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(54) **Titre : PROCEDES DE PRODUCTION D'HYDROCARBURES PENDANT LA DERNIERE ETAPE DES PROCEDES DE
RECUPERATION D'HYDROCARBURE FONDEE SUR LE DRAINAGE PAR GRAVITE**
(54) **Title: PROCESSES FOR PRODUCING HYDROCARBONS DURING LATER STAGE GRAVITY DRAINAGE-BASED
HYDROCARBON RECOVERY PROCESSES**

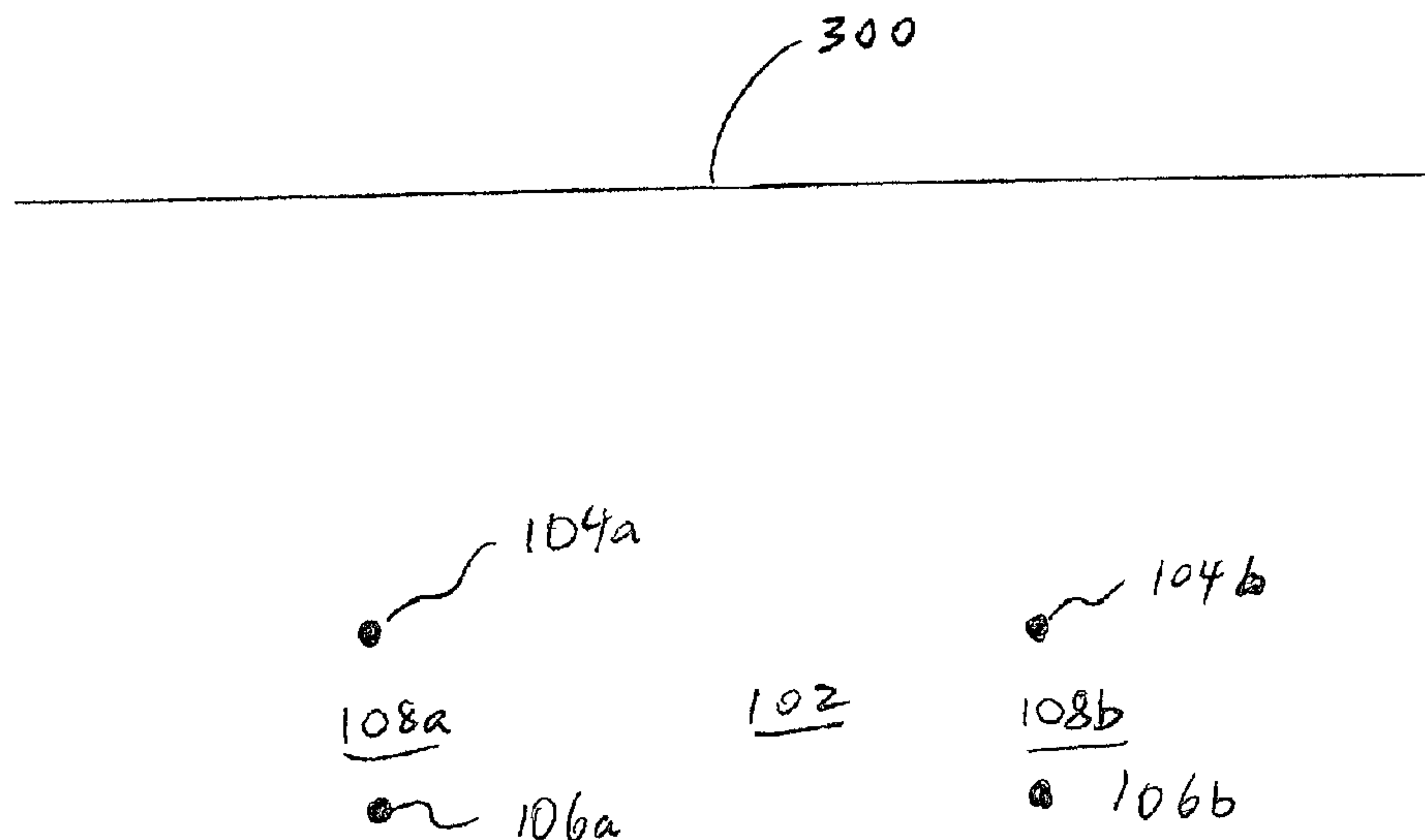
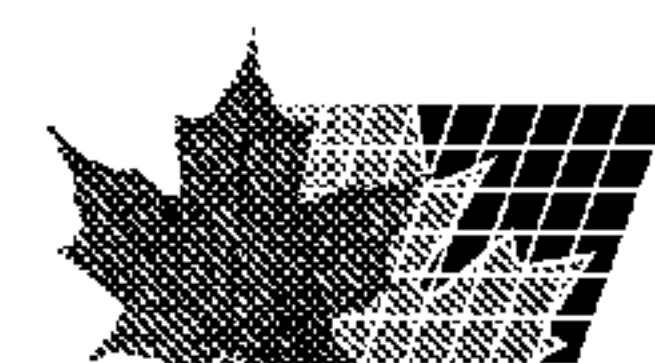


Figure 1

(57) **Abrégé/Abstract:**

A hydrocarbon producing process comprising operating a first thermally- actuated gravity drainage-based process with a first well pair within a first communication zone, wherein the first thermally-actuated gravity drainage-based process includes injecting a



(57) Abrégé(suite)/Abstract(continued):

mobilizing gaseous material into the first communication zone via an injection well of the first well pair such that hydrocarbon material is mobilized, and producing mobilized hydrocarbon material that has drained into a production well of the first well pair; operating a second thermally-actuated gravity drainage-based process with a second well pair within a second communication zone, wherein the second thermally-actuated gravity drainage-based process includes injecting a mobilizing gaseous material into the second communication zone via an injection well of the second well pair such that hydrocarbon material is mobilized, and producing mobilized hydrocarbon material that has drained into a production well of the second well pair; and after a drive process pre-condition has been established, and while a heated gaseous material is at least being supplied to the first communication zone via an injection well of one of the well pairs, applying a pressure differential across the first and second communication zones; wherein the drive process pre-condition has been established when: (a) the first and second communication zones have merged; or (b) the viscosity of hydrocarbon material within an intermediate reservoir region disposed between the first and second communication zones becomes sufficiently low such that the hydrocarbon material is capable of being mobilized in response to the application of a pressure differential; or (c) the minimum viscosity of hydrocarbon material, within the intermediate reservoir region becomes disposed below about 1200 centipoise; or (d) the minimum temperature within the intermediate reservoir region becomes disposed above 90 degrees Celsius.

ABSTRACT

A hydrocarbon producing process comprising operating a first thermally-actuated gravity drainage-based process with a first well pair within a first communication zone, wherein the first thermally-actuated gravity drainage-based process includes injecting a mobilizing gaseous material into the first communication zone via an injection well of the first well pair such that hydrocarbon material is mobilized, and producing mobilized hydrocarbon material that has drained into a production well of the first well pair; operating a second thermally-actuated gravity drainage-based process with a second well pair within a second communication zone, wherein the second thermally-actuated gravity drainage-based process includes injecting a mobilizing gaseous material into the second communication zone via an injection well of the second well pair such that hydrocarbon material is mobilized, and producing mobilized hydrocarbon material that has drained into a production well of the second well pair; and after a drive process pre-condition has been established, and while a heated gaseous material is at least being supplied to the first communication zone via an injection well of one of the well pairs, applying a pressure differential across the first and second communication zones; wherein the drive process pre-condition has been established when: (a) the first and second communication zones have merged; or (b) the viscosity of hydrocarbon material within an intermediate reservoir region disposed between the first and second communication zones becomes sufficiently low such that the hydrocarbon material is capable of being mobilized in response to the application of a pressure differential; or (c) the minimum viscosity of hydrocarbon material, within the intermediate reservoir region becomes disposed below about 1200 centipoise; or (d) the minimum temperature within the intermediate reservoir region becomes disposed above 90 degrees Celsius.

PROCESSES FOR PRODUCING HYDROCARBONS DURING LATER STAGE GRAVITY DRAINAGE-BASED HYDROCARBON RECOVERY PROCESSES

FIELD

[0001] The present disclosure relates to improvements in production of hydrocarbon-comprising material from hydrocarbon-bearing reservoirs.

BACKGROUND

[0002] Thermal enhanced oil recovery methods are used to recover bitumen and heavy oil from hydrocarbon reservoirs. The most dominant of these methods is steam-assisted gravity drainage (“SAGD”). However, SAGD operations typically leave behind significant quantities of residual bitumen within the reservoir, as the gravity drainage mechanism becomes inefficient during later stages of the operation.

SUMMARY

[0003] In one aspect, there is provided a hydrocarbon producing process comprising:

operating a first thermally-actuated gravity drainage-based process with a first well pair within a first communication zone, wherein the first thermally-actuated gravity drainage-based process includes injecting a mobilizing gaseous material into the first communication zone via an injection well of the first well pair such that hydrocarbon material is mobilized, and producing mobilized hydrocarbon material that has drained into a production well of the first well pair;

operating a second thermally-actuated gravity drainage-based process with a second well pair within a second communication zone, wherein the second thermally-actuated gravity drainage-based process includes injecting a mobilizing gaseous material into the second communication zone via an injection well of the second well pair such that hydrocarbon material is mobilized, and producing mobilized hydrocarbon material that has drained into a production well of the second well pair;

and

after a drive process pre-condition has been established, and while a heated gaseous material is at least being supplied to the first communication zone via an injection well of one of the well pairs, applying a pressure differential across the first and second communication zones;

wherein the drive process pre-condition has been established when:

- (a) the first and second communication zones have merged; or
- (b) the viscosity of hydrocarbon material within an intermediate reservoir region disposed between the first and second communication zones becomes sufficiently low such that the hydrocarbon material is capable of being mobilized in response to the application of a pressure differential; or
- (c) the minimum viscosity of hydrocarbon material, within the intermediate reservoir region becomes disposed below about 1200 centipoise; or
- (d) the minimum temperature within the intermediate reservoir region becomes disposed above 90 degrees Celsius.

[0004] In another aspect, there is provided a hydrocarbon producing process comprising:

operating a first thermally-actuated gravity drainage-based process with a first well pair within a first communication zone, wherein the first thermally-actuated gravity drainage-based process includes injecting a mobilizing gaseous material into the first communication zone via an injection well of the first well pair such that hydrocarbon material is mobilized, and producing mobilized hydrocarbon material that has drained into a production well of the first well pair;

operating a second thermally-actuated gravity drainage-based process with a second well pair within a second communication zone, wherein the second thermally-actuated gravity drainage-based process includes injecting a mobilizing gaseous material into the second communication zone via an injection well of the second well pair such that hydrocarbon material is mobilized, and producing mobilized hydrocarbon material that has drained into a production well of the second well pair;

and

after a drive process pre-condition has been established, operating a drive process, wherein the drive process includes:

over a first time interval, and while a heated gaseous material is at least being supplied to the first communication zone via the injection well of the first well pair, applying a first pressure differential across the first and second communication zones, wherein the first communication zone is disposed at a higher pressure than the second communication zone; and

after completion of the first interval, and over a second time interval, and while a heated gaseous material is at least being supplied to the second communication zone via the injection well of the second well pair, applying a second pressure differential across the first and second communication zones, wherein the second communication zone is disposed at a higher pressure than the first communication zone;

wherein the drive process pre-condition has been established when:

- (a) the first and second communication zones have merged; or
- (b) the viscosity of hydrocarbon material within an intermediate reservoir region disposed between the first and second communication zone becomes sufficiently low such that the hydrocarbon material is capable of being mobilized in response to the application of a pressure differential; or
- (c) the minimum viscosity of hydrocarbon material, within the intermediate reservoir region becomes disposed below about 1200 centipoise; or
- (d) the minimum temperature within the intermediate reservoir region becomes disposed above 90 degrees Celsius.

[0005] In another aspect, there is provided a hydrocarbon producing process comprising:

operating a first thermally-actuated gravity drainage-based process with a first well pair within a first communication zone, wherein the first thermally-actuated gravity drainage-based process

includes injecting a mobilizing gaseous material into the first communication zone via an injection well of the first well pair such that hydrocarbon material is mobilized, and producing mobilized hydrocarbon material that has drained into a production well of the first well pair;

operating a second thermally-actuated gravity drainage-based process with a second well pair within a second communication zone, wherein the second thermally-actuated gravity drainage-based process includes injecting a mobilizing gaseous material into the second communication zone via an injection well of the second well pair such that hydrocarbon material is mobilized, and producing mobilized hydrocarbon material that has drained into a production well of the second well pair;

after a cyclic process pre-condition has been established, operating a cyclic process, wherein the cyclic process includes:

during the entirety of a first operating mode, applying a first pressure differential across the first and second communication zones while a heated gaseous material is at least being supplied to the first communication zone via the injection well of the first well pair, wherein the first communication zone is disposed at a higher pressure than the second communication zone; and

after completion of the first operating mode, during the entirety of the second operating mode, applying a second pressure differential across the first and second communication zones while a heated gaseous material is at least being supplied to the second communication zone via the injection well of the second well pair, wherein the second communication zone is disposed at a higher pressure than the first communication zone;

wherein the cyclic process pre-condition has been established when:

- (a) the first and second communication zones have merged; or
- (b) the viscosity of hydrocarbon material within an intermediate reservoir region disposed between the first and second communication zones becomes sufficiently low such that the hydrocarbon material is capable of being mobilized in response to the application of a pressure differential; or

(c) the minimum viscosity of hydrocarbon material, within the intermediate reservoir region becomes disposed below about 1200 centipoise; or

(d) the minimum temperature within the intermediate reservoir region becomes disposed above 90 degrees Celsius.

