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(54) RELEASING ACTIVATORS DURING WELLBORE OPERATIONS

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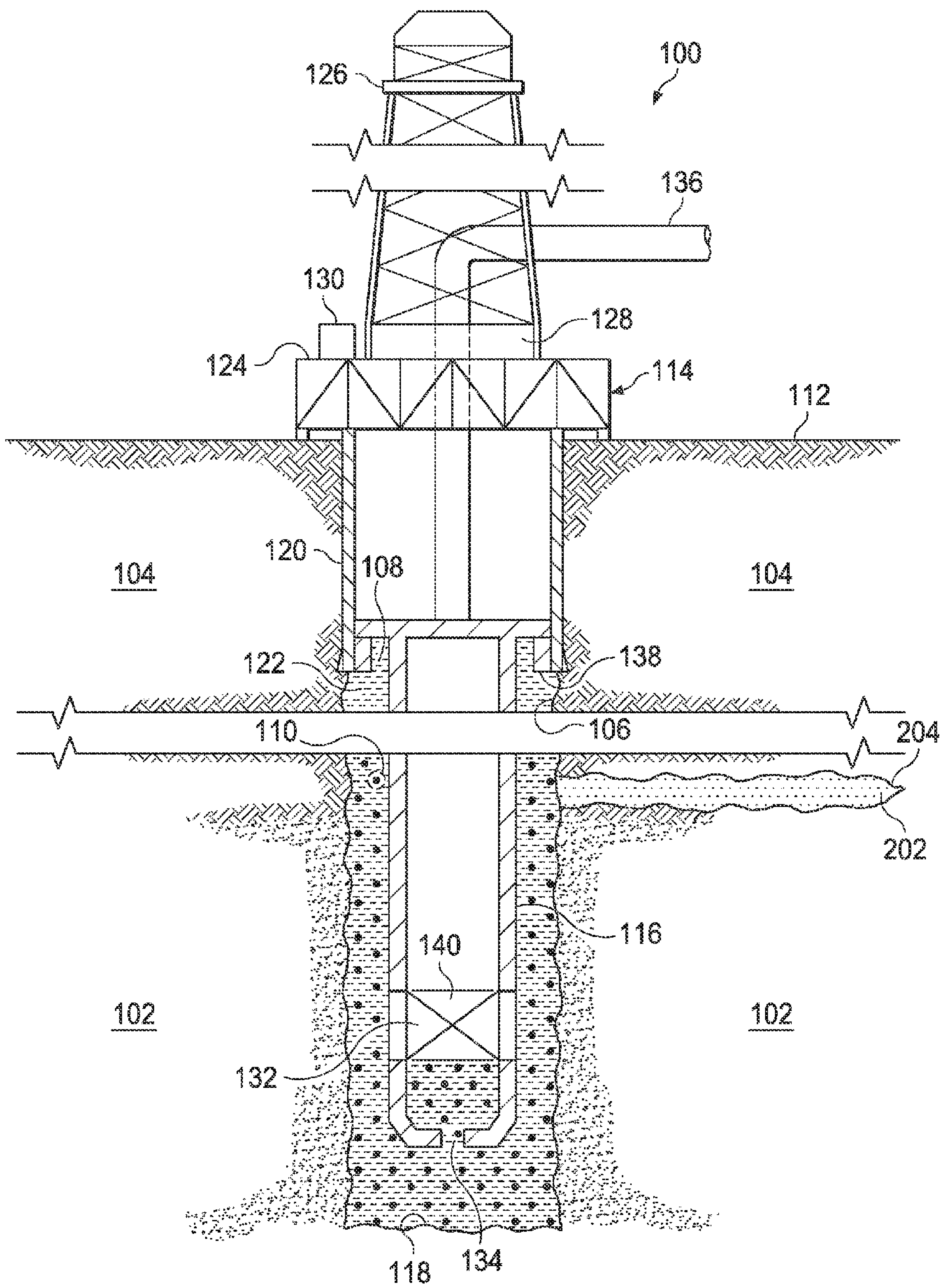
(57) ABSTRACT

In some implementations, a method for reducing material loss includes adding, to a downhole fluid circulated through a drill string, encapsulants encapsulating one or more activators. One or more parameters in a wellbore associated with a fault in operating conditions are determined. One or more energy waves in the downhole fluid configured to release the one or more activators from the encapsulants are emitted.



