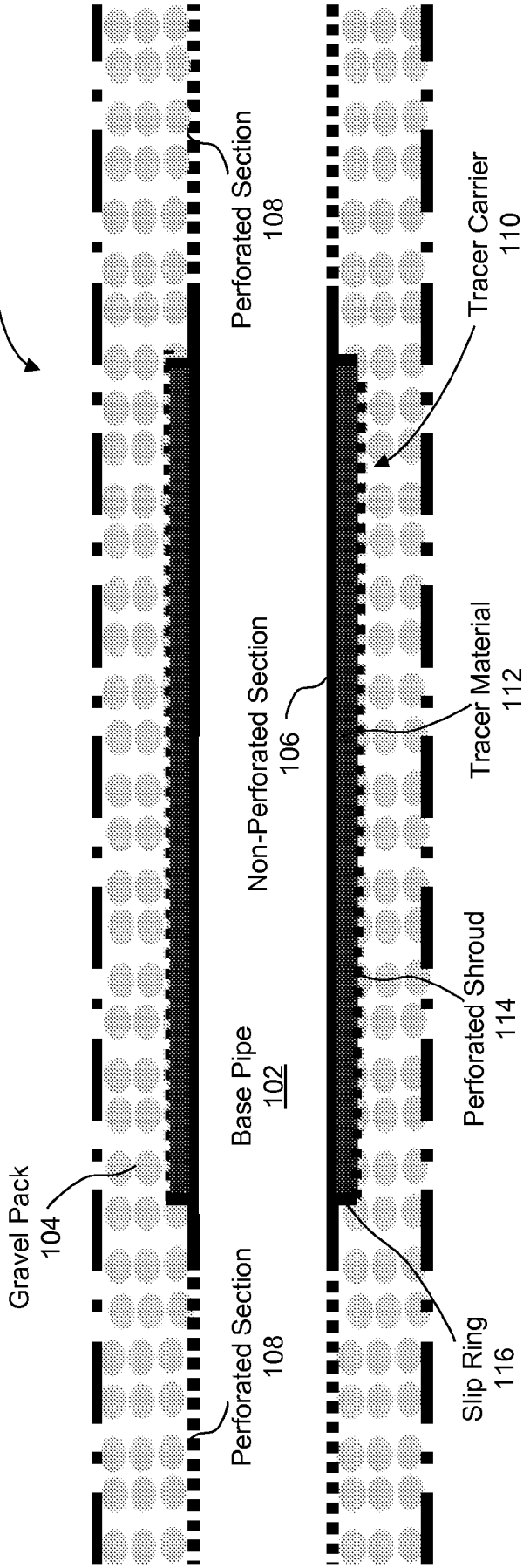

100
Perforated Section
108
Tracer Carrier
110
Non-Perforated Section
106
Tracer Material
112
Base Pipe
102
Perforated Shroud
114
Gravel Pack
104
Perforated Section
108
Slip Ring
116