[0006] In another aspect, there is provided a hydrocarbon producing process comprising:

operating a first thermally-actuated gravity drainage-based process with a first well pair within a first communication zone, wherein the first thermally-actuated gravity drainage-based process includes injecting a mobilizing gaseous material into the first communication zone via an injection well of the first well pair such that hydrocarbon material is mobilized, and producing mobilized hydrocarbon material that has drained into a production well of the first well pair;

operating a second thermally-actuated gravity drainage-based process with a second well pair within a second communication zone, wherein the second thermally-actuated gravity drainage-based process includes injecting a mobilizing gaseous material into the second communication zone via an injection well of the second well pair such that hydrocarbon material is mobilized, and producing mobilized hydrocarbon material that has drained into a production well of the second well pair;

operating a third thermally-actuated gravity drainage-based process with a third well pair within a third communication zone, wherein the third thermally-actuated gravity drainage-based process includes injecting a mobilizing gaseous material into the third communication zone via an injection well of the third well pair such that hydrocarbon material is mobilized, and producing mobilized hydrocarbon material that has drained into a production well of the third well pair;

wherein the second communication zone is disposed between the first and third communication zones;

and

after a drive process pre-condition has been established, operating a drive process, wherein the drive process includes both of:

(i) applying a first driving pressure differential across the first and second communication zones, wherein the applying a first driving pressure differential across the first and second communication zones is effected while a heated gaseous material is at least being supplied to the second communication zone via the injection well of the second well pair, wherein the second communication zone is disposed at a higher pressure than the first communication zone; and

(ii) applying a second driving pressure differential across the second and third communication zones, wherein the applying a second driving pressure differential across the second and third communication zones is effected while a heated gaseous material is at least being supplied to the second communication zone via the injection well of the second well pair, wherein the second communication zone is disposed at a higher pressure than the third communication zone.

wherein the drive process pre-condition has been established when both of: (i) a first pre-condition has been established, and (ii) a second pre-condition has been established;

wherein the first pre-condition has been established when: (a) the first and second communication zones have merged; or (b) the viscosity of hydrocarbon material within an intermediate reservoir region disposed between the first and second communication zone becomes sufficiently low such that the hydrocarbon material is capable of being mobilized in response to the application of a pressure differential, or (c) the minimum viscosity of hydrocarbon material, within the intermediate reservoir region disposed between the first and second communication zones, becomes disposed below about 1200 centipoise, or (d) the minimum temperature, within the intermediate reservoir region disposed between the first and second communication zones, becomes disposed above 90 degrees Celsius;

and wherein the second pre-condition has been established when: (a) the second and third communication zones have merged, or (b) the viscosity of hydrocarbon material within an intermediate reservoir region disposed between the second and third communication zones becomes sufficiently low such that the hydrocarbon material is capable of being mobilized in response to the application of a pressure differential, or (c) the minimum viscosity of hydrocarbon material, within the intermediate reservoir region disposed between the second and third communication zones, becomes disposed below about 1200 centipoise, or (d) the minimum

temperature, within the intermediate reservoir region disposed between the second and third communication zones, becomes disposed above 90 degrees Celsius

BRIEF DESCRIPTION OF DRAWINGS

[0007] Embodiments will now be described, by way of example only, with reference to the attached figures, wherein:

[0008] Figure 1 is a schematic illustration of an embodiment of a system for producing hydrocarbon material from a reservoir;

[0009] Figure 2 is a schematic illustration of a first set of well pairs of the system of Figure 1, or of the system of Figure 5 (see below)

[0010] Figure 3 is a schematic illustration of a second set of well pairs of the system of Figure 1, or of the system of Figure 5 (see below);

[0011] Figure 4 is a schematic illustration of the communication zones that have been developed within the reservoir by implementing hydrocarbon recovery processes via the system of Figure 1;

[0012] Figure 5 is schematic illustration of another embodiment of a system for producing hydrocarbon material from a reservoir;

[0013] Figure 6 is a schematic illustration of a third set of well pairs of the system of Figure 1; and

[0014] Figure 7 is a schematic illustration of the communication zones that have been developed within the reservoir by implementing hydrocarbon recovery processes via the system of Figure 5.

DETAILED DESCRIPTION

[0015] The present disclosure relates to use of a production-initiating fluid including steam and non-condensable gaseous material for effecting production of hydrocarbon material from a hydrocarbon-containing reservoir.

[0016] As used herein, the following terms have the following meanings:

[0017] “Hydrocarbon” is an organic compound consisting primarily of hydrogen and carbon, and, in some instances, may also contain heteroatoms such as sulfur, nitrogen and oxygen.

[0018] “Hydrocarbon material” is material that consists of one or more hydrocarbons.

[0019] “Heavy hydrocarbon material” is material that consists of one or more heavy hydrocarbons. A heavy hydrocarbon is a hydrocarbon that, at conditions existing with the hydrocarbon-containing reservoir, has a an API gravity of less than 26 degrees and a viscosity of greater than 10,000 centipoise.

[0020] Referring to Figure 1, there is provided a system 100 for carrying out a process for producing hydrocarbon material from a hydrocarbon-containing reservoir 102 disposed below the earth’s surface 300. In some embodiments, for example, the hydrocarbon-containing reservoir includes an oil sands reservoir, and the hydrocarbon material includes heavy hydrocarbon material, such as bitumen.

[0021] The system 100 includes two sets 101a, 101b of well pairs. Referring to Figure 2, the first set 101a includes a pair of wells 104a, 106a, and the second set includes a pair of wells 104b, 106b. Each one of the wells 104a, 106a, independently, includes a respective horizontal section, and the horizontal section of the well 104a is vertically spaced from the horizontal section of the well 106a, such that the horizontal section of the well 104a is vertically higher than the horizontal section of the well 106a. For the first set 101a, the well 104a functions as an injection well and the well 106a functions as a production well. An interwell region 108a is disposed between the wells 104a, 106a. Each one of the wells 104a, 106a, independently, includes a respective horizontal section, and the horizontal section of the well 104a is vertically spaced from the horizontal section of the well 106a, such that the horizontal section of the well 104a is vertically higher than the horizontal section of the well 106a. Referring to Figure 3, for the second set 101b of well pairs, the well 104b functions as an injection well and the well 106b functions as a production well. An interwell region 108b is disposed between the wells 104b, 106b. Each one of the wells 104b, 106b, independently, includes a respective horizontal section, and the horizontal section of the well 104b is vertically spaced from the horizontal section of the

well 106b, such that the horizontal section of the well 104b is vertically higher than the horizontal section of the well 106b.

[0022] A thermally-actuated gravity drainage-based hydrocarbon recovery process may be implemented via the first set 101a of well pairs, and such process is said to be respective to the first set 101a of well pairs. Another thermally-actuated gravity drainage-based hydrocarbon recovery process may also be implemented via the second set 101b of well pairs, and such process is said to be respective to the second set 101b of well pairs.

[0023] The following is a description of a thermally-actuated gravity drainage-based hydrocarbon recovery process, that may be implemented via the first set 101a of well pairs, but it is understood that this description is also applicable to implementation of a thermally-actuated gravity drainage-based hydrocarbon recovery process via the second set 101b of well pairs.

[0024] During the production phase, the well 104a (the “injection well”) functions to inject a production-initiating fluid 116 into the reservoir 102 to effect mobilization of the hydrocarbon material within the reservoir such that the hydrocarbon material is conducted to the well 106a for production through the well 106a (the “production well”). In some embodiments, for example, the production-initiating fluid includes steam.

[0025] The production phase of the process occurs after interwell communication has been established within the interwell region 108a between the wells 104a, 106a. The interwell communication is established when the injected production-initiating fluid is able to communicate heat to hydrocarbon material within the reservoir such that the hydrocarbon material is mobilized, and the mobilized hydrocarbon material is able to be conducted, by gravity, through the interwell region 108a to the production well 106a.

[0026] In some embodiments, for example, initially, the reservoir 102 has relatively low fluid mobility. In order to enable the injected production-initiating fluid 116a (being injected through the injection well 104a) to promote the conduction of the reservoir hydrocarbons, within the reservoir 102, to the production well 106a, heat and mass transfer communication must be established between the wells 104a, 106a through the interwell region 108a. This communication may be established during a “start-up” phase. During the start-up phase, the

interwell region 108a is heated. In some embodiments, for example, the heat is supplied to the interwell region 108a by circulating a start-up phase fluid 118 (such as steam, or a fluid including steam) through one or both of the wells 104a, 106a. The heat that is supplied to the interwell region 108a heats the reservoir hydrocarbons within the interwell region 108a, thereby reducing the viscosity of the reservoir hydrocarbons. Eventually, the interwell region 108a becomes heated to a temperature such that the hydrocarbon material is sufficiently mobile (i.e. the hydrocarbon material has been “mobilized”) for displacement to the production well 106a by at least gravity drainage. Eventually, sufficient hydrocarbon material drains such that space previously occupied by the hydrocarbon material effects fluid communication between the injection well 106a and the production well 106a, and this space defines a first communication zone 109a. The development of the first communication zone 109a signals completion of the start-up phase and conversion to a production phase.

[0027] During the production phase, the first communication zone 109a effects fluid communication between the production-initiating fluid 116a, being injected through the injection well 104a, with hydrocarbon material within the reservoir, such that the injected production-initiating fluid 116a is conducted through the first communication zone 109a and becomes disposed in heat transfer communication with hydrocarbon material within the reservoir such that the hydrocarbon material becomes heated. When sufficiently heated such that its viscosity becomes sufficiently reduced, the hydrocarbon material becomes mobilized, and, in this respect, the hydrocarbon material is able to be conducted, by at least gravity drainage, through the first communication zone 109a, to the production well 106a. During the production phase, while the production-initiating fluid 116 is being injected into the first communication zone 109a via the injection well 104a, as the mobilized hydrocarbon material drains to the production well 106a, space previously occupied by the hydrocarbon material within the reservoir becomes occupied by the injected production-initiating fluid 116a, thereby exposing a fresh hydrocarbon material surface for receiving heat from the production-initiating fluid 116a (typically, by conduction). This repeated cycle of heating, mobilization, drainage, and establishment of heat transfer communication between the production-initiating fluid 116a and a freshly exposed hydrocarbon material source results in the growth of the first communication zone 109a, with the freshly exposed hydrocarbon material being disposed along an edge of the communication zone 109a. In some embodiments, for example, the first communication zone 109a includes a “vapour

chamber”. In some embodiments, for example, the vapour chamber may also be referred to as a “steam chamber”. In some embodiments, for example, the growth of the first communication zone 109a is upwardly, laterally, or both.

[0028] After the interwell communication has been established between the wells 104a, 106a, production of hydrocarbon material from the reservoir may be effected during the production phase, as described above. In this way, a hydrocarbon recovery process, such as a thermally-actuated gravity drainage-based process, is implemented via the first set 101a of well pairs. In some embodiments, for example, where the production-initiating fluid 116a includes steam, the process that is effecting this production is described as “steam-assisted gravity drainage” or “SAGD”. In some embodiments, for example, the first communication zone 109a includes a vapour chamber, such as, for example, a “steam chamber”.

[0029] Similarly, interwell communication may be established between the wells 104b, 106b (i.e. within the interwell region 108b), in like manner to that which has been described above with respect to the first set 101a of well pairs. In like manner to that which has been described above with respect to the first set 101a of well pairs, after the interwell communication has been established between the wells 104b, 106b, a hydrocarbon recovery process, such as a thermally-actuated gravity drainage process, may be implemented via the second well pair 101b. Creation of a second communication zone 109b is effected while interwell communication is being established, and the second communication zone 109b continues to expand during the production phase of the process, in like manner to that which has been described above with respect to the first set 101a of well pairs and the creation of the second communication zone 109a. In some embodiments, for example, the second communication zone 109b includes a vapour chamber, such as, for example, a “steam chamber”. In some embodiments, for example, the growth of the second communication zone 109b is upwardly, laterally, or both. In some embodiments, for example, the hydrocarbon recovery process may be described as “steam-assisted gravity drainage” or “SAGD”.

[0030] As described above, the production-initiating fluid transfers heat to the hydrocarbon reservoir and effects heating of the bitumen. Although some of this bitumen becomes mobilized, some of it is not. If the bitumen is not mobilized, the transferred heat is wasted, as it is not

leveraged to effect production of the bitumen. Some of this heated bitumen may become stranded within shale shelves 112 within the reservoir 102, or may require significant investment of heat energy to effect its recovery from the shale shelves. As well, some of this heated bitumen may become stranded within an intermediate reservoir region 110a disposed between the communication zones 109a, 109b, or may require significant investment of heat energy to effect its recovery from this intermediate reservoir region. In some embodiments, for example, this intermediate reservoir region is referred to as a “wedge” region.

[0031] In some embodiments, for example, heat generated by either one of:

(a) the thermally-actuated gravity drainage-based process being effected by the first well pair 101a, or

(b) the thermally-actuated gravity drainage-based process being effected by the second well pair 101b, or

(c) both of: (i) the thermally-actuated gravity drainage-based process being effected by the first well pair 101a, and (ii) the thermally-actuated gravity drainage-based process being effected by the second well pair 101b,

effects heating of hydrocarbon material within these regions where stranded bitumen may be present within the intermediate reservoir region 110a disposed between the first and second communication zones 109a, 109b.

[0032] In some of these embodiments, for example, the heating of hydrocarbon material within these regions is effected while both of: (i) a thermally-actuated gravity drainage-based process is being effected by the first well pair 101a, and (ii) a thermally-actuated gravity drainage-based process is being effected by the second well pair 101b.

[0033] Recovery of this heated bitumen is accelerated by implementing a drive process after:

(a) the first and second communication zones have merged; or

(b) the viscosity of hydrocarbon material within an intermediate reservoir region disposed between the first and second communication zones becomes sufficiently low such that

the hydrocarbon material is capable of being mobilized in response to the application of a pressure differential; or

(c) the minimum viscosity of hydrocarbon material, within the intermediate reservoir region becomes disposed below about 1200 centipoise; or

(d) the minimum temperature within the intermediate reservoir region becomes disposed above 90 degrees Celsius.

[0034] The drive process is effected by supplying a heated gaseous material, to at least to one of the first and second communication zones 109a, 109b, via an injection well respective to that communication zone, while applying a pressure differential across the first and second communication zones 109a, 109b. In some embodiments, for example, the heated gaseous material includes steam.

[0035] In some embodiments, for example, the heated gaseous material used during the drive process includes steam.

[0036] In some embodiments, for example, each one of the first and second thermally-actuated gravity drainage-based processes, independently, continue to be effected after the application of the pressure differential.

[0037] In some embodiments, for example, the pressure differential is applied over a time interval, and the time interval has a duration that is at least sufficient to conduct hydrocarbon material from the intermediate reservoir region 110a to one of the first and second communication zones 109a, 109b (the one of the first and second communication zones 109a, 109b disposed at a lower pressure relative to the other one of the first and second communication zones 109a, 109b). In some embodiments, for example, The duration of the time interval is a function of the mobility of the hydrocarbon material within the reservoir and the applied pressure differential. Contributing factors include: absolute reservoir permeability, relative permeability of hydrocarbon material, viscosity of hydrocarbon material, spacing between the communication zones 109a, 109b, and the presence of any baffles to flow and reservoir pressure containment. In some embodiments, for example, the time interval, over which the pressure differential is

applied, is at least two (2) months, such as, for example, at least six (6) months, such as, for example, eight (8) months.