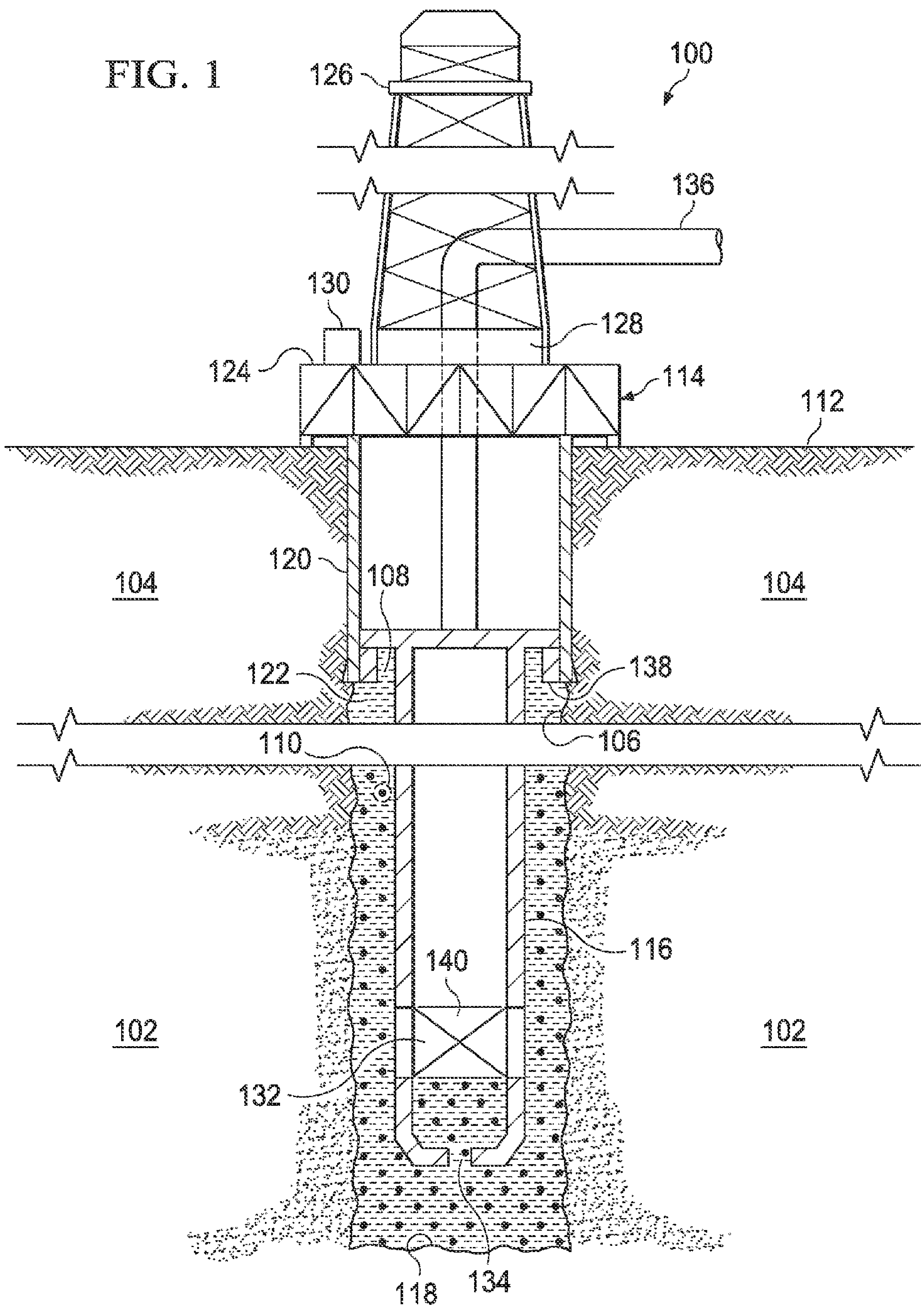

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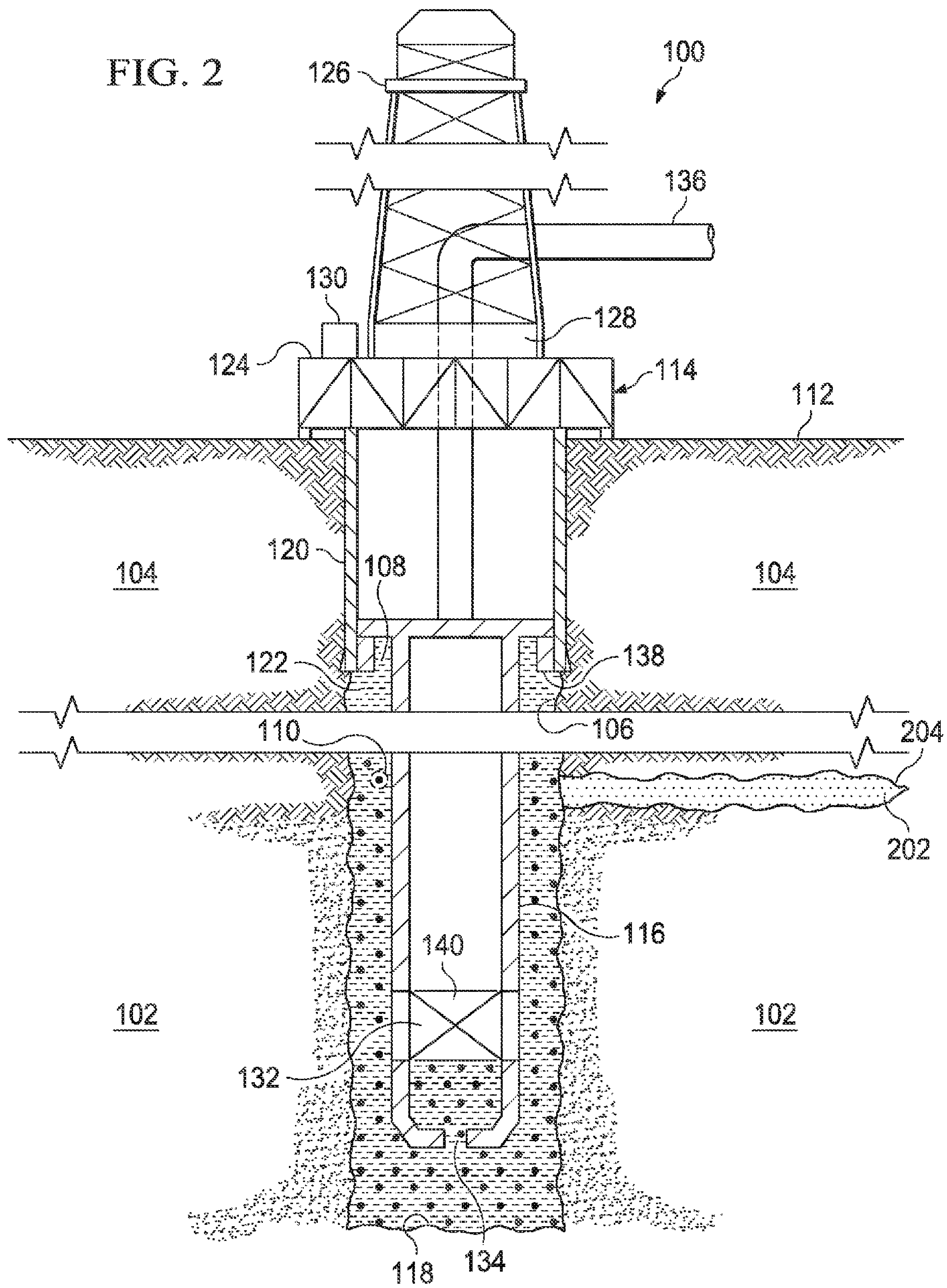
FIG. 1

FIG. 2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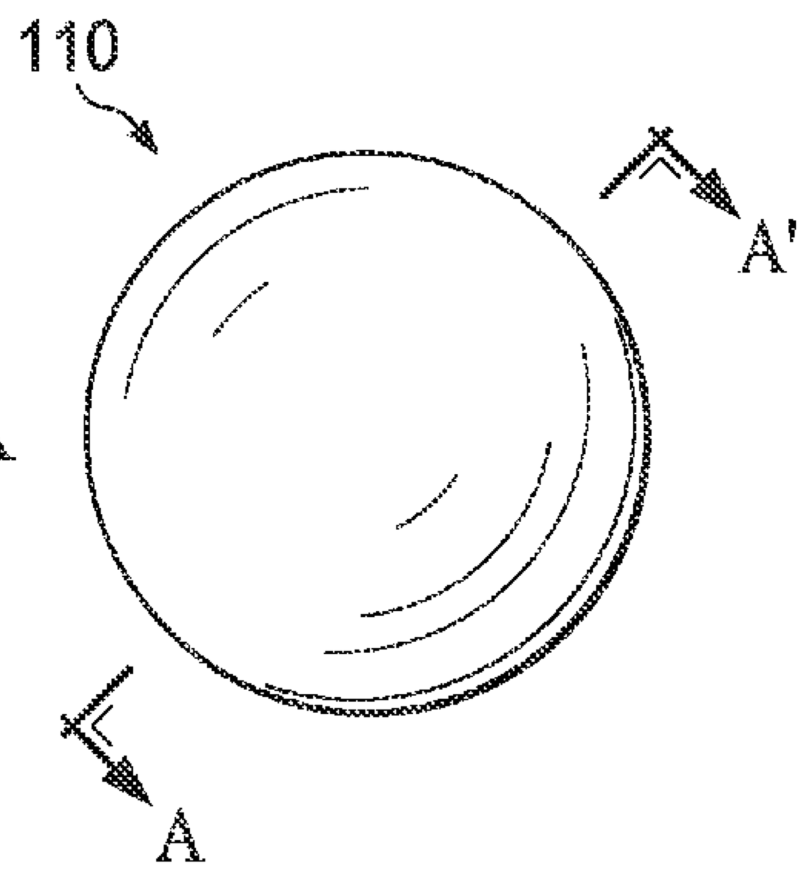