FIG. 1

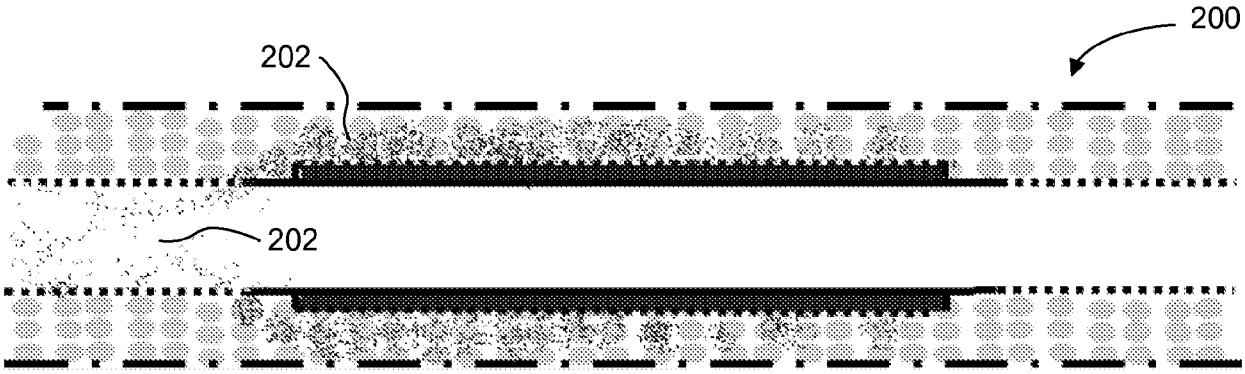



FIG. 2A

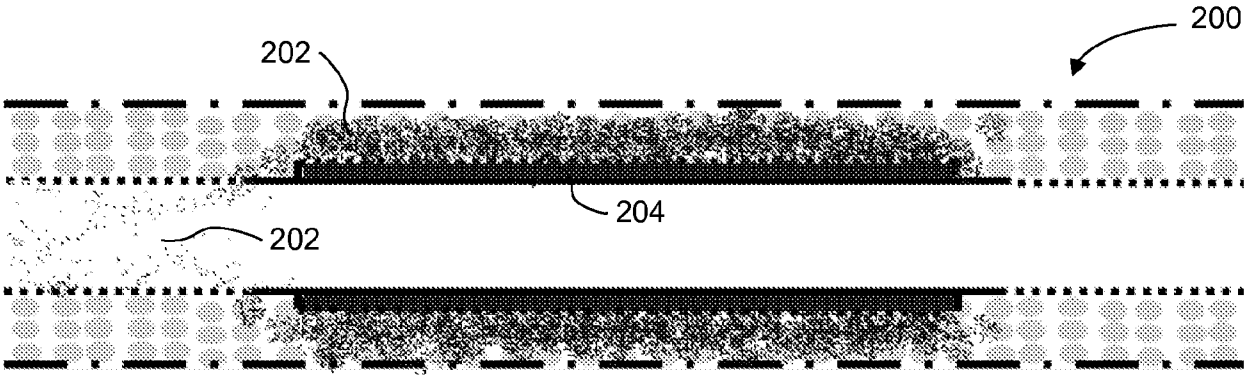



FIG. 2B

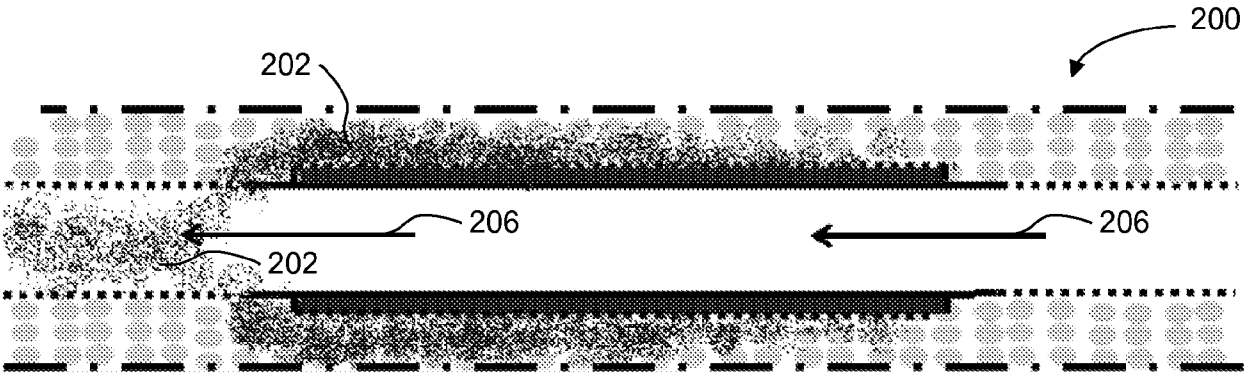



FIG. 2C

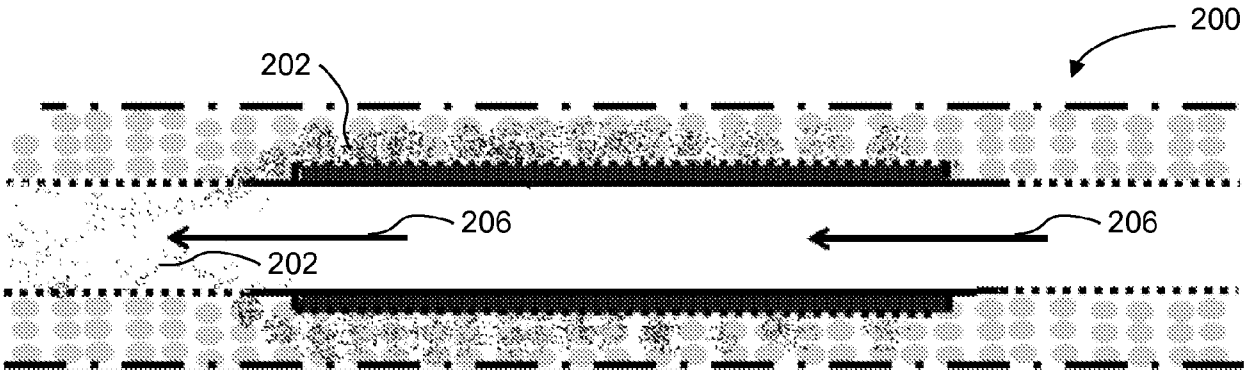



FIG. 2D

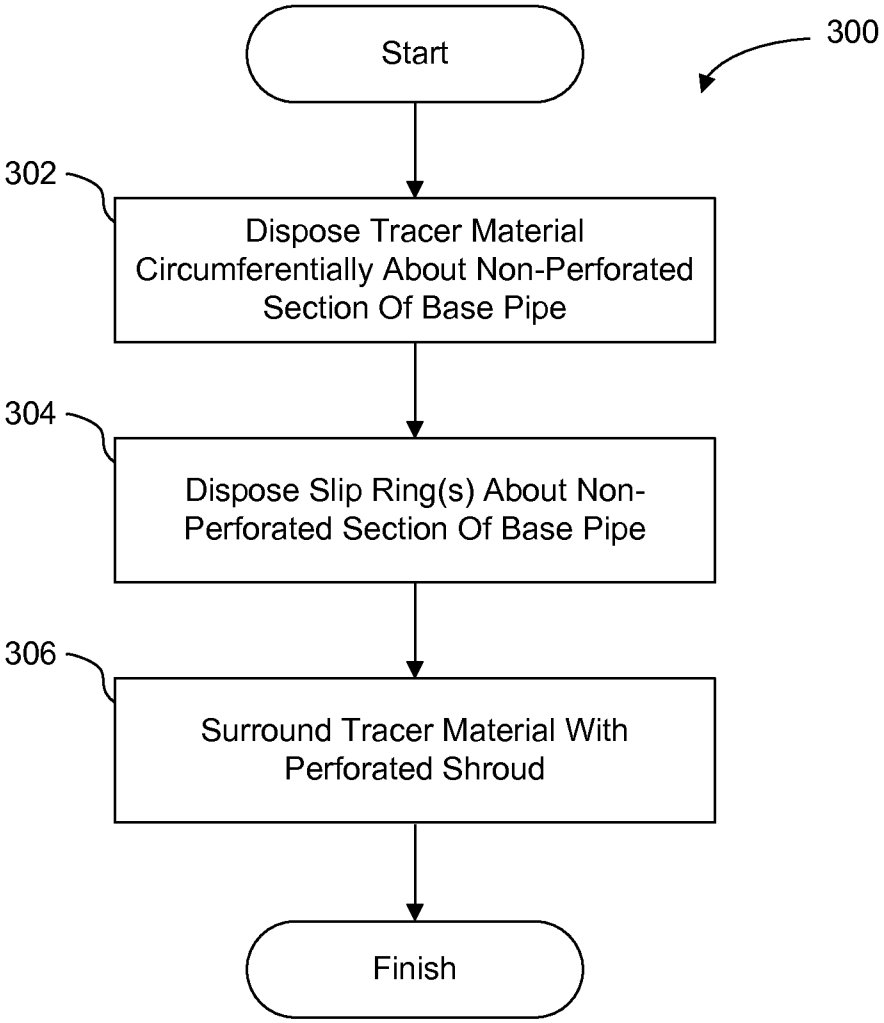

Start
300
302
Dispose Tracer Material Circumferentially About Non-Perforated Section Of Base Pipe
304
Dispose Slip Ring(s) About Non-Perforated Section Of Base Pipe
306
Surround Tracer Material With Perforated Shroud
Finish