[0038] Figure 4 is illustrative of the system 100, and includes the first and second well pairs 101a, 101b, with the communication zones 109a, 109b having been developed by implementation of respective thermally-actuated gravity drainage-based processes via the first and second sets 101a, 101b of well pairs, and with an intermediate reservoir region 110a having become heated by such thermally-actuated gravity drainage-based processes. The system may also include a shale shelf 112 disposed in an upper region of the reservoir 102.

[0039] In some embodiments, for example, the application of a pressure differential is such that hydrocarbon material is conducted from the intermediate reservoir region 110a to one of the first and second communication zones 109a, 109b in response to the applied pressure differential. In some embodiments, for example, the application of a pressure differential is such that hydrocarbon material is conducted from the shale shelf 112 to one of the first and second communication zones 109a, 109b in response to the applied pressure differential.

[0040] In some embodiments, for example, the application of a pressure differential includes effecting at least a reduction in pressure within a one of the first and second communication zones 109a, 109b, such that the pressure within the other one of the first and second communication zones becomes greater than the pressure within the communication zone within which the pressure reduction has been effected. In some embodiments, for example, the at least a reduction in pressure is effected by shutting in an injection well of one of the first and second well pairs. In some embodiments, for example, by shutting in the injection well, trapped oil, prevented from draining into the production well by higher pressure conditions within the communication zone that persisted while the injection well was supplying the production-initiating fluid to the communication zone via the injection well, is now able to be recovered by drainage to the production well.

[0041] In some embodiments, for example, the application of a pressure differential includes increasing the rate of steam being supplied to one of the first and second communication zones 109a, 109b, such that an increase in pressure, within the communication zone which is receiving the increased rate of supply of steam, is effected.

[0042] In some embodiments, for example, the applied pressure differential is at least about 50 kPa. In some embodiments, for example, the applied pressure differential is from about 50 kPa to about 1500 kPa. In some embodiments, for example, the applied pressure differential is constant, or substantially constant, over the entire duration of the time interval. Alternatively, in some embodiments, for example, the pressure differential may be variable over the time interval.

[0043] In another aspect, the drive process is implemented while employing pressure swing as between the first and second well pairs 101a, 101b. In this respect, the drive process is operated over a first time interval and a second time interval. Over the first time interval, and while a heated gaseous material is at least being supplied to the first communication zone 109a via the injection well 104a of the first well pair 101a, a first pressure differential is applied across the first and second communication zones, wherein the first communication zone 109a is disposed at a higher pressure than the second communication zone 109b. After completion of the first interval, and over the second time interval, and while a heated gaseous material is at least being supplied to the second communication zone 109b via the injection well 104b of the second well pair 101b, a second pressure differential is applied across the first and second communication zones 109a, 109b, wherein the second communication zone 109b is disposed at a higher pressure than the first communication zone 109a.

[0044] In some embodiments, for example, the second time interval occurs immediately, or substantially immediately, after the first time interval.

[0045] In some embodiments, for example, the first time interval has a duration that is at least sufficient to conduct hydrocarbon material from the intermediate reservoir region 110a to the second communication zone 109b. The duration of the first time interval is a function of the mobility of the hydrocarbon material within the reservoir and the applied pressure differential. Contributing factors include: absolute reservoir permeability, relative permeability of hydrocarbon material, viscosity of hydrocarbon material, spacing between the communication zones 109a, 109b, and the presence of any baffles to flow and reservoir pressure containment. In some embodiments, for example, the duration of the first time interval is at least two (2) months, such as, for example, at least six (6) months, such as, for example, eight (8) months.

[0046] In some embodiments, for example, the second time interval has a duration that is at least sufficient to conduct hydrocarbon material from the intermediate reservoir region 110a to the first communication zone 109a. In some embodiments, for example, the duration of the second time interval is a function of the mobility of the hydrocarbon material within the reservoir and the applied pressure differential. Contributing factors include: absolute reservoir permeability, relative permeability of hydrocarbon material, viscosity of hydrocarbon material, spacing between the communication zones 109a, 109b, and the presence of any baffles to flow and reservoir pressure containment. In some embodiments, for example, the duration of the second time interval is at least two (2) months, such as, for example, at least six (6) months, such as, for example, eight (8) months.

[0047] In some embodiments, for example, the duration of the first time interval may be the same, or substantially the same, as the duration of the second time interval. Alternatively, in some embodiments, for example, the duration of the first time interval may be different than the duration of the second time interval.

[0048] In some embodiments, for example, the ratio of the total duration of the first time interval to the total duration of the second time interval is a function of geometry of the heterogeneity inhibiting gravity drainage of the hydrocarbon material, location of pressure swing within the greater field well pattern, and injectivity constraints due to reservoir properties or facility limitations. In some embodiments, for example, the ratio of the total duration of the first time interval to the total duration of the second time interval is at least 0.5, such as, for example, 1.0.

[0049] In some embodiments, for example, the heated gaseous material, being supplied during each of the first and second time intervals, includes steam.

[0050] In some embodiments, for example, each one of the first and second thermally-actuated gravity drainage-based processes, independently, continue to be effected while the drive process is being effected.

[0051] In some embodiments, for example, the application of a pressure differential during the first time interval is such that hydrocarbon material is conducted from the intermediate

reservoir region 110a to the second communication zone 109b in response to the applied pressure differential, and the application of a pressure differential during the second time interval is such that hydrocarbon material is conducted from the intermediate reservoir region 110a to the first communication zone 109a in response to the applied pressure differential.

[0052] In some embodiments, for example, the application of a pressure differential during the first time interval is such that hydrocarbon material is conducted from the shale shelf 112 to the second communication zone 109b in response to the applied pressure differential, and the application of a pressure differential during the second time interval is such that hydrocarbon material is conducted from the shale shelf 112 to the first communication zone 109a in response to the applied pressure differential.

[0053] In some embodiments, for example, the application of the first pressure differential includes effecting at least a reduction in pressure within the second communication zone 109b, such that the pressure within the first communication zone 109a becomes greater than the pressure within the second communication zone 109b. In some embodiments, for example, the at least a reduction in pressure is effected by shutting in the injection well 104b of the second well pair 101b. In some embodiments, for example, by shutting in the injection well, trapped oil, prevented from draining into the production well by higher pressure conditions within the communication zone that persisted while the injection well was supplying the production-initiating fluid to the communication zone via the injection well, is now able to be recovered by drainage to the production well.

[0054] In some embodiments, for example, the application of the second pressure differential includes effecting at least a reduction in pressure within the first communication zone 109a, such that the pressure within the second communication zone 109b becomes greater than the pressure within the first communication zone 109a. In some embodiments, for example, the at least a reduction in pressure is effected by shutting in the injection well 104a of the first well pair 101a. In some embodiments, for example, by shutting in the injection well, trapped oil, prevented from draining into the production well by higher pressure conditions within the communication zone that persisted while the injection well was supplying the production-initiating fluid to the

communication zone via the injection well, is now able to be recovered by drainage to the production well.

[0055] In some embodiments, for example, the application of the first pressure differential includes increasing the rate of steam being supplied to the first communication zone 10a, such that an increase in pressure within the first communication zone 109a is effected.

[0056] In some embodiments, for example, the application of the second pressure differential includes increasing the rate of steam being supplied to the second communication zone 109b, such that an increase in pressure within the second communication zone 109b is effected.

[0057] In some embodiments, for example, each one of the applied first and second pressure differentials, independently, is at least about 50 kPa. In some embodiments, for example, each one of applied first and second pressure differentials, independently, is from about 50 kPa to about 1500 kPa.

[0058] In some embodiments, for example, the first pressure differential, being applied over the first time interval, is constant, or substantially constant, over the entire duration of the first time interval. Alternatively, in some embodiments, for example, the first pressure differential is variable over the first time interval.

[0059] In some embodiments, for example, the second pressure differential, being applied over the second time interval, is constant, or substantially constant, over the entire duration of the second time interval. Alternatively, in some embodiments, for example, the second pressure differential is variable over the second time interval.

[0060] In some embodiments, for example, the magnitude of the first pressure differential, being applied at least at some point in time during the first time interval, is the same, or substantially the same, as the magnitude of the second pressure differential being applied at some point in time during the second time. In other embodiments, for example, the magnitude of at least one first pressure differential (such as, for example, every first pressure differential), applied during the first time interval, is different than the magnitude of at least one second pressure differential (such as, for example, every second pressure differential) being applied during the second time interval.

[0061] In another aspect, drive processes are incorporated within a cyclic process. The cyclic process includes a first operating mode and a second operating mode. During the entirety of a first operating mode, a first pressure differential is applied across the first and second communication zones 109a, 109b while a heated gaseous material is at least being supplied to the first communication zone 109a via the injection well 104a of the first well pair 101a, and the first communication zone 109a is disposed at a higher pressure than the second communication zone 109b. After completion of the first operating mode, the second operating mode is effectuated. During the entirety of the second operating mode, a second pressure differential is applied across the first and second communication zones 109a, 109b while a heated gaseous material is at least being supplied to the second communication zone 109b via the injection well 104b of the second well pair 101b, and the second communication zone 109b is disposed at a higher pressure than the first communication zone 109a.

[0062] The cyclic process is repeated at least once. In some embodiments, for example, the second operating mode occurs immediately, or substantially, immediately after the first operating mode.

[0063] In some embodiments, for example, the cyclic process is repeated until the intermediate reservoir region 110a is depleted, or substantially depleted, of the hydrocarbon material. Alternatively, in some embodiments, for example, the cyclic process is repeated until injection conditions are unable to sustain a pressure differential between the communication zones 109a, 109b. In some embodiments, for example, this is a function of timing of thermal maturity of the drainage area, initial application of pressure swing, the durations of the first and second intervals, geometry of the reservoir, initial saturations and relative permeability.

[0064] The first operating mode may be implemented over a first time interval. In some embodiments, for example, the first time interval has a duration that is at least sufficient to conduct hydrocarbon material from the intermediate reservoir region 110a to the second communication zone 109b. The duration of the first time interval is a function of the mobility of the hydrocarbon material within the reservoir and the applied pressure differential. Contributing factors include: absolute reservoir permeability, relative permeability of hydrocarbon material, viscosity of hydrocarbon material, spacing between the communication zones 109a, 109b, and

the presence of any baffles to flow and reservoir pressure containment. In some embodiments, for example, the duration of the first time interval is at least two (2) months, such as, for example, at least six (6) months, such as, for example, eight (8) months.

[0065] In some implementations, the total duration of the first time interval of the first operating mode may vary as between some cycles of the cyclic process, while being the same, or substantially the same, as between the other cycles of the cyclic process. In some embodiments, for example, the total duration of the first time interval of the first operating mode may vary as between all cycles of the cyclic process. In some embodiments, for example, the total duration of the first time interval of the first operating mode may be the same, or substantially the same, as between all cycles of the cyclic process. In this respect, in some embodiments, for example, with respect to at least one of the cycles, the total duration of the first time interval of the first operating mode of the cycle is the same, or substantially the same, as the total duration of the first time interval of the first operating mode of at least another one (such as, for example, every other one) of the cycles. As well, in some embodiments, for example, with respect to at least one of the cycles, the total duration of the first time interval of the first operating mode of the cycle is different than the total duration of the first time interval of the first operating mode of at least another one (such as, for example, every other one) of the cycles.

[0066] The second operating mode may be implemented over a second time interval. In some embodiments, for example, the second time interval has a duration that is at least sufficient to conduct hydrocarbon material from the intermediate reservoir region 110a to the first communication zone 109a. In some embodiments, for example, the duration of the second time interval is a function of the mobility of the hydrocarbon material within the reservoir and the applied pressure differential. Contributing factors include: absolute reservoir permeability, relative permeability of hydrocarbon material, viscosity of hydrocarbon material, spacing between the communication zones 109a, 109b, and the presence of any baffles to flow and reservoir pressure containment. In some embodiments, for example, the duration of the second time interval is at least two (2) months, such as, for example, at least six (6) months, such as, for example, eight (8) months.

[0067] In some embodiments, for example, the total duration of the second time interval of the second operating mode may vary as between some cycles of the cyclic process, while being the same, or substantially the same, as between the other cycles of the cyclic process. In some embodiments, for example, the total duration of the second time interval of the second operating mode may vary as between all cycles of the cyclic process. In some embodiments, for example, the total duration of the second time interval of the second operating mode may be the same, or substantially the same, as between all cycles of the cyclic process. In this respect, in some embodiments, for example, with respect to at least one of the cycles of the cyclic process, the total duration of the second time interval of the second operating mode of the cycle is the same, or substantially the same, as the total duration of the second time interval of the second operating mode of at least another one (such as, for example, every other one) of the cycles. As well, in some embodiments, for example, with respect to at least one of the cycles of the cyclic process, the total duration of the second time interval of the second operating mode of the cycle is different than the total duration of the second time interval of the second operating mode of at least another one (such as, for example, every other one) of the cycles.

[0068] Within the same cycle of the cyclic process, the total duration of the first operating mode may be the same, or substantially the same, as the total duration of the second operating mode, or may be different than the total time duration of the second operating mode. In this respect, in some embodiments, for example, with respect to at least one of the cycles of the cyclic process, the duration of the first operating mode of the cycle is the same, or substantially the same, as the total duration of the second operating mode of at least another other one (such as, for example, every other one) of the cycles. Also, in some embodiments, for example, with respect to at least one of the cycles of the cyclic process, the duration of the first operating mode of the cycle is different than the total duration of the second operating mode of at least another other one (such as, for example, every other one) of the cycles.