FIG. 3A

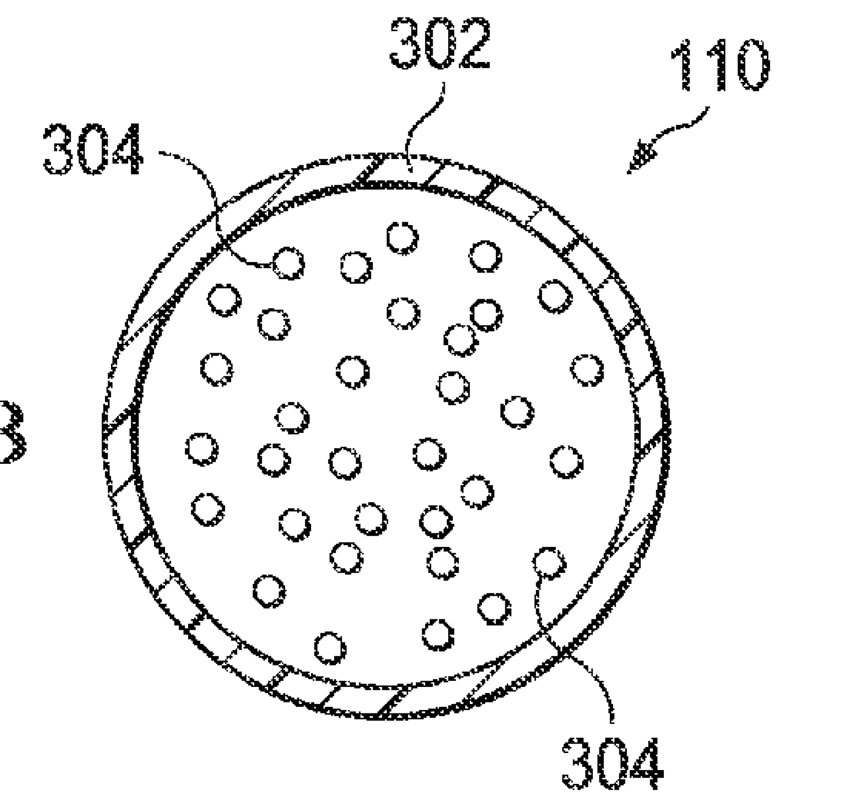


FIG. 3B

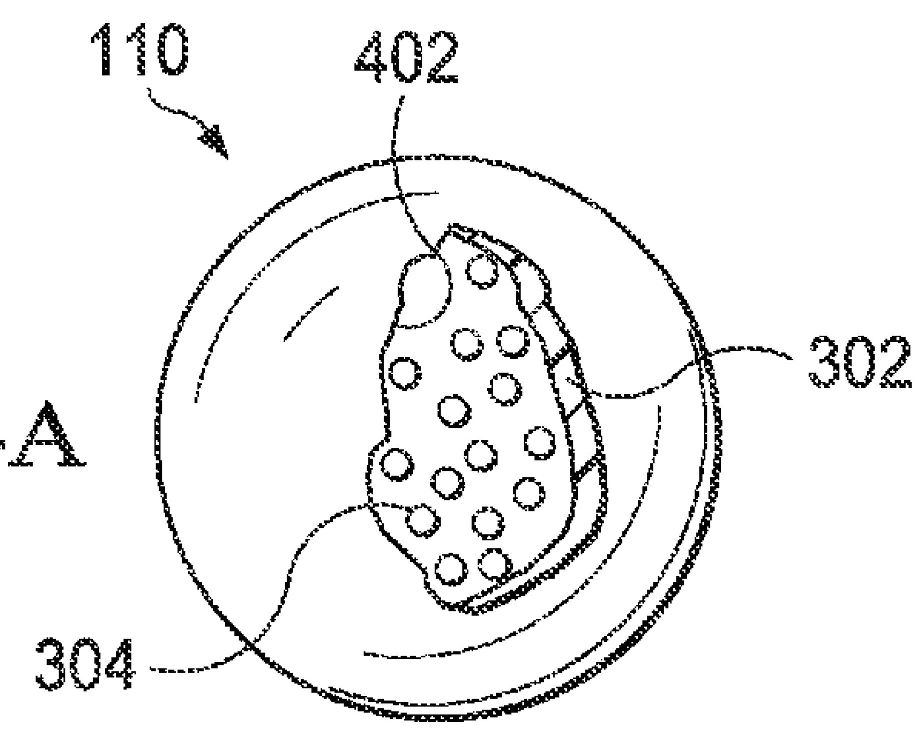


FIG. 4A

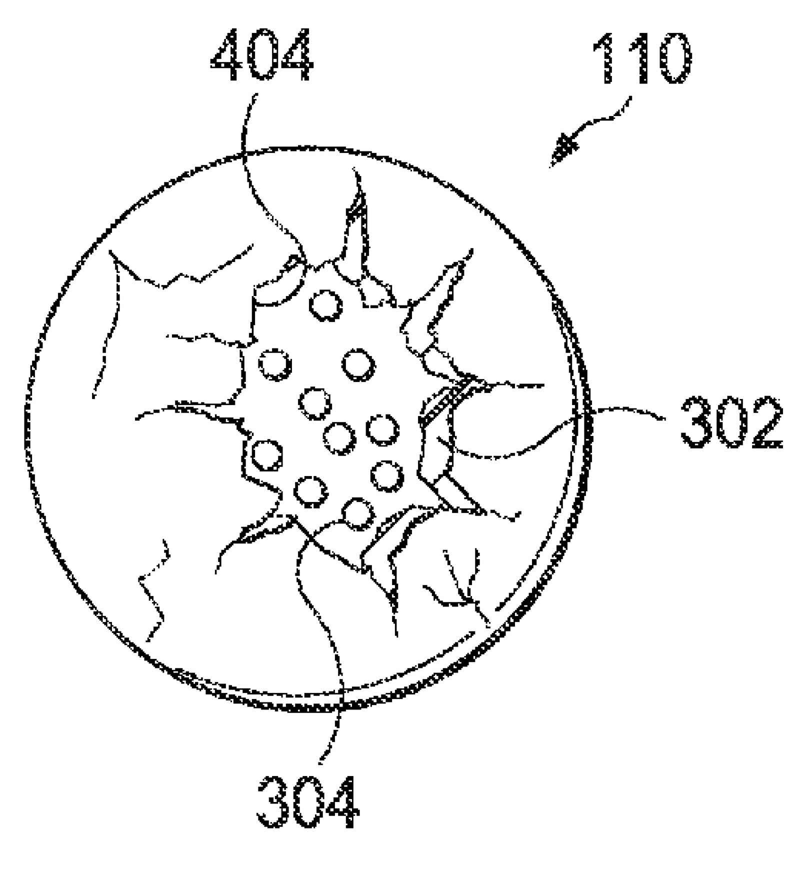


FIG. 4B

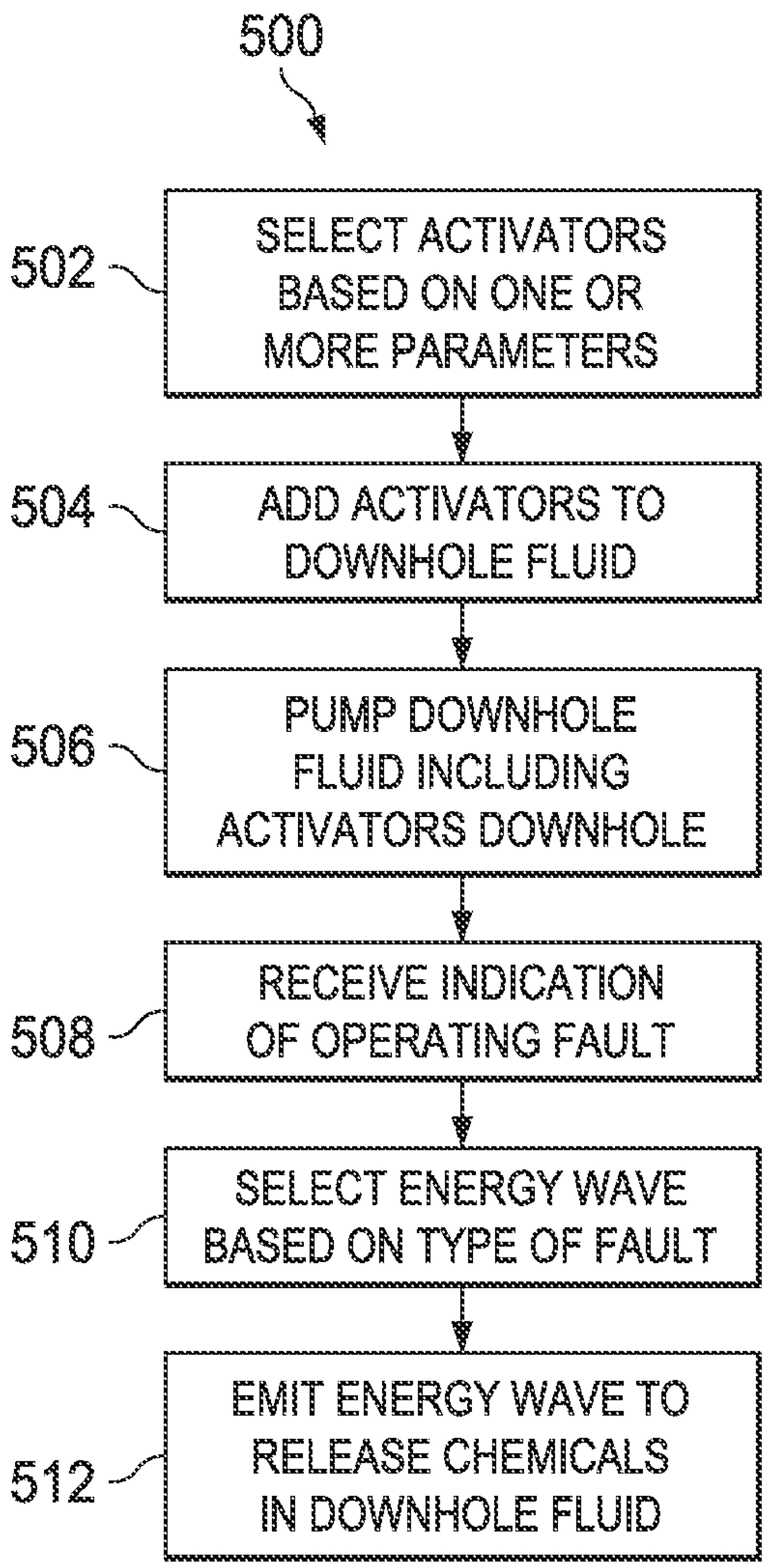
500
502
SELECT ACTIVATORS BASED ON ONE OR MORE PARAMETERS
504
ADD ACTIVATORS TO DOWNHOLE FLUID
506
PUMP DOWNHOLE FLUID INCLUDING ACTIVATORS DOWNHOLE
508
RECEIVE INDICATION OF OPERATING FAULT
510
SELECT ENERGY WAVE BASED ON TYPE OF FAULT
512
EMIT ENERGY WAVE TO RELEASE CHEMICALS IN DOWNHOLE FLUID

FIG. 5

# RELEASING ACTIVATORS DURING WELLBORE OPERATIONS

## TECHNICAL FIELD

**[0001]** This invention relates to wellbore operations and, more particularly, to releasing encapsulated activators during wellbore operations.

## BACKGROUND

**[0002]** Some wellbores, for example, those of some oil and gas wells, use downhole fluids during operations such as drilling, cementing, and others. For example, a downhole fluid may be introduced into an annular space between the casing/drill string and the surrounding earth. As for cementing, the downhole fluid may secure the casing in the wellbore and prevent fluids from flowing vertically in the annulus between the casing and the surrounding earth. Different fluid formulations are designed for a variety of wellbore conditions and operating conditions, which may be above ambient temperature and pressure. In designing a fluid formulation, a number of potential mixtures may be evaluated to determine their mechanical properties under various conditions.

## SUMMARY

**[0003]** In some implementations, a method for reducing material loss includes adding, to a downhole fluid circulated through a drill string, encapsulants encapsulating one or more activators. One or more parameters in a wellbore associated with a fault in operating conditions are determined. One or more energy waves in the downhole fluid configured to release the one or more activators from the encapsulants are emitted.

**[0004]** The details of one or more embodiments of the invention are set forth in the accompanying drawings and the description below. Other features, objects, and advantages of the invention will be apparent from the description and drawings, and from the claims.

## DESCRIPTION OF DRAWINGS

**[0005]** FIG. **1** is an example well system for producing fluids from a production zone;

**[0006]** FIGS. **3**A and **3**B illustrate an example activation device for activating cement slurry in a wellbore;

**[0007]** FIGS. **4**A and **4**B illustrate example processes for releasing activators in cement slurries; and

**[0008]** FIG. **5** is a flow chart illustrating an example method for updating one or more properties of downhole fluid.