FIG. 3

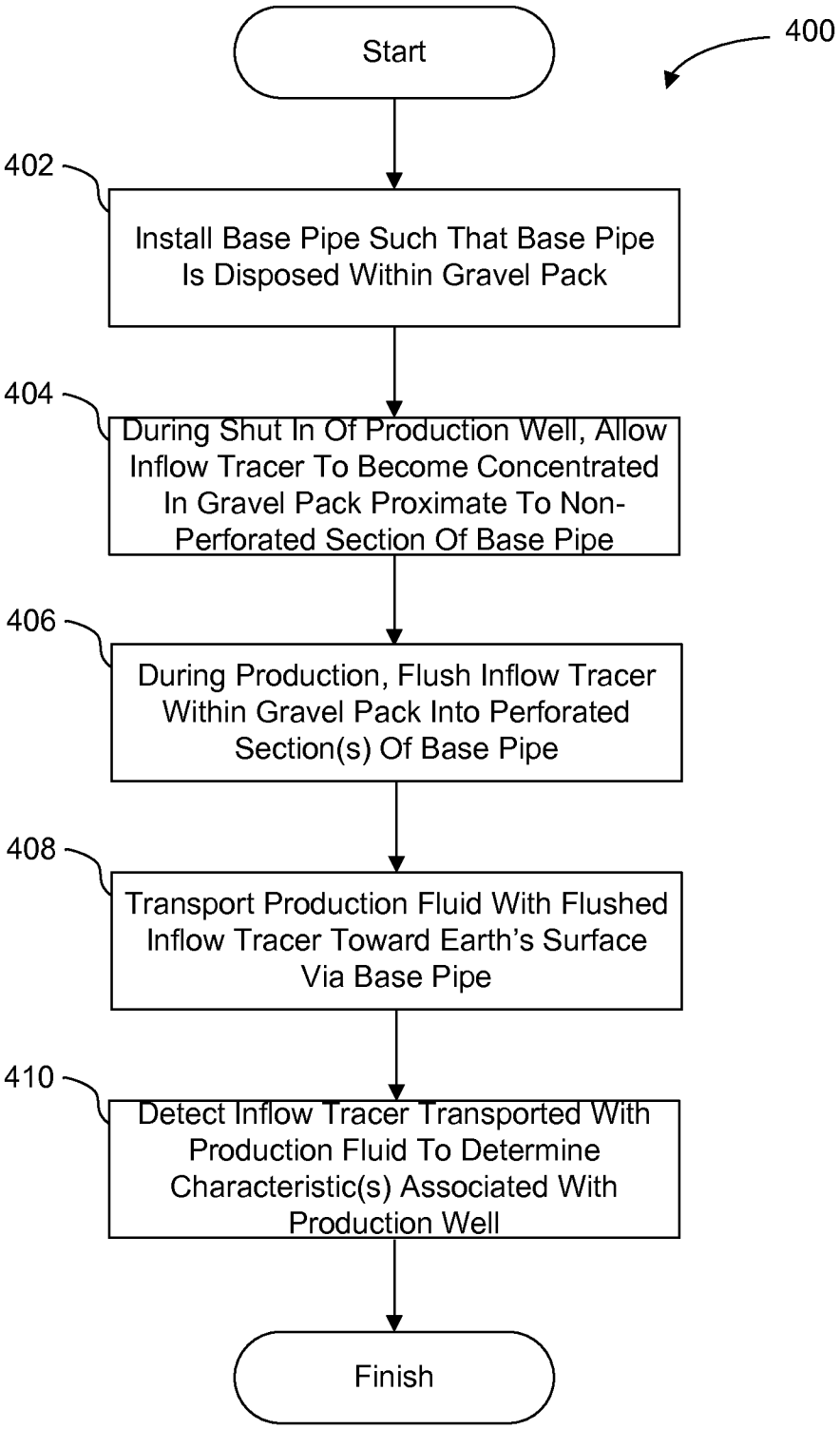

Start
400
402
Install Base Pipe Such That Base Pipe Is Disposed Within Gravel Pack
404
During Shut In Of Production Well, Allow Inflow Tracer To Become Concentrated In Gravel Pack Proximate To Non-Perforated Section Of Base Pipe
406
During Production, Flush Inflow Tracer Within Gravel Pack Into Perforated Section(s) Of Base Pipe
408
Transport Production Fluid With Flushed Inflow Tracer Toward Earth's Surface Via Base Pipe
410
Detect Inflow Tracer Transported With Production Fluid To Determine Characteristic(s) Associated With Production Well
Finish

FIG. 4