[0069] In some embodiments, for example, within the same cycle of the cyclic process, the ratio of the total duration of the first operating mode to the total duration of the second operating mode is a function of geometry of the heterogeneity inhibiting gravity drainage of the hydrocarbon material, location of pressure swing within the greater field well pattern, and injectivity constraints due to reservoir properties or facility limitations. In some embodiments,

for example, within the same cycle of the cyclic process, the ratio of the total duration of the first operating mode to the total duration of the second operating mode is at least 0.5, such as, for example, 1.0. In some embodiments, for example, the ratio of the total duration of the first operating mode to the total duration of the second operating mode of at least one of the cycles of the cyclic process is the same, or substantially the same, as the ratio of the total duration of the first operating mode to the total duration of the second operating mode of at least another other one (such as, for example, every other one) of the cycles of the cyclic process. In some embodiments, for example, the ratio of the total duration of the first operating mode to the total duration of the second operating mode of at least one of the cycles of the cyclic process is different than the ratio of the total duration of the first operating mode to the total duration of the second operating mode of at least another one (such as, for example, every other one) of the operating cycles of the cyclic process.

[0070] In some embodiments, for example, the heated gaseous material, being supplied during each of the first and second operating modes, includes steam.

[0071] In some embodiments, for example, each one of the first and second thermally-actuated gravity drainage-based processes, independently, continue to be effected while the cyclic process is being effected.

[0072] In some embodiments, for example, the application of a first pressure differential during the first operating mode is such that hydrocarbon material is conducted from the intermediate reservoir region 110a to the second communication zone 109b in response to the applied pressure differential, and the application of a second pressure differential during the second operating mode is such that hydrocarbon material is conducted from the intermediate reservoir region 110a to the first communication zone 109a in response to the applied pressure differential;

[0073] In some embodiments, for example, the application of a first pressure differential during the first operating mode is such that hydrocarbon material is conducted from the shale shelf 112 to the second communication zone 109b in response to the applied pressure differential, and the application of a second pressure differential during the second operating

mode is such that hydrocarbon material is conducted from the shale shelf 112 to the first communication zone 109a in response to the applied pressure differential.

[0074] In some embodiments, for example, the application of the first pressure differential includes effecting at least a reduction in pressure within the second communication zone 109b, such that the pressure within the first communication zone 109a becomes greater than the pressure within the second communication zone 109b. In some of these embodiments, for example, the at least a reduction in pressure is effected by shutting in the injection well 104b of the second well pair 101b. In some embodiments, for example, by shutting in the injection well, trapped oil, prevented from draining into the production well by higher pressure conditions within the communication zone that persisted while injection well was supplying the production-initiating fluid to the communication zone via the injection well, is now able to be recovered by drainage to the production well.

[0075] In some embodiments, for example, the application of the second pressure differential includes effecting at least a reduction in pressure within the first communication zone 109a, such that the pressure within the second communication zone 109b becomes greater than the pressure within the first communication zone 109a. In some of these embodiments, for example, the at least a reduction in pressure is effected by shutting in the injection well 104a of the first well pair 101a. In some embodiments, for example, by shutting in the injection well, trapped oil, prevented from draining into the production well by higher pressure conditions within the communication zone that persisted while injection well was supplying the production-initiating fluid to the communication zone via the injection well, is now able to be recovered by drainage to the production well.

[0076] In some embodiments, for example, the application of the first pressure differential includes increasing the rate of steam being supplied to the first communication zone 109a, such that an increase in pressure within the first communication zone 109a is effected.

[0077] In some embodiments, for example, the application of the second pressure differential includes increasing the rate of steam being supplied to the second communication zone 109b, such that an increase in pressure within the second communication zone 109b is effected.

[0078] In some embodiments, for example, each one of the applied first and second pressure differentials, independently, is at least about 50 kPa. In some embodiments, for example, each one of applied first and second pressure differentials, independently, is from about 50 kPa to about 1500 kPa.

[0079] In some embodiments, for example, the first pressure differential may be constant, or substantially constant, over the entirety of the first operating mode, or may be variable over the entirety of the first operating mode.

[0080] In some embodiments, for example, the first pressure differential of the first operating mode may vary as between some cycles of the cyclic process, while being the same, or substantially the same, as between the other cycles of the cyclic process. In some embodiments, for example, the first pressure differential of the first operating mode may vary as between all cycles of the cyclic process. In some embodiments, for example, the first pressure differential of the first operating mode may be the same, or substantially the same, as between all cycles of the cyclic process. In this respect, in some embodiments, for example, with respect to at least one of the cycles of the cyclic process, the first pressure differential of the first operating mode of the cycle is the same, or substantially the same, as the first pressure differential of the first operating mode of at least another one (such as, for example, every other one) of the cycles of the cyclic process. Also, in some embodiments, for example, with respect to at least one of the cycles of the cyclic process, the first pressure differential of the first operating mode of the cycle is different than the first pressure differential of the first operating mode of at least another one (such as, for example, every other one) of the cycles of the cyclic process.

[0081] In some embodiments, for example, the second pressure differential may be constant, or substantially constant, over the entirety of the second operating mode, or may be variable over the entirety of the second operating mode.

[0082] In some embodiments, for example, the second pressure differential of the second operating mode may vary as between some cycles of the cyclic process, while being the same, or substantially the same, as between the other cycles of the cyclic process. In some embodiments, for example, the second pressure differential of the second operating mode may vary as between all cycles of the cyclic process. In some embodiments, for example, the second pressure

differential of the second operating mode may be the same, or substantially the same, as between all cycles of the cyclic process. In this respect, in some embodiments, for example, with respect to at least one of the cycles of the cyclic process, the second pressure differential of the second operating mode of the cycle is the same, or substantially the same, as the second pressure differential of the second operating mode of at least another one (such as, for example, every other one) of the cycles of the cyclic process. Also, in some embodiments, for example, with respect to at least one of the cycles of the cyclic process, the second pressure differential of the second operating mode of the cycle is different than the second pressure differential of the second operating mode of at least another one (such as, for example, every other one) of the cycles of the cyclic process.

[0083] In some embodiments, for example, within the same cycle of the cyclic process, the magnitude of the first pressure differential, being applied at least at some point in time during the first operating mode, is the same, or substantially the same, as the magnitude of a second pressure differential being applied at some point in time during the second operating mode. In some embodiments, for example, within the same cycle of the cyclic process, the magnitude of at least one first pressure differential (such as, for example, every first pressure differential), being applied at least at some point in time during the first operating mode is different than the magnitude of at least one second pressure differential (such as, for example, every second pressure differential) being applied during the second operating.

[0084] Referring to Figure 5 in another aspect, the first and second well pairs 101a, 101b are combined with a third well pair 101c, to provide system 200. The second well pair 101b is disposed between the first and third well pairs 101a, 101c. Referring to Figure 6, like the first and second well pairs 101a, 101b, the third well pair 101c includes an injection well 104c and a production well 106c. An interwell region 108c is disposed between the wells 104c, 106c. The horizontal section of injection well 104c is disposed above the horizontal section of the production well 106. A thermally-actuated gravity drainage-based hydrocarbon recovery process may be implemented via the third set 101a of well pairs, and such process is said to be respective to the third set 101a of well pairs.

[0085] Prior to implementation of a production phase, interwell communication is established between the wells 104c, 106c (i.e. within the interwell region 108c), in like manner to that which has been described above with respect to the first set 101a of well pairs. The interwell communication is such that production of hydrocarbon material from the reservoir may be effected during a production phase via the third well pair 101c.

[0086] In like manner to that which has been described above with respect to the first set 101a of well pairs, after the interwell communication has been established between the wells 104c, 106c, a hydrocarbon recovery process, such as a thermally-actuated gravity drainage process, may be implemented via the third well pair 101c. Creation of the communication zone 109c is effected while interwell communication is being established, and the communication zone 109c continues to expand during the production phase of the process, in like manner to that which has been described above with respect to the first set 101a of well pairs and the creation of the communication zone 109a. In some embodiments, for example, the communication zone 109c includes a vapour chamber, such as, for example, a “steam chamber”. In some embodiments, for example, the growth of the communication zone 109c is upwardly, laterally, or both. In some embodiments, for example, the hydrocarbon recovery process may be described as “steam-assisted gravity drainage” or “SAGD”.

[0087] The creation of the first, second and third communication zones 109a, 109b 109c is such that: (i) a first intermediate reservoir region 110x becomes disposed between the first and second communication zones 109a 109b, and (ii) a second intermediate reservoir region 110y becomes disposed between the second and third communication zones 109b, 109c.

[0088] In some embodiments, for example, heating of hydrocarbon material, within the first and second intermediate reservoir regions 110x, 110y, and the shale shelves 112x, 112y, is effected.

[0089] The heating of the first intermediate reservoir region 110x, and the shale shelf 112x, is effected by heat transfer from at least one of the communication zones 109a, 109b. In some embodiments, for example, the heat transfer from at least one of the communication zones 109a, 109b is that of: (i) heat that is generated by a thermally-actuated gravity drainage-based hydrocarbon recovery process respective to the first set 101a of well pairs, or (ii) heat that is

generated by a thermally-actuated gravity drainage-based hydrocarbon recovery process respective to the second set 101b of well pairs, or (iii) both of heat that is generated by a thermally-actuated gravity drainage-based hydrocarbon recovery process respective to the first set 101a of well pairs and heat that is generated by a thermally-actuated gravity drainage-based hydrocarbon recovery process respective to the second set 101b of well pairs. In some embodiments, for example, at least a fraction of the heating by heat that is generated by a thermally-actuated gravity drainage-based hydrocarbon recovery process respective to the first set 101a of well pairs is effected while the thermally-actuated gravity drainage-based hydrocarbon recovery process, respective to the first set 101a of well pairs, is being implemented. In some embodiments, for example, at least a fraction of the heating by heat that is generated by a thermally-actuated gravity drainage-based hydrocarbon recovery process respective to the second set 101b of well pairs is effected while the thermally-actuated gravity drainage-based hydrocarbon recovery process, respective to the second set 101b of well pairs, is being implemented.

[0090] The heating of the second intermediate reservoir region 110y, and the shale shelf 112y, is effected by heat transfer from at least one of the communication zones 109b, 109c. In some embodiments, for example, the heat transfer from at least one of the communication zones 109b, 109c is that of: (i) heat that is generated by a thermally-actuated gravity drainage-based hydrocarbon recovery process respective to the second set 101b of well pairs, or (ii) heat that is generated by a thermally-actuated gravity drainage-based hydrocarbon recovery process respective to the third set 101c of well pairs, or (iii) both of heat that is generated by a thermally-actuated gravity drainage-based hydrocarbon recovery process respective to the second set 101b of well pairs and heat that is generated by a thermally-actuated gravity drainage-based hydrocarbon recovery process respective to the third set 101c of well pairs. In some embodiments, for example, at least a fraction of the heating by heat that is generated by a thermally-actuated gravity drainage-based hydrocarbon recovery process respective to the second set 101b of well pairs is effected while the thermally-actuated gravity drainage-based hydrocarbon recovery process, respective to the second set 101b of well pairs, is being implemented. In some embodiments, for example, at least a fraction of the heating by heat that is generated by a thermally-actuated gravity drainage-based hydrocarbon recovery process respective to the third set 101c of well pairs is effected while the thermally-actuated gravity

drainage-based hydrocarbon recovery process, respective to the third set 101c of well pairs, is being implemented.

[0091] Figure 7 is illustrative of the system 200, including the first, second and third well pairs 101a, 101b, 101c with the communication zones 109a, 109b, 109c having been developed by implementation of respective thermally-actuated gravity drainage-based hydrocarbon recovery processes via the first, second and third sets 101a, 101b, 101c of well pairs. Drive processes are implemented to effect recovery of trapped bitumen, such as from the intermediate reservoir regions 110x, 110y, and the shale shelves 112x, 112y.

[0092] The drive process is implemented when a drive process pre-condition has been established. The drive process pre-condition has been established when both of: (i) a first pre-condition has been established, and (ii) a second pre-condition has been established.

[0093] The first pre-condition has been established when: (a) the first and second communication zones 109a, 109b have merged; or (b) the viscosity of hydrocarbon material within an intermediate reservoir region 110x disposed between the first and second communication zones 109a, 109b becomes sufficiently low such that the hydrocarbon material is capable of being mobilized in response to the application of a pressure differential, or (c) the minimum viscosity of hydrocarbon material, within the intermediate reservoir region 110x disposed between the first and second communication zones 109a, 109b, becomes disposed below about 1200 centipoise, or (d) the minimum temperature, within the intermediate reservoir region 110x disposed between the first and second communication zones 109a, 109b, becomes disposed above 90 degrees Celsius;

[0094] The second pre-condition has been established when: (a) the second and third communication zones 109b, 109c have merged, or (b) the viscosity of hydrocarbon material within an intermediate reservoir region 110y disposed between the second and third communication zones 109b, 109c becomes sufficiently low such that the hydrocarbon material is capable of being mobilized in response to the application of a pressure differential, or (c) the minimum viscosity of hydrocarbon material, within the intermediate reservoir region 110y disposed between the second and third communication zones 109b, 109c, becomes disposed below about 1200 centipoise, or (d) the minimum temperature, within the intermediate reservoir

region 110y disposed between the second and third communication zones 109b, 109c, becomes disposed above 90 degrees Celsius;

[0095] The drive process includes both of:

(i) applying a first driving pressure differential across the first and second communication zones 109a, 109b, wherein the applying a first driving pressure differential across the first and second communication zones 109a, 109b is effected while a heated gaseous material is at least being supplied to the second communication zone 109b via the injection well 104b of the second well pair 101b, wherein the second communication zone 109b is disposed at a higher pressure than the first communication zone 109a; and

(ii) applying a second driving pressure differential across the second and third communication zones 109b, 109c, wherein the applying a second driving pressure differential across the second and third communication zones 109b, 109c is effected while a heated gaseous material is at least being supplied to the second communication zone 109b via the injection well 104b of the second well pair 101b, wherein the second communication zone 109b is disposed at a higher pressure than the third communication zone 109a.

[0096] In some embodiments, for example, the first driving pressure differential is applied over a first time interval. In some embodiments, for example, the first time interval has a duration that is at least sufficient to conduct hydrocarbon material from the intermediate reservoir region 110x to the first communication zone 109a. The duration of the first time interval is a function of the mobility of the hydrocarbon material within the reservoir and the applied pressure differential. Contributing factors include: absolute reservoir permeability, relative permeability of hydrocarbon material, viscosity of hydrocarbon material, spacing between the communication zones 109a, 109b, and the presence of any baffles to flow and reservoir pressure containment. In some embodiments, for example, the duration of the first time interval is at least two (2) months, such as, for example, at least six (6) months, such as, for example, eight (8) months.