**[0009]** Like reference symbols in the various drawings indicate like elements.

## DETAILED DESCRIPTION

**[0010]** The present disclosure is directed to one or more well systems having a fluid delivery system that selectively releases activators configured to update one or more properties of a downhole fluid. For example, the described system may release encapsulated active ingredients in selected subsurface locations in wells to substantially prevent loss of drilling fluid through a subsurface fracture or to control a formation fluid influx. A downhole fluid may include a settable material (e.g., cementing fluid), a drilling fluid, a completion fluid, a "kill" fluid (controls influxes), and/or others. For example, the downhole fluid may be a cementing fluid such that the released chemicals accelerate the associated setting rate. The one or more updated properties may include a setting rate, viscosity, solubility, lubrication, static gel strength (SGS) development, density, compressive strength development, and/or others. The activators may be released in response to at least detecting formation pore fluid influx from or downhole fluid loss into one or more substerranean zones exceeding a predefined threshold and may be configured to activate and/or accelerate the setting process for a cement fluid or slurry in a wellbore. By dymanically altering the properties of a downhole fluid, the system may provide one or more of the following: major savings to the customer would include savings of rig time (~$500K/day for deepwater rigs); savings of lost drilling and cementing fluids; reducing cement WOC time, eliminating remedial cementing costs; savings of time waiting on less effective systems (i.e. like Portland cement) to set in +/−8 hours; mitigate losses and/or influxes that cause loss of well control incidents ($millions damage costs) and/or others.

**[0011]** In some implementations, activators are enclosed in a shell or at least partially enclosed in a shell and released in response to encapsulation failure triggered or otherwise initiated by the system. Encapsulation Shell Failure (ESF) may include molecular resonation of fatigue fail chemical bonds, disruption of oriented structures of shells' emulsified interfacial phases, altering molecular surface charges of shell membranes, exceeding shell tensile or bond strengths to generate cracks or other openings in the encapsulating shells, resonance heating and expansion of internal phases to stress crack shells to induce internal phase leaks and/or releases, and/or other failure types caused or otherwise associated with energy waves. Energy waves may include sonic/ultrasonic acoustic sound signals, tuned frequency and/or amplitude oscillating pressure pulses (e.g. Coanda Effect), ultra-fast laser pulse induced desorption, vibrationally mediated photodissociation, electromagnetic, radio, and/or microwave waveforms, laser ablation, and/or other wave types. In some implementations, the described systems may use energy waves (e.g., ultrasound, pressure pulses, lasers, radiation) to release activators configured to update one or more properties of the downhole fluid in response, for example, to detecting a fault in operating conditions of the wellbore. An operating fault may include loss of circulation fluid above a specified threshold, a stuck drilling pipe, a partially or fully occluded wellbore, uncontrolled formation fluid influxes (called "kicks"), underground blowouts (uncontrolled flows of formation fluids from one zone into another one), surface blowouts (uncontrolled flows of formation fluids to the surface), and/or others. Alternatively or in combination, the energy waves may directly update physical properties of chemicals in the downhole fluid by using one or more different mechanisms responsive to energy waves. The one or more different mechanisms may include modifying chemical properties, releasing chemicals, modifying physical properties (e.g., particle size), updating operating conditions (e.g., pressure, temperature), and/or other mechanisms responsive to energy waves. For example, described systems may use energy waves to directly heat chemicals to increase their reaction rate with other materials.

**[0012]** Referring to FIG. **1**, the system **100** is a cross-sectional well system **100** that updates properties of downhole fluids in response to at least detecting a operating fault. In the illustrated implementation, the well system **100** includes a production zone **102**, a non-production zone **104**, wellbore

**106**, downhole fluid **108**, and encapsulants **110**. The production zone **102** may be a subterranean formation including resources (e.g., oil, gas, water). The non-production zone **104** may be one or more formations that are isolated from the wellbore **106** using cement and/or other isolators. For example, the zone **104** may include contaminants that, if mixed with the resources, may result in requiring additional processing of the resources and/or make production economically unviable. The downhole fluid **108** may be pumped or selectively positioned in the wellbore **106**, and the properties of the downhole fluid **108** may be updated using the encapsulants **110**. In some implementations, the encapsulants **110** may release activators in response to energy waves initiated by, for example, a user of the system **100**. By remotely controlling the properties, a user may configure the system **100** without substantially interferencing with wellbore operations. While the figure illustrates using the encapsulants with cementing operations, the encapsulants **108** may be used during other types of operations such as drilling without departing from the scope of this disclosure.

**[0013]** Turning to a more detailed description of the elements of system **100**, the wellbore **106** extends from a surface **112** to the production zone **102**. The wellbore **106** may include a rig **114** that is disposed proximate to the surface **112**. The rig **114** may be coupled to a casing **116** that extends the entire length of the wellbore or a substantial portion of the length of the wellbore **106** from about the surface **112** towards the production zones **102** (e.g., hydrocarbon-containing reservoir). In some implementations, the casing **116** can extend past the production zone **102**. The casing **116** may extend to proximate a terminus **118** of the wellbore **106**. In some implementations, the well **106** may be completed with the casing **116** extending to a predetermined depth proximate to the production zone **102**. In short, the wellbore **106** initially extends in a substantially vertical direction toward the production zone **102**. In some implementations, the wellbore **106** may include other portions that are horizontal, slanted or otherwise deviated from vertical.

**[0014]** The rig **114** may be centered over a subterranean oil or gas formation **102** located below the earth's surface **112**. The rig **114** includes a work deck **124** that supports a derrick **126**. The derrick **126** supports a hoisting apparatus **128** for raising and lowering pipe strings such as casing **116**. Pump **130** is capable of pumping a variety of downhole fluids **108** (e.g., drilling fluid, cement) into the well and includes a pressure measurement device that provides a pressure reading at the pump discharge. The wellbore **106** has been drilled through the various earth strata, including formation **102**. Upon completion of wellbore drilling, the casing **116** is often placed in the wellbore **106** to facilitate the production of oil and gas from the formation **102**. The casing **116** is a string of pipes that extends down wellbore **106**, through which oil and gas will eventually be extracted. A cement or casing shoe **132** is typically attached to the end of the casing string when the casing string is run into the wellbore. The casing shoe **132** guides the casing **116** toward the center of the hole and may minimize or otherwise decrease problems associated with hitting rock ledges or washouts in the wellbore **106** as the casing string is lowered into the well. The casing shoe **132** may be a guide shoe or a float shoe, and typically comprises a tapered, often bullet-nosed piece of equipment found on the bottom of the casing string **116**. The casing shoe **132** may be a float shoe fitted with an open bottom and a valve that serves to prevent reverse flow, or U-tubing, of downhole fluid **108** from annulus **122** into casing **116** after the downhole fluid **108** has been placed into the annulus **122**. The region between casing **116** and the wall of wellbore **106** is known as the casing annulus **122**. To fill up casing annulus **122** and secure casing **116** in place, casing **116** is usually "cemented" in wellbore **106**, which is referred to as "primary cementing." In some implementations, the downhole fluid **108** may be injected into the wellbore **106** through one or more ports **134** in the casing shoe **132**. The downhole fluid **108** may flow through a hose **136** into the casing **116**. In some instances where the casing **116** does not extend the entire length of the wellbore **106** to the surface **112**, the casing **116** may be supported by a liner hanger **138** near the bottom of a previous casing **120**. In the illustrated implementation, the casing shoe **132** includes a wave generator **140** including any hardware, software or firmware configured to generate one or more energy waves proximate the terminus of the casing **116**.