[0097] In some embodiments, for example, the second driving pressure differential is applied over a second time interval. In some embodiments, for example, the first time interval has a

duration that is at least sufficient to conduct hydrocarbon material from the intermediate reservoir region 110y to the third communication zone 109c. The duration of the first time interval is a function of the mobility of the hydrocarbon material within the reservoir and the applied pressure differential. Contributing factors include: absolute reservoir permeability, relative permeability of hydrocarbon material, viscosity of hydrocarbon material, spacing between the communication zones 109b, 109c, and the presence of any baffles to flow and reservoir pressure containment. In some embodiments, for example, the duration of the first time interval is at least two (2) months, such as, for example, at least six (6) months, such as, for example, eight (8) months.

[0098] In some embodiments, for example, at least a fraction of the first time interval (over which the first driving pressure differential is being applied) is contemporaneous with at least a fraction of the second time interval (over which the second driving pressure differential is being applied). In some embodiments, for example, the entirety of the first time interval (over which the first driving pressure differential is being applied) is contemporaneous with the entirety of the second time interval (over which the second driving pressure differential is being applied).

[0099] In some embodiments, for example, the heated gaseous material, being supplied to at least the second communication zone, includes steam.

[00100] In some embodiments, for example, each one of the first, second and third thermally-actuated gravity drainage-based processes, independently, continue to be effected during the drive process.

[00101] In some embodiments, for example, the application of a first driving pressure differential is such that hydrocarbon material is conducted from the intermediate reservoir region 110x to the first communication zone 109a in response to the applied pressure differential, and the application of a second driving pressure differential is such that hydrocarbon material is conducted from the intermediate reservoir region 110y to the third communication zone 109c in response to the applied pressure differential.

[00102] In some embodiments, for example, the application of a first driving pressure differential is such that hydrocarbon material is conducted from the shale shelf 112x to the first

communication zone 109a in response to the applied pressure differential, and the application of a second driving pressure differential is such that hydrocarbon material is conducted from the shale shelf 112y to the third communication zone 109c in response to the applied pressure differential.

[00103] In some embodiments, for example, the application of the first driving pressure differential includes effecting at least a reduction in pressure within the first communication zone 109a, such that the pressure within the second communication zone 109b becomes greater than the pressure within the first communication zone 109a, and the application of the second driving pressure differential includes effecting at least a reduction in pressure within the third communication zone 109c, such that the pressure within the second communication zone 109b becomes greater than the pressure within the third communication zone 109c. In some embodiments, for example, the at least a reduction in pressure within the first communication zone 109a is effected by shutting in the injection well 104a of the first well pair 101a, and the at least a reduction in pressure within the third communication zone 109c is effected by shutting in the injection well 104c of the third well pair 101c. In some embodiments, for example, by shutting in the injection well, trapped oil, prevented from draining into the production well by higher pressure conditions within the communication zone that persisted while the injection well was supplying the production-initiating fluid to the communication zone via the injection well, is now able to be recovered by drainage to the production well.

[00104] In some embodiments, for example, both of: (i) the application of the first driving pressure differential, and (ii) the application of the second driving pressure differential, are effected by increasing the rate of steam being supplied to the second communication zone 109b, such that an increase in pressure within the second communication zone 109b is effected.

[00105] In some embodiments, for example, each one of the applied first and second driving pressure differentials, independently, is at least about 50 kPa. In some embodiments, for example, each one of applied first and second driving pressure differentials, independently, is from about 50 kPa to about 1500 kPa.

[00106] In some embodiments, for example, the applied first pressure differential may be constant, or substantially constant, over the entire duration of the first time interval, or may be variable over the entire duration of the first time interval.

[00107] In some embodiments, for example, the applied second pressure differential may be constant, or substantially constant, over the entire duration of the second time interval, or may be variable over the entire duration of the second time interval.

[00108] In some embodiments, for example, the magnitude of the first driving pressure differential, being applied at least at some point in time during the first time interval, is the same, or substantially the same, as the magnitude of the second driving pressure differential being applied at some point in time during the second time interval. In other embodiments, for example, the magnitude of at least one first driving pressure differential (such as, for example, every first pressure differential), being applied during the first time interval, is different than the magnitude of at least one second driving pressure differential (such as, for example, every second driving pressure differential) being applied during the second time interval.

[00109] In the above description, for purposes of explanation, numerous details are set forth in order to provide a thorough understanding of the present disclosure. However, it will be apparent to one skilled in the art that these specific details are not required in order to practice the present disclosure. Although certain dimensions and materials are described for implementing the disclosed example embodiments, other suitable dimensions and/or materials may be used within the scope of this disclosure. All such modifications and variations, including all suitable current and future changes in technology, are believed to be within the sphere and scope of the present disclosure. All references mentioned are hereby incorporated by reference in their entirety.

CLAIMS

1. A hydrocarbon producing process comprising:

operating a first thermally-actuated gravity drainage-based process with a first well pair within a first communication zone, wherein the first thermally-actuated gravity drainage-based process includes injecting a mobilizing gaseous material into the first communication zone via an injection well of the first well pair such that hydrocarbon material is mobilized, and producing mobilized hydrocarbon material that has drained into a production well of the first well pair;

operating a second thermally-actuated gravity drainage-based process with a second well pair within a second communication zone, wherein the second thermally-actuated gravity drainage-based process includes injecting a mobilizing gaseous material into the second communication zone via an injection well of the second well pair such that hydrocarbon material is mobilized, and producing mobilized hydrocarbon material that has drained into a production well of the second well pair;

and

after a drive process pre-condition has been established, and while a heated gaseous material is at least being supplied to the first communication zone via an injection well of one of the well pairs, applying a pressure differential across the first and second communication zones;

wherein the drive process pre-condition has been established when:

(a) the first and second communication zones have merged; or

(b) the viscosity of hydrocarbon material within an intermediate reservoir region disposed between the first and second communication zones becomes sufficiently low such that the hydrocarbon material is capable of being mobilized in response to the application of a pressure differential; or

(c) the minimum viscosity of hydrocarbon material, within the intermediate reservoir region becomes disposed below about 1200 centipoise; or

(d) the minimum temperature within the intermediate reservoir region becomes disposed above 90 degrees Celsius.

2. The hydrocarbon producing process as claimed in claim 1;

wherein the drive process pre-condition has been established when the first and second communication zones have merged.

3. The hydrocarbon producing process as claimed in claim 1;

wherein the pressure differential is applied for a time duration of at least two months.

4. The hydrocarbon producing process as claimed in claim 2 or 3;

wherein the application of a pressure differential is such that hydrocarbon material is conducted from an intermediate reservoir region, disposed between the first and second communication zones, to one of the first and second communication zones in response to the applied pressure differential.

5. The hydrocarbon producing process as claimed in claim 4;

wherein the pressure differential is applied for a time duration that is at least sufficient to conduct hydrocarbon material from the intermediate reservoir region to the one of the first and second communication zones.

6. The hydrocarbon producing process as claimed in claim 4 or 5;

wherein heat generated by either one of:

(a) the thermally-actuated gravity drainage-based process being effected by the first well pair, or

(b) the thermally-actuated gravity drainage-based process being effected by the second well pair; or

(c) both of: (i) the thermally-actuated gravity drainage-based process being effected by the first well pair, and (ii) the thermally-actuated gravity drainage-based process being effected by the second well pair;

effects heating of hydrocarbon material within the intermediate reservoir region disposed between the first and second communication zones.

7. The hydrocarbon producing process as claimed in claim 6;

wherein the heating of hydrocarbon material within the intermediate reservoir region is effected while both of: (i) a thermally-actuated gravity drainage-based process is being effected by the first well pair, and (ii) a thermally-actuated gravity drainage-based process is being effected by the second well pair.

8. The hydrocarbon producing process as claimed in claim 1;

wherein the drive process pre-condition has been established when the viscosity of hydrocarbon material within an intermediate reservoir region disposed between the first and second communication zones becomes sufficiently low such that the hydrocarbon material is capable of being mobilized in response to the application of a pressure differential.

9. The hydrocarbon producing process as claimed in any one of claims 1 or 8;

wherein the drive process pre-condition has been established when the minimum viscosity of hydrocarbon material, within the intermediate reservoir region disposed between the first and second communication zones becomes disposed below about 1200 centipoise

10. The hydrocarbon producing process as claimed in any one of claims 1, 8 or 9;

wherein the drive process pre-condition has been established when the minimum temperature within the intermediate reservoir region disposed between the first and second communication zones becomes disposed above 90 degrees Celsius.

11. The hydrocarbon producing process as claimed in any one of claims 8 to 10;

wherein the application of a pressure differential is such that hydrocarbon material is conducted from the intermediate reservoir region to one of the first and second communication zones in response to the applied pressure differential.

12. The hydrocarbon producing process as claimed in claim 11;

wherein the pressure differential is applied for a time duration that is at least sufficient to conduct hydrocarbon material from the intermediate reservoir region to the one of the first and second communication zones.

13. The hydrocarbon producing process as claimed in claim 11 or 12;

wherein the pressure differential is applied for a time duration of at least two months.

14. The hydrocarbon producing process as claimed in any one of claims 8 to 13;

wherein heat generated by either one of:

(a) the thermally-actuated gravity drainage-based process being effected by the first well pair, or

(b) the thermally-actuated gravity drainage-based process being effected by the second well pair; or

(c) both of: (i) the thermally-actuated gravity drainage-based process being effected by the first well pair, and (ii) the thermally-actuated gravity drainage-based process being effected by the second well pair;

effects heating of hydrocarbon material within the intermediate reservoir region disposed between the first and second communication zones.

15. The hydrocarbon producing process as claimed in claim 14;

wherein the heating of hydrocarbon material within the intermediate reservoir region is effected while both of: (i) a thermally-actuated gravity drainage-based process is being effected by the

first well pair, and (ii) a thermally-actuated gravity drainage-based process is being effected by the second well pair.

16. The hydrocarbon producing process as claimed in claim 2;

wherein the application of a pressure differential is such that hydrocarbon material is conducted from a shale shelf to one of the first and second communication zones in response to the applied pressure differential.

17. The hydrocarbon producing process as claimed in claim 16;

wherein the pressure differential is applied for a time duration of at least two months.

18. The hydrocarbon producing process as claimed in claim 16 or 17;

wherein heat generated by either one of:

(a) the thermally-actuated gravity drainage-based process being effected by the first well pair, or

(b) the thermally-actuated gravity drainage-based process being effected by the second well pair; or

(c) both of: (i) the thermally-actuated gravity drainage-based process being effected by the first well pair, and (ii) the thermally-actuated gravity drainage-based process being effected by the second well pair;

effects heating of hydrocarbon material within the shale shelf.

19. The hydrocarbon producing process as claimed in claim 18;

wherein the heating of hydrocarbon material within the shale shelf is effected while both of: (i) a thermally-actuated gravity drainage-based process is being effected by the first well pair, and (ii) a thermally-actuated gravity drainage-based process is being effected by the second well pair.

20. The hydrocarbon producing process as claimed in any one of claims 1 to 19;

wherein the application of a pressure differential includes effecting at least a reduction in pressure within a one of the first and second communication zones, such that the pressure within the other one of the first and second communication zones becomes greater than the pressure within the communication zone within which the pressure reduction has been effected.

21. The hydrocarbon producing process as claimed in claim 20;

wherein the at least a reduction in pressure is effected by shutting in an injection well of one of the first and second well pairs.

22. The hydrocarbon producing process as claimed in any one of claims 1 to 21;

wherein the application of a pressure differential includes increasing the rate of steam being supplied to one of the first and second communication zones, such that an increase in pressure, within the communication zone which is receiving the increased rate of supply of steam, is effected.

23. The hydrocarbon producing process as claimed in any one of claims 1 to 22;

wherein the applied pressure differential at least about 50 kPa.

24. The hydrocarbon producing process as claimed in any one of claims 1 to 22;

wherein the applied pressure differential is from about 50 kPa to about 1500 kPa.

25. The hydrocarbon producing process as claimed in any one of claims 1 to 24;

wherein the hydrocarbon material includes bitumen;

and wherein the mobilizing gaseous material include steam.

26. The hydrocarbon producing process as claimed in claim 25;

wherein the heated gaseous material includes steam.

27. The hydrocarbon producing process as claimed in any one of claims 1 to 26;

wherein the hydrocarbon material includes bitumen;

and wherein, for each one of the first and second well pairs, independently, the thermally-actuated gravity drainage-based process being effected includes SAGD.

28. The hydrocarbon producing process as claimed in any one of claims 1 to 27;

wherein each one of the first and second thermally-actuated gravity drainage-based processes, independently, continue to be effected after the application of the pressure differential.

29. A hydrocarbon producing process comprising:

operating a first thermally-actuated gravity drainage-based process with a first well pair within a first communication zone, wherein the first thermally-actuated gravity drainage-based process includes injecting a mobilizing gaseous material into the first communication zone via an injection well of the first well pair such that hydrocarbon material is mobilized, and producing mobilized hydrocarbon material that has drained into a production well of the first well pair;

operating a second thermally-actuated gravity drainage-based process with a second well pair within a second communication zone, wherein the second thermally-actuated gravity drainage-based process includes injecting a mobilizing gaseous material into the second communication zone via an injection well of the second well pair such that hydrocarbon material is mobilized, and producing mobilized hydrocarbon material that has drained into a production well of the second well pair;

and

after a drive process pre-condition has been established, operating a drive process, wherein the drive process includes:

over a first time interval, and while a heated gaseous material is at least being supplied to the first communication zone via the injection well of the first well pair, applying a first pressure differential across the first and second communication zones, wherein the first communication zone is disposed at a higher pressure than the second communication zone; and

after completion of the first interval, and over a second time interval, and while a heated gaseous material is at least being supplied to the second communication zone via the injection well of the second well pair, applying a second pressure differential across the first and second communication zones, wherein the second communication zone is disposed at a higher pressure than the first communication zone;

wherein the drive process pre-condition has been established when:

- (a) the first and second communication zones have merged; or
- (b) the viscosity of hydrocarbon material within an intermediate reservoir region disposed between the first and second communication zone becomes sufficiently low such that the hydrocarbon material is capable of being mobilized in response to the application of a pressure differential; or
- (c) the minimum viscosity of hydrocarbon material, within the intermediate reservoir region becomes disposed below about 1200 centipoise; or
- (d) the minimum temperature within the intermediate reservoir region becomes disposed above 90 degrees Celsius.

30. The hydrocarbon producing process as claimed in claim 29;

wherein the drive process pre-condition has been established when the first and second communication zones have merged.

31. The hydrocarbon producing process as claimed in claim 30;

wherein the first time interval has a total duration of at least two months;

and wherein the second time interval has a total duration of at least two months.

32. The hydrocarbon producing process as claimed in claim 29 or 30;

wherein the application of a pressure differential during the first time interval is such that hydrocarbon material is conducted from an intermediate reservoir region, disposed between the

first and second communication zones, to the second communication zone in response to the applied pressure differential.

and wherein the application of a pressure differential during the second time interval is such that hydrocarbon material is conducted from the intermediate reservoir region to the first communication zone in response to the applied pressure differential.

33. The hydrocarbon producing process as claimed in any one of claims 29 to 32;

wherein the first time interval has a total duration that is at least sufficient to conduct hydrocarbon material from the intermediate reservoir region to the second communication zone;

and wherein the second time interval that is at least sufficient to conduct hydrocarbon material from the intermediate reservoir region to the first communication zone

34. The hydrocarbon producing process as claimed in claim 32 or 33;

wherein heat generated by either one of:

- (a) the first thermally-actuated gravity drainage-based process, or
- (b) the second thermally-actuated gravity drainage-based process; or
- (c) both of: (i) the thermally-actuated gravity drainage-based, and (ii) the thermally-actuated gravity drainage-based process;

effects heating of hydrocarbon material within the intermediate reservoir region disposed between the first and second communication zones.

35. The hydrocarbon producing process as claimed in claim 34;

wherein the heating of hydrocarbon material within the intermediate reservoir region is effected while both of: (i) the first thermally-actuated gravity drainage-based process is being effected, and (ii) the second thermally-actuated gravity drainage-based process is being effected.

36. The hydrocarbon producing process as claimed in claim 29;

wherein the drive process pre-condition has been established when the viscosity of hydrocarbon material within an intermediate reservoir region disposed between the first and second communication zones becomes sufficiently low such that the hydrocarbon material is capable of being mobilized in response to the application of a pressure differential.

37. The hydrocarbon producing process as claimed in claim 29 or 36;

wherein the drive process pre-condition has been established when the minimum viscosity of hydrocarbon material, within an intermediate reservoir region disposed between the first and second communication zones, becomes disposed below about 1200 centipoise.

38. The hydrocarbon producing process as claimed in any one of claims 29, 36 or 37;

wherein the drive process pre-condition has been established when the minimum temperature within the intermediate reservoir region disposed between the first and second communication zones becomes disposed above 90 degrees Celsius.

39. The hydrocarbon producing process as claimed in any one of claims 36 to 38;

wherein the application of a pressure differential during the first time interval is such that hydrocarbon material is conducted from the intermediate reservoir region to the second communication zones in response to the applied pressure differential;

and wherein the application of a pressure differential during the second time interval is such that hydrocarbon material is conducted from the intermediate reservoir region to the first communication zone in response to the applied pressure differential.

40. The hydrocarbon producing process as claimed in claim 39;

wherein the first time interval has a total duration that is at least sufficient to conduct hydrocarbon material from the intermediate reservoir region to the second communication zone.;

and wherein the second time interval that is at least sufficient to conduct hydrocarbon material from the intermediate reservoir region to the first communication zone

41. The hydrocarbon producing process as claimed in claim 38 or 39;

wherein the first time interval has a total duration of at least two months;

and wherein the second time interval has a total duration of at least two months.

42. The hydrocarbon producing process as claimed in claim 36 to 41;

wherein heat generated by either one of:

(a) the first thermally-actuated gravity drainage-based process, or

(b) the second thermally-actuated gravity drainage-based process; or

(c) both of: (i) the thermally-actuated gravity drainage-based, and (ii) the thermally-actuated gravity drainage-based process;

effects heating of hydrocarbon material within the intermediate reservoir region disposed between the first and second communication zones.

43. The hydrocarbon producing process as claimed in claim 42;

wherein the heating of hydrocarbon material within the intermediate reservoir region is effected while both of: (i) the first thermally-actuated gravity drainage-based process is being effected, and (ii) the second thermally-actuated gravity drainage-based process is being effected.

44. The hydrocarbon producing process as claimed in claim 30 or 31;

wherein the application of a pressure differential during the first time interval is such that hydrocarbon material is conducted from a shale shelf to the second communication zone in response to the applied pressure differential;

and wherein the application of a pressure differential during the second time interval is such that hydrocarbon material is conducted from a shale shelf to the first communication zone in response to the applied pressure differential.

45. The hydrocarbon producing process as claimed in claim 44;

wherein heat generated by either one of:

- (a) the first thermally-actuated gravity drainage-based process, or
- (b) the second thermally-actuated gravity drainage-based process; or
- (c) both of: (i) the thermally-actuated gravity drainage-based, and (ii) the thermally-actuated gravity drainage-based process;

effects heating of hydrocarbon material within the shale shelf.

46. The hydrocarbon producing process as claimed in claim 45;

wherein the heating of hydrocarbon material within the shale shelf is effected while both of: (i) the first thermally-actuated gravity drainage-based process is being effected, and (ii) the second thermally-actuated gravity drainage-based process is being effected.

47. The hydrocarbon producing process as claimed in any one of claims 29 to 46;

wherein the application of the first pressure differential includes effecting at least a reduction in pressure within the second communication zone, such that the pressure within the first communication zone becomes greater than the pressure within the second communication zone.

48. The hydrocarbon producing process as claimed in claim 47;

wherein the at least a reduction in pressure is effected by shutting in the injection well of the second well pair.

49. The hydrocarbon producing process as claimed in any one of claims 29 to 48;

wherein the application of the second pressure differential includes effecting at least a reduction in pressure within the first communication zone, such that the pressure within the second communication zone becomes greater than the pressure within the first communication zone.

50. The hydrocarbon producing process as claimed in claim 49;

wherein the at least a reduction in pressure is effected by shutting in the injection well of the first well pair.

51. The hydrocarbon producing process as claimed in any one of claims 29 to 50;
wherein the application of the first pressure differential includes increasing the rate of steam being supplied to the first communication zone, such that an increase in pressure within the first communication zone is effected.
52. The hydrocarbon producing process as claimed in any one of claims 29 to 51;
wherein the application of the second pressure differential includes increasing the rate of steam being supplied to the second communication zone, such that an increase in pressure within the second communication zone is effected.
53. The hydrocarbon producing process as claimed in any one of claims 29 to 52;
wherein each one of the applied first and second pressure differentials, independently, is at least about 50 kPa.
54. The hydrocarbon producing process as claimed in any one of claims 29 to 52;
wherein each one of applied first and second pressure differentials, independently, is from about 50 kPa to about 1500 kPa.
55. The hydrocarbon producing process as claimed in any one of claims 29 to 54;
wherein the hydrocarbon material includes bitumen;
and wherein the mobilizing gaseous material include steam.
56. The hydrocarbon producing process as claimed in claim 55;
wherein the heated gaseous material includes steam.
57. The hydrocarbon producing process as claimed in any one of claims 29 to 56;
wherein the hydrocarbon material includes bitumen;

and wherein each one of the first and second thermally-actuated gravity drainage-based processes, independently, includes SAGD.

58. The hydrocarbon producing process as claimed in any one of claims 29 to 58;

wherein each one of the first and second thermally-actuated gravity drainage-based processes, independently, continue to be effected while the drive process is being effected..

59. A hydrocarbon producing process comprising:

operating a first thermally-actuated gravity drainage-based process with a first well pair within a first communication zone, wherein the first thermally-actuated gravity drainage-based process includes injecting a mobilizing gaseous material into the first communication zone via an injection well of the first well pair such that hydrocarbon material is mobilized, and producing mobilized hydrocarbon material that has drained into a production well of the first well pair;

operating a second thermally-actuated gravity drainage-based process with a second well pair within a second communication zone, wherein the second thermally-actuated gravity drainage-based process includes injecting a mobilizing gaseous material into the second communication zone via an injection well of the second well pair such that hydrocarbon material is mobilized, and producing mobilized hydrocarbon material that has drained into a production well of the second well pair;

after a cyclic process pre-condition has been established, operating a cyclic process, wherein the cyclic process includes:

during the entirety of a first operating mode, applying a first pressure differential across the first and second communication zones while a heated gaseous material is at least being supplied to the first communication zone via the injection well of the first well pair, wherein the first communication zone is disposed at a higher pressure than the second communication zone; and

after completion of the first operating mode, during the entirety of the second operating mode, applying a second pressure differential across the first and second communication zones while a heated gaseous material is at least being supplied to the second communication zone via

the injection well of the second well pair, wherein the second communication zone is disposed at a higher pressure than the first communication zone;

wherein the cyclic process pre-condition has been established when:

- (a) the first and second communication zones have merged; or
- (b) the viscosity of hydrocarbon material within an intermediate reservoir region disposed between the first and second communication zones becomes sufficiently low such that the hydrocarbon material is capable of being mobilized in response to the application of a pressure differential; or
- (c) the minimum viscosity of hydrocarbon material, within the intermediate reservoir region becomes disposed below about 1200 centipoise; or
- (d) the minimum temperature within the intermediate reservoir region becomes disposed above 90 degrees Celsius.

60. The hydrocarbon producing process as claimed in claim 59;

wherein the cyclic process pre-condition has been established when the first and second communication zones have merged.

61. The hydrocarbon producing process as claimed in claim 60;

wherein the first operating mode has a total duration of at least two months;

and wherein the second operating mode has a total duration of at least two months.

62. The hydrocarbon producing process as claimed in claim 60 or 61;

wherein the application of a first pressure differential during the first operating mode is such that hydrocarbon material is conducted from an intermediate reservoir region, disposed between the first and second communication zones, to the second communication zone in response to the applied pressure differential;

and wherein the application of a second pressure differential during the second operating mode is such that hydrocarbon material is conducted from the intermediate reservoir region to the first communication zone in response to the applied pressure differential.

63. The hydrocarbon producing process as claimed in claim 62;

wherein the first operating mode has a total duration that is at least sufficient to conduct hydrocarbon material from the intermediate reservoir region to the second communication zone.;

and wherein the second operating mode has a total duration that is at least sufficient to conduct hydrocarbon material from the intermediate reservoir region to the first communication zone

64. The hydrocarbon producing process as claimed in claim 62 or 63;

wherein heat generated by either one of:

- (a) the first thermally-actuated gravity drainage-based process, or
- (b) the second thermally-actuated gravity drainage-based process; or
- (c) both of: (i) the thermally-actuated gravity drainage-based, and (ii) the thermally-actuated gravity drainage-based process;

effects heating of hydrocarbon material within the intermediate reservoir region disposed between the first and second communication zones.

65. The hydrocarbon producing process as claimed in claim 64;

wherein the heating of hydrocarbon material within the intermediate reservoir region is effected while both of: (i) the first thermally-actuated gravity drainage-based process is being effected, and (ii) the second thermally-actuated gravity drainage-based process is being effected.

66. The hydrocarbon producing process as claimed in claim 59;

wherein the cyclic process pre-condition has been established when the viscosity of hydrocarbon material within an intermediate reservoir region disposed between the first and second

communication zones becomes sufficiently low such that the hydrocarbon material is capable of being mobilized in response to the application of a pressure differential.

67. The hydrocarbon producing process as claimed in claim 59 or 66;

wherein the cyclic process pre-condition has been established when the minimum viscosity of hydrocarbon material, within an intermediate reservoir region disposed between the first and second communication zones, becomes disposed below about 1200 centipoise.

68. The hydrocarbon producing process as claimed in any one of claims 59, 66, or 67;

wherein the cyclic process pre-condition has been established when the minimum temperature within the intermediate reservoir region disposed between the first and second communication zones becomes disposed above 90 degrees Celsius.

69. The hydrocarbon producing process as claimed in any one of claims 66 to 68;

wherein the application of a first pressure differential during the first operating mode is such that hydrocarbon material is conducted from the intermediate reservoir region to the second communication zone in response to the applied pressure differential;

and wherein the application of a second pressure differential during the second operating mode is such that hydrocarbon material is conducted from the intermediate reservoir region to the first communication zone in response to the applied pressure differential.

70. The hydrocarbon producing process as claimed in claim 69;

wherein the first operating mode has a total duration that is at least sufficient to conduct hydrocarbon material from the intermediate reservoir region to the second communication zone.;

and wherein the second operating mode has a total duration that is at least sufficient to conduct hydrocarbon material from the intermediate reservoir region to the first communication zone

71. The hydrocarbon producing process as claimed in claim 69 or 70;

wherein the first operating mode has a total duration of at least two months;

and wherein the second operating mode has a total duration of at least two months.

72. The hydrocarbon producing process as claimed in any one of claims 66 to 71;

wherein heat generated by either one of:

- (a) the first thermally-actuated gravity drainage-based process, or
- (b) the second thermally-actuated gravity drainage-based process; or
- (c) both of: (i) the thermally-actuated gravity drainage-based, and (ii) the thermally-actuated gravity drainage-based process;

effects heating of hydrocarbon material within the intermediate reservoir region disposed between the first and second communication zones.

73. The hydrocarbon producing process as claimed in claim 72;

wherein the heating of hydrocarbon material within the intermediate reservoir region is effected while both of: (i) the first thermally-actuated gravity drainage-based process is being effected, and (ii) the second thermally-actuated gravity drainage-based process is being effected.

74. The hydrocarbon producing process as claimed in claim 60 or 61;

wherein the application of a first pressure differential during the first operating mode is such that hydrocarbon material is conducted from a shale shelf to the second communication zone in response to the applied pressure differential.

and wherein the application of a second pressure differential during the second operating mode is such that hydrocarbon material is conducted from the shale shelf to the first communication zone in response to the applied pressure differential.

75. The hydrocarbon producing process as claimed in claim 74;

wherein heat generated by either one of:

- (a) the first thermally-actuated gravity drainage-based process, or

(b) the second thermally-actuated gravity drainage-based process; or

(c) both of: (i) the thermally-actuated gravity drainage-based, and (ii) the thermally-actuated gravity drainage-based process;

effects heating of hydrocarbon material within the intermediate reservoir region disposed between the first and second communication zones.

76. The hydrocarbon producing process as claimed in claim 75;

wherein the heating of hydrocarbon material within the intermediate reservoir region is effected while both of: (i) the first thermally-actuated gravity drainage-based process is being effected, and (ii) the second thermally-actuated gravity drainage-based process is being effected.