**[0015]** As previously mentioned, the wave generator **140** may generate energy waves including one or more of the following: sonic and/or ultrasonic acoustic sound signals, tuned frequency and/or amplitude oscillating pressure pulses (e.g. Coanda Effect), ultra-fast laser pulse induced desorption, vibrationally mediated photodissociation, electromagnetic, radio, and/or microwave waveforms, laser ablation, and/or other wave types. The ESF wave types and characteristics (frequency, amplitude, bandwidth, intensity, duration, etc.) may be selected to substantially match wave attributes configured to break or otherwise form openings in the specific encapsulating shells. For example, the selected wave attributes may isolate and carry the internal phase materials into the wellbore **106** and deliver them to the desired location without significant leakage. In addition, the selected wave attributes may be utilized to spatially tune release of encapsulates to within the confines of the wellbore **106** or also material infiltrated into the formation. In these instances, the activators may be delivered into pore space prior to activation, which may enable introducing co-reactants in place with mixed encapsulant systems. In regards to radio and/or microwaves, invert emulsion muds may be broken to facilitate recycling of the water and oil in refineries, oil production facilities, etc. The application may work by microwave (electromagnetic fields oscillating at 915 MHz) treating oil/water emulsions to destabilize them by breaking down the physical bonds holding the emulsion together. This type of wave energy may be absorbed by polar and/or charged molecules, including the water and the surfactants, charged solids and polar asphaltene aggregates that stabilize the emulsion interface. As the wave fields oscillate, a temperature gradient may be established across the oil/water interface, and the surface active molecules may begin to rotate and move about as they react to the changing fields. This may result in a breakdown of the surface and emulsion stability. In regards to ultrasonic waves, these waves may break nanobubbles to release activators. For example, micro-emulsions called nanobubbles in the downhole fluid may transport activators to precise locations within the wellbore where they are released by ultrasonic waves breaking the encapsulating micro-emulsions. In other words, ultrasonic/sonic ESF wave tools in the well may release the nanobubble encapsulated chemicals at the desired downhole locations without being exposed to contaminants that degrade performance in conventional placement methods.

**[0016]** In some implementations, the system **100** may update properties of the downhole fluid **108** using the encapsulants **110** during one or more wellbore operations. In some implementations, the encapsulants **110** may be mixed into the downhole fluid **108** prior to entering the casing **116**, and the downhole fluid **108** may then be pumped down the inside of the casing **116**. As previously mentioned, the encapsulants **110** may include one or more activators that update the properties of the downhole fluid **108** in response to at least an energy wave. For example, the leaking or otherwise released activators may trigger rapid gelation, hydration, swelling, expansion, foaming, and/or setting of at least a portion of the downhole fluid **108**. For example, the activators may trigger, intiate or increase a setting rate of LCM (Lost Circulation Material) and/or other drilling/completion/cementing fluid materials. The LCM and/or other material systems may be placed either pumping them into a zone and/or behind a pipe (casing, liners, drillpipe), and/or they can be activated as they pass through an ESF wave downhole tool such as the generator **140** while being pumped down and out of a working string (as illustrated). The encapsulants **110** may infiltrate pore space of the formation, which may allow for in-situ reactions such as pore-throat sealing and/or formation stabilization. Other encapsulants **110** may be released in selected intervals of the well, which may increase downhole fluid viscosity to help slow down and control “kicks” migrating to the surface and to decrease or stop uncontrolled flows in underground or surface blowouts. Additionally, the infiltrated encapsulants **110** may be tailored for later PE applications such as acidizing. Later triggering or releasing acidic materials may be able to acidize from behind the filtercake. For instance, in response to detecting fluid loss reaches a specified threshold, the operator of the rig **114** may switch on the ESF wave tool **140** placed near the end of a work string via, for example, surface controls.

**[0017]** During cementing operations (as illustrated), both primary and remedial cementing may also utilize the encapsulated LCM or other encapsulated materials such as accelerators, surfactants, expanding agents (aluminum powder, etc.), foaming agents, etc. For primary cementing, the ESF wave tool **140** may be installed in the casing shoe or float collar **132** as discussed above. In some implementations, the tool **140** may be a non-retrievable, low-cost, and very small ESF tool such as the “Pulsonix” device (PE PSL product) or modified-version thereof that produces tuned frequency/amplitude oscillating pressure pulses (Coanda Effect) mounted either inside the bottom wiper plug or inside the float collar. When the bottom wiper plug seats on the float collar and its rupture disc opens to bypass the cement slurry, part of the slurry flows enters the ESF wave tool’s flow channel to start sending ESF waves into all the slurry flowing into the annulus **122**. As the encapsulating shells **110** are broken by the ESF waves’ molecular resonance action, the encapsulated materials may be released and react in the annulus **122** and perform various functions such as sealing loss zones, accelerating cement strength development, controlling gas migration (shortening SGS transit times, activating latex or GasCheck additives, etc.), creating in-situ foam cement, etc. For remedial cementing, the ESF wave tool **140** is mounted in a sub at or near the bottom of the work string and either continually or selectively operated (sending out ESF waves). The latter may be started by a dropping a dart or ball or by the same surface on/off tool controlling signal described above for drilling operations.

**[0018]** During drilling operations, ESF waves may be incident a pill of LCM laden fluid while it is being pumped out the bit (not illustrated). As the ESF waves pass through the LCM system, the encapsulated materials may be released to activate other LCM components creating the types of compounds for effective sealing of the loss zone formation. After the activated LCM passes out of the bit and travels into the loss zone, the activators may rapidly react chemically into soft sealing agglomerates, osmotically-swelling hard particles, and/or a combination of both and seal off the zone. If this proves not effective enough, a second type of LCM pill may be pumped in a similar fashion. In this case after passing the ESF wave tool and going out into the lost circulation zone, the LCM may begin to rapidly set into a hard sealing system. In other cases, the customer may add encapsulated LCM into the total circulating mud volume that is pumped into and out of the well such as during drilling operations. When drilling fluid losses occur, the operator may flip a switch on the surface control panel to start sending out ESF waves from the ESF tool (located inside or near the drill bit) to convert the encapsulated LCM into a loss zone sealing LCM system. The ESF tool may be switched off as losses diminish and returns are re-established within specified guidelines. An example of non LCM applications related to wellbore drilling, the encapsulant material may be utilized for real-time mud property alterations. The drilling fluid may be formulated to contain an encapsulated viscosity modifier, which upon release may specifically alter the fluid rheology in a near-bit region rather as compared with fluid cycling. Such spatial/temporal control may allow for rapid fluid tuning or may be used to establish highly viscous ‘pills’ in real-time for zonal isolation and/or other applications.