77. The hydrocarbon producing process as claimed in any one of claims 59 to 76;

wherein the application of the first pressure differential includes effecting at least a reduction in pressure within the second communication zone, such that the pressure within the first communication zone becomes greater than the pressure within the second communication zone.

78. The hydrocarbon producing process as claimed in claim 77;

wherein the at least a reduction in pressure is effected by shutting in the injection well of the second well pair.

79. The hydrocarbon producing process as claimed in any one of claims 59 to 78;

wherein the application of the second pressure differential includes effecting at least a reduction in pressure within the first communication zone, such that the pressure within the second communication zone becomes greater than the pressure within the first communication zone.

80. The hydrocarbon producing process as claimed in claim 79;

wherein the at least a reduction in pressure is effected by shutting in the injection well of the first well pair.

81. The hydrocarbon producing process as claimed in any one of claims 59 to 80;

wherein the application of the first pressure differential includes increasing the rate of steam being supplied to the first communication zone, such that an increase in pressure within the first communication zone is effected.

82. The hydrocarbon producing process as claimed in any one of claims 59 to 81;

wherein the application of the second pressure differential includes increasing the rate of steam being supplied to the second communication zone, such that an increase in pressure within the second communication zone is effected.

83. The hydrocarbon producing process as claimed in any one of claims 59 to 82;

wherein each one of the applied first and second pressure differentials, independently, is at least about 50 kPa.

84. The hydrocarbon producing process as claimed in any one of claims 59 to 82;

wherein each one of applied first and second pressure differentials, independently, is from about 50 kPa to about 1500 kPa.

85. The hydrocarbon producing process as claimed in any one of claims 59 to 84;

wherein the hydrocarbon material includes bitumen;

and wherein the mobilizing gaseous material include steam.

86. The hydrocarbon producing process as claimed in claim 85;

wherein the heated gaseous material includes steam.

87. The hydrocarbon producing process as claimed in any one of claims 59 to 86;

wherein the hydrocarbon material includes bitumen;

and wherein each one of the first and second thermally-actuated gravity drainage-based processes, independently, includes SAGD.

88. The hydrocarbon producing process as claimed in any one of claims 59 to 87;
wherein each one of the first and second thermally-actuated gravity drainage-based processes,
independently, continue to be effected during the cyclic process.