**[0019]** The potential encapsulated materials and descriptions of their system recipes and applications may be customized for a plurality of different types of operation. For example, a well may being drilled with SBM (synthetic based mud) and severe losses indicate a large size fracture is taking the SBM flow out of the well. The operator may decide to apply the LCM encapsulated systems and have a ESF wave tool installed in the drill bit. One encapsulated LCM component may be the water phase of the SBM invert emulsion that contains high concentrations of cement acceleration chemicals such as $CaCl_2$. Other LCM system components may be selected based on the downhole sealant properties to seal large fractures. The operator may select a hard setting sealant “pill” with dry powdered cement and a second encapsulated component such as “dry emulsion” powder of LATEX 2000 (cement) added to the synthetic oil phase of the SBM to make a “pill” in the “slugging pit” on the rig. This pill may be a substantially improved version of the old LCM system called DOC (diesel oil cement) where the oil is an inert carrying fluid for the cement. The new LCM system may also utilizes the synthetic oil as an inert carrying fluid for both the cement and encapsulated latex. In addition, the SBM’s water phase may carry the cement’s accelerating agent and hydration mix water. The ESF wave tool may be tuned to break the SBM invert emulsion and may be switched on as the new LCM “pill” exits the drill bit. The ESF waves break the invert emulsion and release the SBM water phase that mixes and reacts with the cement and latex to create a fast setting sealant squeezed into and plugging the fracture near the wellbore.

**[0020]** As the fluid **108** reaches the bottom of casing **116**, it flows out of casing **116** and into casing annulus **122** between casing **116** and the wall of wellbore **106**. In connection with pumping the downhole fluid **108** into the annulus, the generator **140** may emit one or more energy waves before, during, and/or after the pumping is complete to release one or more chemicals from the encapsulants **110**. In response to at least the signal, the encapsulants **110** may release chemicals that update the properties of the downhole fluid **108** in the annulus **122**. Some or all of the casing **116** may be affixed to the adjacent ground material with set cement as illustrated in FIG. **2**. In some implementations, the casing **116** comprises a metal. After setting, the casing **116** may be configured to carry a fluid, such as air, water, natural gas, or to carry an electrical line, tubular string, or other elements.

**[0021]** After positioning the casing **116**, a settable slurry **108** including encapsulants **110** may be pumped into annulus **122** by a pump truck (not illustrated). While the following discussion will center on the settable slurry **108** comprising a downhole fluid **108**, the settable slurry **108** may include other compounds such as resin systems, settable muds, conformance fluids, lost circulation, and/or other settable compositions. Example cement slurries **108** are discussed in more detail below. In connecting with depositing or otherwise positioning the downhole fluid **108** in the annulus **122**, the encapsulants **110** may release activators to activate or otherwise increase the setting rate of the downhole fluid **108** in response to at least ultrasound. In other words, the released activators may activate the downhole fluid **108** to set cement in the annulus **122**.

**[0022]** In some implementations, the encapsulants **110** may release an activator that initiates or accelerates the setting of the downhole fluid **108**. For example, the downhole fluid **108** may remain in a substantially slurry state for a specified period of time, and the encapsulants **110** may activate the cement slurry in response to ultrasound. In some instances, ultrasound may crack, break or otherwise form one or more holes in the encapsulants **110** to release the activators. In some instances, the ultrasound may generate heat that melts one or more holes in the encapsulants **110**. The encapsulants **110** enclose the activators with, for example, a membrane such as a polymer (e.g., polystyrene, ethylene/vinyl acetate copolymer, polymethylmethacrylate, polyurethanes, polylactic acid, polyglycolic acid, polyvinylalcohol, polyvinylacetate, hydrolyzed ethylene/vinyl acetate, or copolymers thereof). The encapsulant **110** may include other materials responsive to ultrasound. In these implementations, the encapsulant **110** may include a polymer membrane that ultrasonically degrades to release the enclosed activators. In some examples, an ultrasonic signal may structurally change the membrane to release the activators such as, for example, opening a preformed slit in the encapsulants **110**. In some implementations, at least one dimension of the encapsulants **110** may be microscopic such as in range from 10 nanometers (nm) to 15,000 nm. For example, the dimensions of the encapsulants **110** may be on a scale of a few tens to about one thousand nanometers and may have one or more external shapes including spherical, cubic, oval and/or rod shapes. In some implementations, the encapsulants **110** can be shells with diameters in the range from about 10 nm to about 1,000 nm. In other implementations, the encapsulants **110** can include a diameter in a range from about 15 micrometers to about 10,000 micrometers. Alternatively or in combination, the encapsulants **110** may be made of metal (e.g., gold) and/or of non-metallic material (e.g., carbon). In some implementations, the encapsulants **110** may be coated with materials to enhance their tendency to disperse in the downhole fluid **108**. The encapsulants **110** may be dispersed in the cement slurry at a concentration of $10^5$ to $10^9$ capsules/$cm^3$. In some implementations, the encapsulants **110** are a shell selected from the group consisting of a polystyrene, ethylene/vinyl acetate copolymer, and polymethylmethacrylate, polyurethanes, polylactic acid, polyglycolic acid, polyvinylalcohol, polyvinylacetate, hydrolyzed ethylene/vinyl acetate, and copolymers thereof.

**[0023]** FIG. **2**A illustrate a cross sectional view of the well system **100** including activated set cement **202** in at least a portion of the subterranean zone **104**. In particular, the encapsulants **110** released activators in response to at least detecting a loss of the downhole fluid **108** such that the fluid **108** including the chemicals were positioned in the fault **204** to the set cement **202**. In some implementations, the cement slurry **108** flowed into the annulus **122** through the casing **116** and further into the fault **204**. In response to at least a signal, the encapsulants **110** in the slurry **108** released one or more chemicals configured to accelerate the setting rate of the slurry **108**. In the illustrated example, substantially all encapsulants **110** in the annulus **122** released activators to form the set cement **202** along substantially the entire length of the annulus **122**. In some implementations, the energy waves may be emitted for a specified period of time to substantially limit the formation of the set cement **204** in the fault **202**. In other words, an initial amount of the cement slurry **108** may be exposed to energy waves such that the setting period may be substantially equal to a period of time for the setting cement slurry **108** to enter to the fault **204**.

**[0024]** FIGS. **3**A and **3**B illustrate an example encapsulant **110** of FIG. **1** in accordance with some implementations of the present disclosure. In this implementation, the encapsulant **110** is substantially spherical but may be other shapes as discussed above. The encapsulant **110** is a shell **302** encapsulating one or more activators **304** as illustrated in FIG. **3**B. The encapsulant **110** releases one or more stored activators **304** in response to at least one or more energy waves. For example, the encapsulant **110** may crack or otherwise form one or more holes in response to at least the energy waves. The illustrated encapsulant **110** is for example purposes only, and the encapsulant **110** may include some, none, or all of the illustrated elements without departing from the scope of this disclosure.

**[0025]** FIGS. **4**A and **4**B illustrate an example implementation of the encapsulant **110** including an opening configured to release one or more activators. The encapsulants **110** may release activators by heating one or more portions to form at least one opening, destroying or otherwise removing one or more portions, and/or other processes for forming an opening in the shell **302**. The following implementations are for illustration purposes only, and the encapsulants **110** may release activators using some, all or none of these processes.

**[0026]** Referring to FIG. **4**A, the encapsulant **110** forms an opening through heat formed from wave energy. For example, the ultrasonic signals may directly heat the membrane of the encapsulant **110** and/or heat the surrounding downhole fluid **108** to a temperature above the melting point. The encapsulant **110** may be a gold shell that when vibrated at its natural frequency melts at least a portion of the shell to release the enclosed activators. In these instances, the generated heat may melt or otherwise deform the shell to form an opening. In addition to metal membranes, the encapsulant **110** may be other materials such as a polymer. Referring to FIG. **4**B, the encapsulant **110** forms cracks, breaks, or openings in the shell in response one or more energy waves. For example, an ultrasonic signal may crack or otherwise destroy portions of the encapsulant **110**. In some implementations, the ultrasound may form defects in the membrane of the shell **302** and, as a result, form one or more openings as illustrated.

**[0027]** FIG. **5** is a flow diagram illustrating an example method **500** for releasing one or more chemicals in response to at least an operating fault. The illustrated methods are described with respect to well system **100** of FIG. **1**, but these methods could be used by any other system. Moreover, well system **100** may use any other techniques for performing these tasks. Thus, many of the steps in these flowcharts may take place simultaneously and/or in different order than as shown. The well system **100** may also use methods with additional steps, fewer steps, and/or different steps, so long as the methods remain appropriate.

**[0028]** Referring to FIG. **5**, method **500** begins at step **502** where activators are selected based, at least in part, on one or more parameters. For example, the encapsulants **110** and the enclosed chemicals may be selected be based, at least in part, on components of the downhole fluid **108** and/or current wellbore operations. In some implementations, the encapsulants **110** may be selected based on downhole conditions (e.g., temperature). At step **504**, the selected activators are mixed with a downhole fluid. In some examples, the encapsulants **110** may be mixed with the downhole fluid **108** as the truck **130** pumps the fluid **108** into the casing **116**. In some examples, the encapsulants **110** may be mixed with dry ingredients prior to generating the downhole fluid **108**. Next, at step **506**, the downhole fluid, including the activators, is pumped downhole. In some instances, the downhole fluid **108** including the encapsulants **110** may be pumped into the annulus **122** at a specified rate. At step **508**, an indication of operating fault is received. For example, the system **100** may detect that a fluid loss exceeds a threshold, a partially occluded wellbore, a stuck pipe, and/or other operating faults. Next, at step **510**, an energy wave I selected based on the type of fault. For example, the downhole fluid **108** may include a plurality of different types of encapsulants **110** such that each type releases the associated chemicals in response to a different energy wave. In doing so, the system **100** may be prepared to address a plurality of different operating faults. One or more energy waves are transmitted to the at least a portion of the downhole fluid at step **512**. Again in the example, the generator **134** may transmit signals at a portion of the downhole fluid **108**. In this example, the transmitted signals may release chemicals proximate the shoe **132** to update one or more properties of that portion of the downhole fluid **108**. In some instances, the casing **116** may be moved (e.g., up/down) to assist in distributing the activators as desired.

**[0029]** A number of embodiments of the invention have been described. Nevertheless, it will be understood that various modifications may be made without departing from the spirit and scope of the invention. Accordingly, other embodiments are within the scope of the following claims.

What is claimed is:

**1**. A method for reducing material loss, comprising:

adding to a downhole fluid circulated through a drill string encapsulants encapsulating one or more activators;

determining one or more parameters in a wellbore associated with a fault in operating conditions; and

emitting one or more energy waves in the downhole fluid configured to release the one or more activators from the encapsulants.

**2**. The method of claim **1**, further comprising determining a location associated with a subset of encapsulants, wherein the one or more activators are released at least proximate the determined location.

**3**. The method of claim **1**, wherein the released chemicals are configured to react with the downhole fluid.

**4**. The method of **1**, wherein the one or more energy waves are emitted in response to at least determining a rate of loss of the downhole fluid exceeds a specified threshold.

**5**. The method of claim **1**, wherein the downhole fluid includes a settable composition, and the one or more released activators are configured to increase a setting rate of the settable composition.

**6**. The method of claim **5**, wherein the settable composition comprises at least one of a cement composition, a resin composition, a settable mud, a conformance fluid, a lost circulation composition, an influx or blowout controlling fluid, or a polymeric additive.

**7**. The method claim **5**, wherein the settable composition sets in a range from about one minute to about 24 hours after reacting with the one or more chemicals.

**8**. The method of claim **2**, wherein the one or more conditions comprises a drill pipe incorrectly positioned in the wellbore.

**9**. The method of claim **1**, wherein the one or more activators are enclosed in a shell that releases the one or more activators in response to at least the one or more energy waves.

**10**. The method of claim **9**, wherein at least one dimension of the shell is from about 10 nanometers to about 1 millimeter.

**11**. The method of claim **1**, wherein the one or more parameters comprise an obstruction in the wellbore.

**12**. The method of claim **1**, wherein the downhole fluid comprises a drilling fluid, and the one or more released activators alter a viscosity of the drilling fluid.

**13**. The method of claim **1**, wherein the one or more energy waves comprises at least one of sonic signals, ultrasonic signals, microwave, or radio waves.

**14**. The method of claim **1**, further comprising remotely activating, at a surface of the wellbore, a signal generator affixed at least proximate a terminus of a drilling string.

**15**. A system, comprising:

a dispenser configured to add, to a downhole fluid circulated through a drill string, encapsulants encapsulating one or more activators;

one or more sensors configured to determine one or more parameters in a wellbore associated with a fault in operating conditions; and

a transmitter configured to emit one or more energy waves in the downhole fluid configured to release the one or more activators from the encapsulants.

**16**. The system of claim **15**, a location module configured to determine a location associated with a subset of encapsulants, wherein the one or more activators are released at least proximate the determined location.

**17**. The system of claim **15**, wherein the released chemicals are configured to react with the downhole fluid.

**18**. The system of claim **15**, wherein the one or more energy waves are emitted in response to at least determining a rate of loss of the downhole fluid exceeds a specified threshold.

**19**. The system of claim **15**, wherein the downhole fluid includes a settable composition, and the one or more released activators are configured to increase a setting rate of the settable composition.

**20**. The system of claim **19**, wherein the settable composition comprises at least one of a cement composition, a resin composition, a settable mud, a conformance fluid, a lost circulation composition, an influx or blowout controlling fluid, or a polymeric additive.

**21**. The system of claim **19**, wherein the settable composition sets in a range from about one minute to about 24 hours after reacting with the one or more chemicals.

**22**. The system of claim **16**, wherein the one or more conditions comprises a drill pipe incorrectly positioned in the wellbore.

**23**. The system of claim **15**, wherein the one or more activators are enclosed in a shell that releases the one or more activators in response to at least the one or more energy waves.

**24**. The system of claim **23**, wherein at least one dimension of the shell is from about 10 nanometers to about 1 millimeter.

**25**. The system of claim **15**, wherein the one or more parameters comprise an obstruction in the wellbore.

**26**. The system of claim **15**, wherein the downhole fluid comprises a drilling fluid, and the one or more released activators alter a viscosity of the drilling fluid.

**27**. The system of claim **15**, wherein the one or more energy waves comprises at least one of sonic signals, ultrasonic signals, microwave, or radio waves.

**28**. The system of claim **15**, further comprising a trigger configured to remotely activate, at a surface of the wellbore, a signal generator affixed at least proximate a terminus of a drilling string.

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