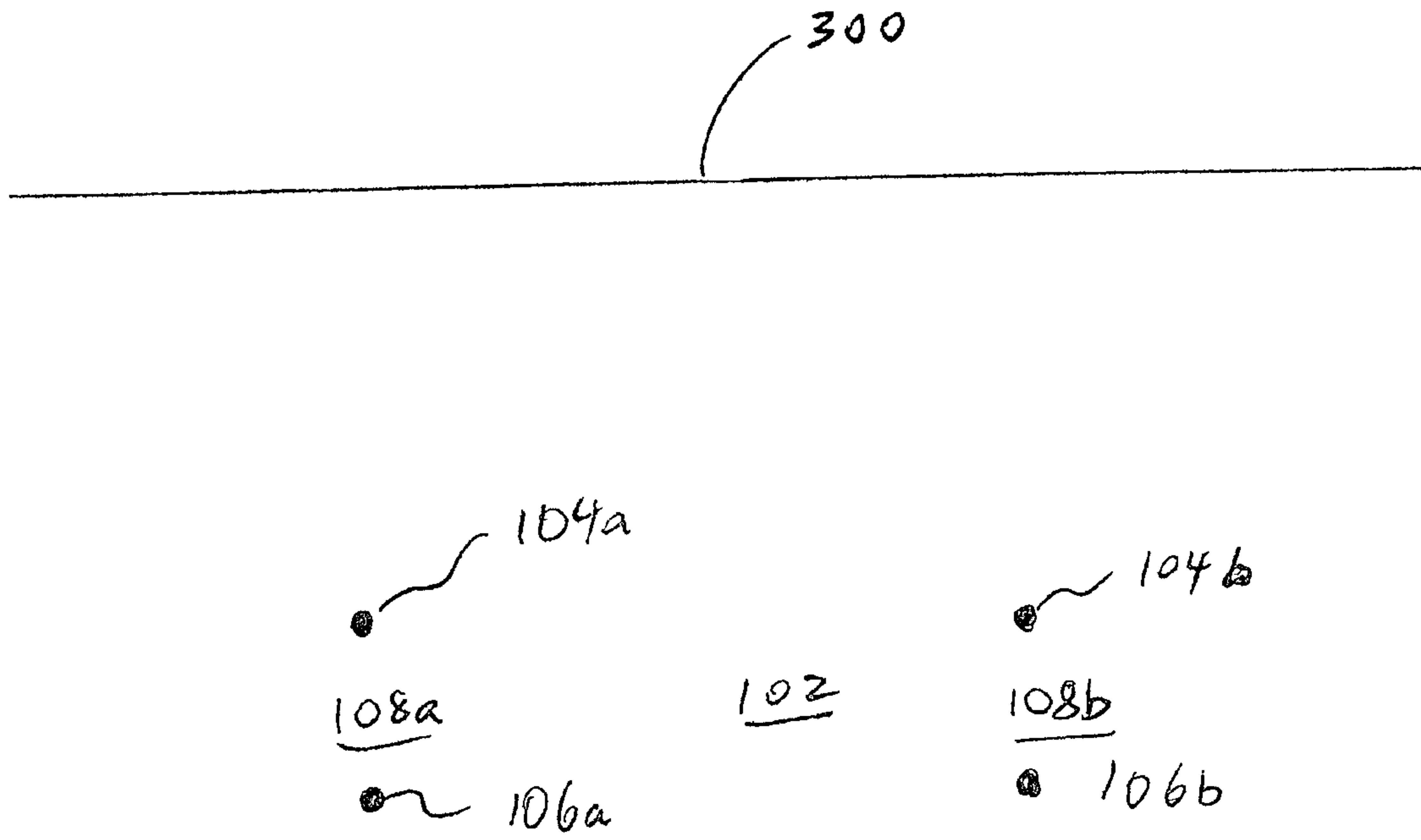


Figure 1

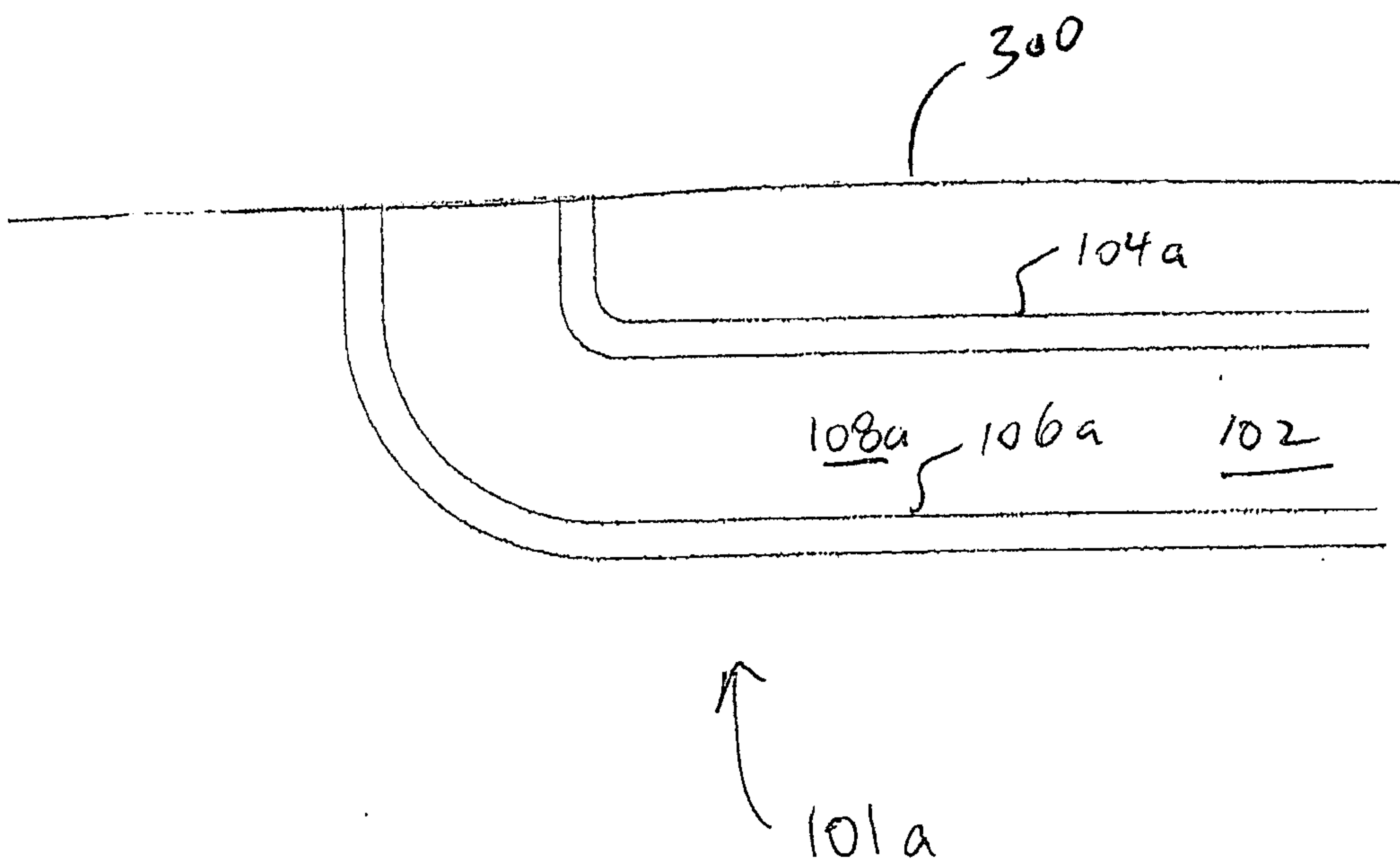


FIGURE 2

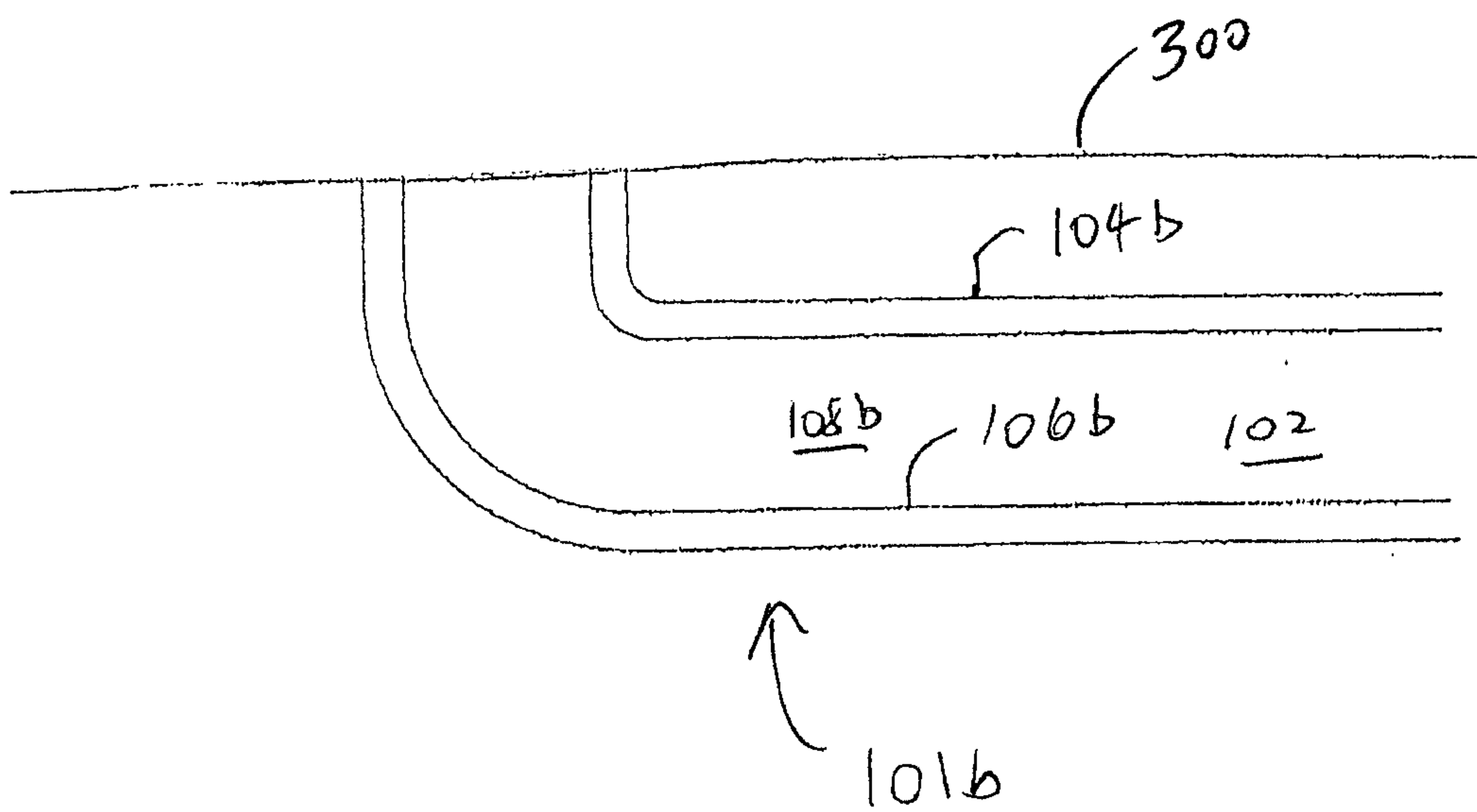


FIGURE 3

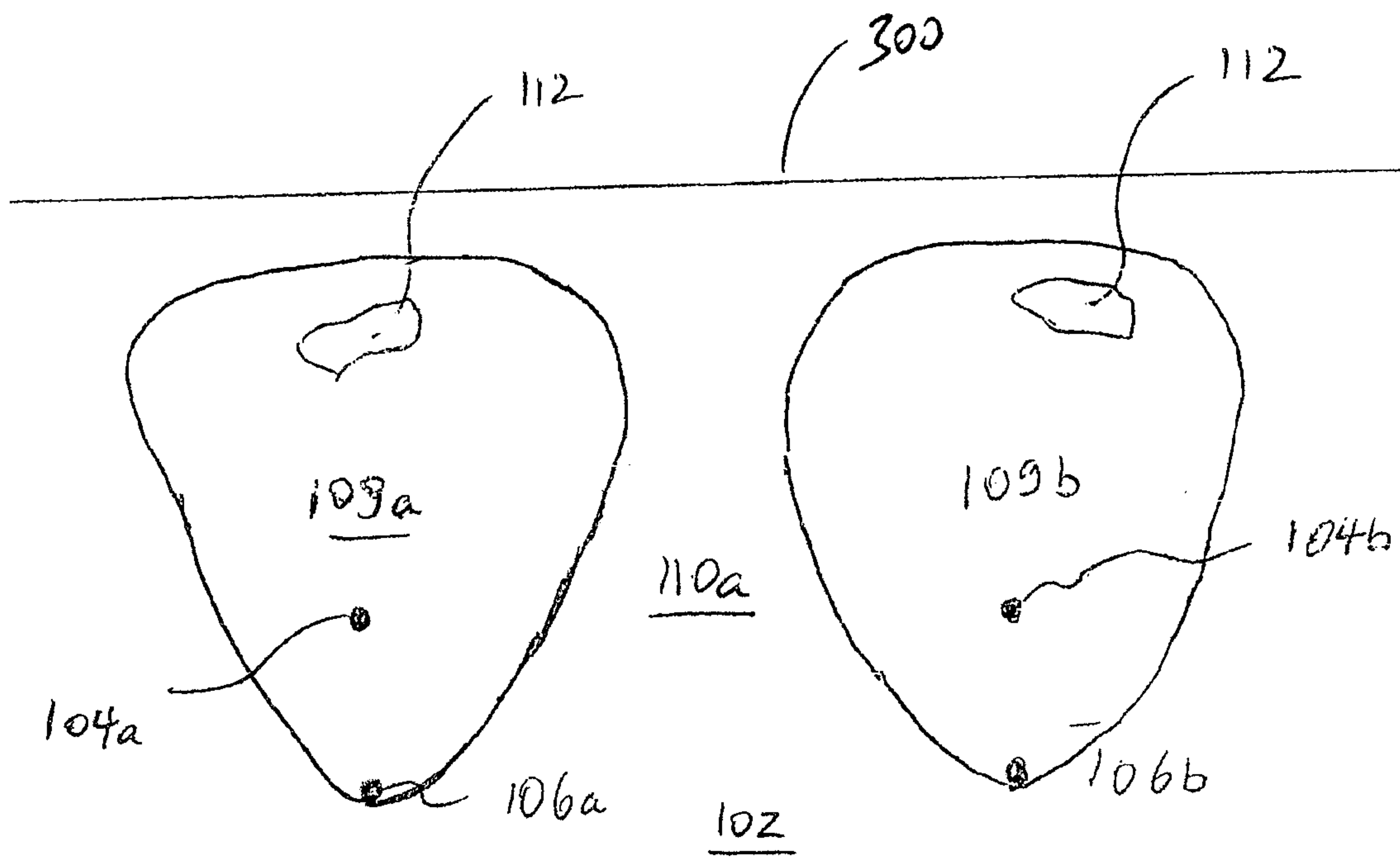


FIGURE 4

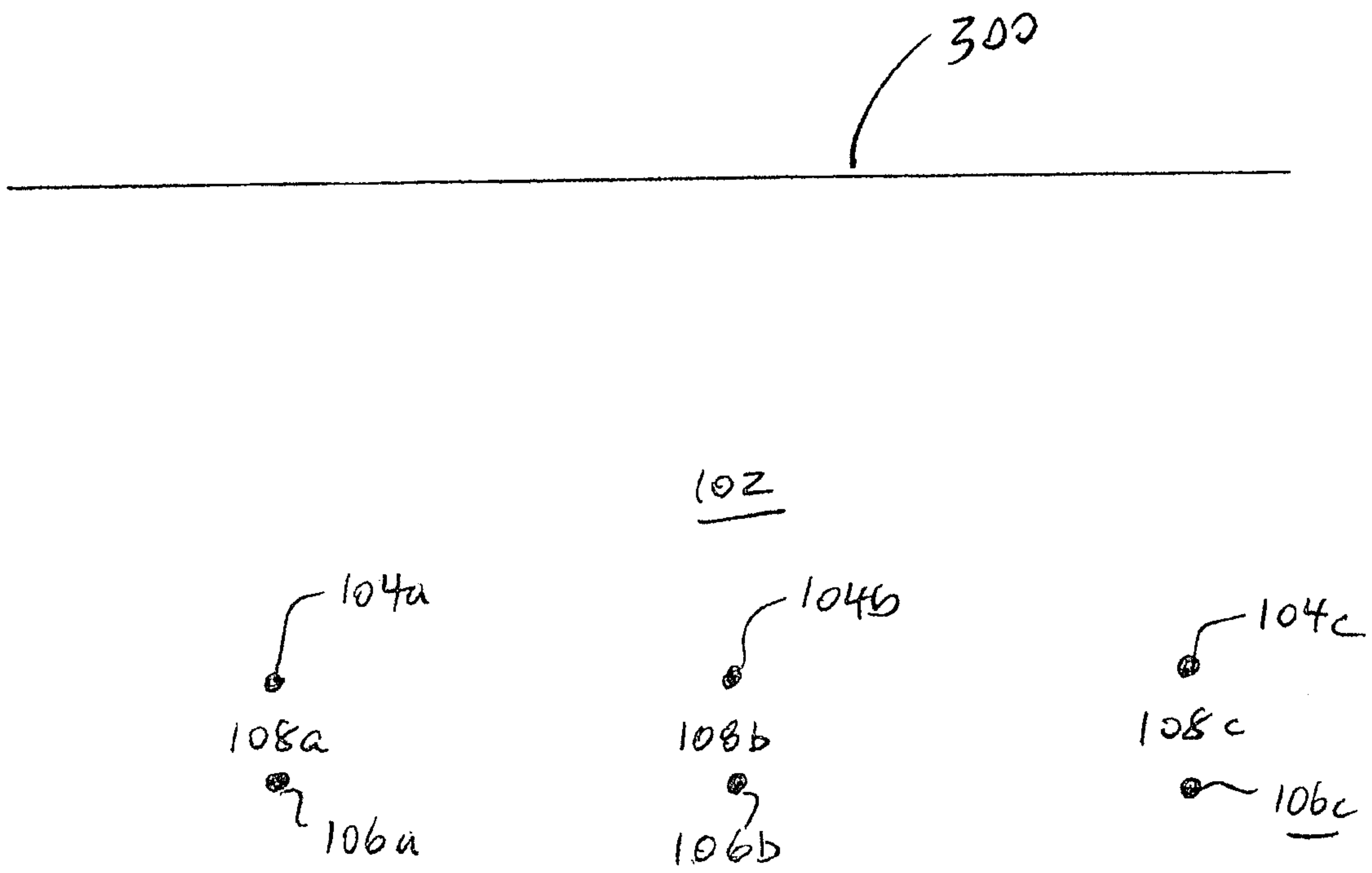


FIGURE 5

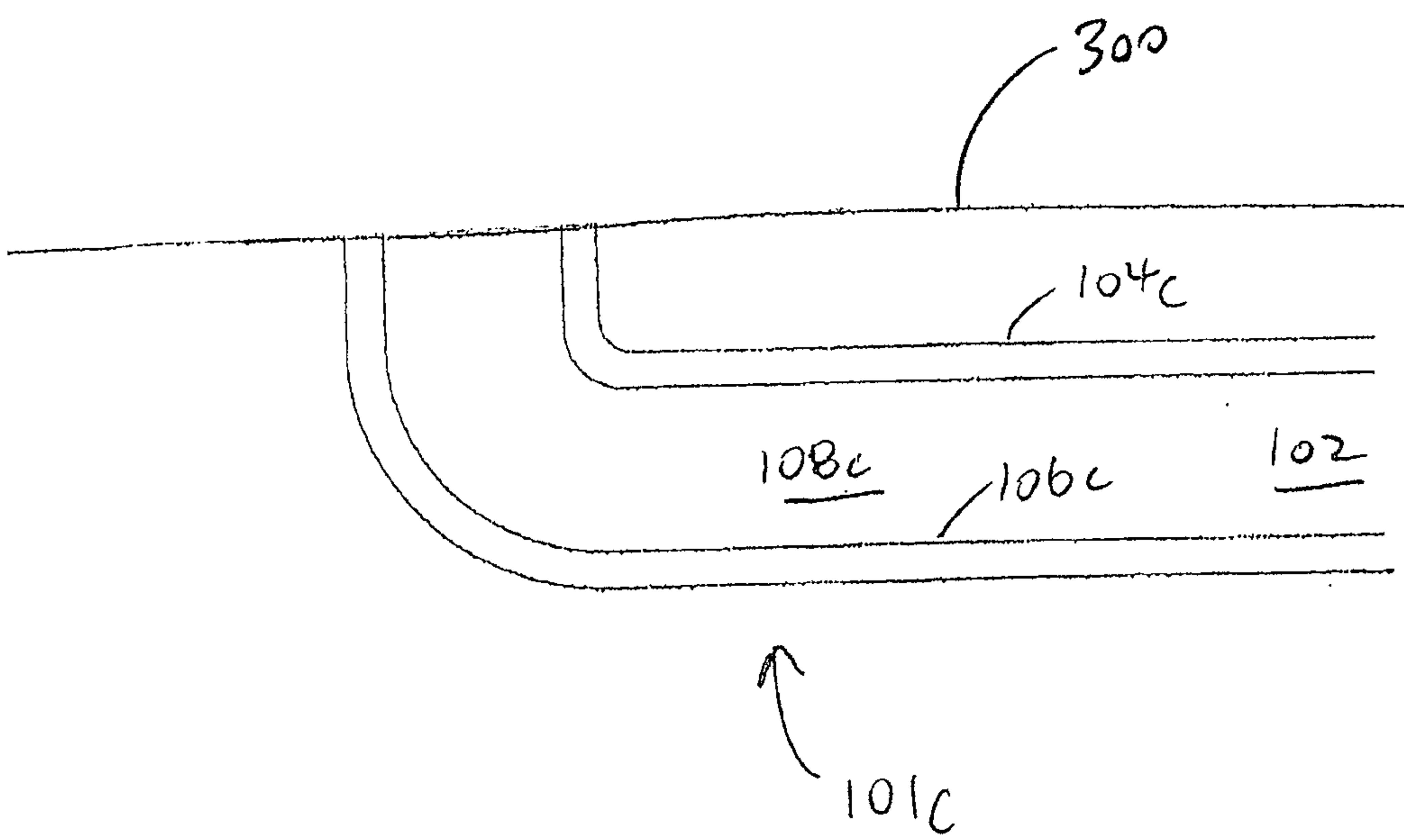


FIGURE 6

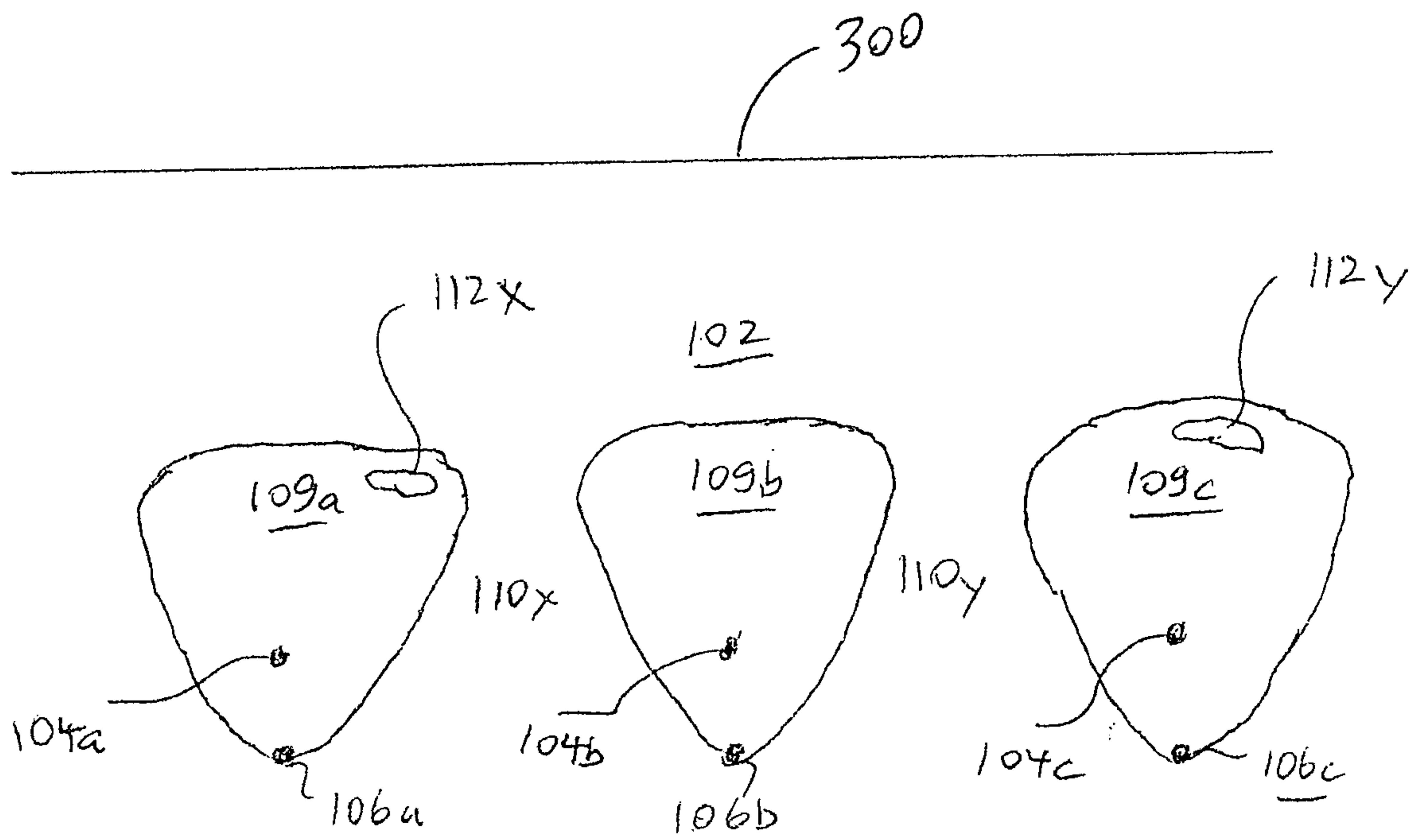


FIGURE 7