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(54) CASING MOUNTED METERING DEVICE

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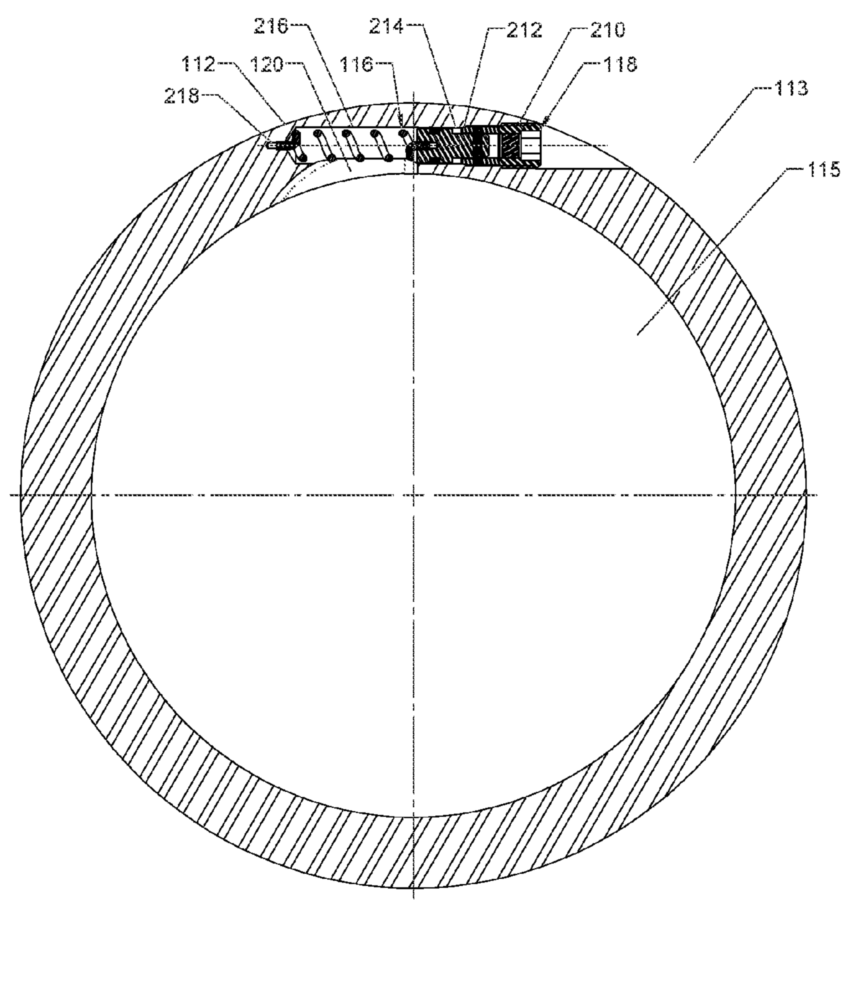
CPC ***E21B 34/063*** (2013.01); ***E21B 34/10*** (2013.01)

(57) **ABSTRACT**

The present invention relates to an inflow control device for controlling the flow of fluid into a tubular deployed in a. wellbore comprising coupling between joints of tubulars. The inflow control device is mounted transversely through the coupling in any inflow can control devices the initial condition fluid flow between the exterior and interior of the tubular is prevented. As sufficient pressure is exerted upon the inflow control device from the interior of the tubular the inflow control device is actuated to allow fluid flow between the interior and exterior the tubular. A nozzle in the inflow control device allows fluid to pass at a preset rate. The present invention furthermore relates to a method of assembling an inflow control device according to the invention and to a completion system comprising an inflow control device according to the invention.



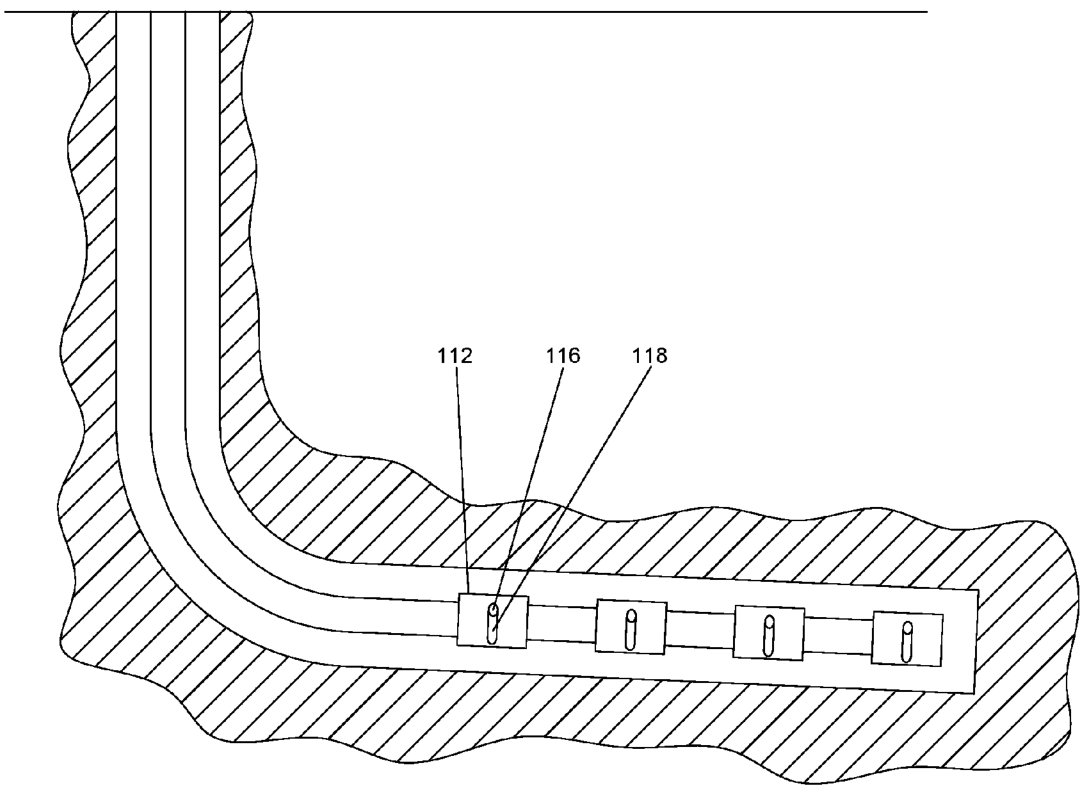


FIGURE 1

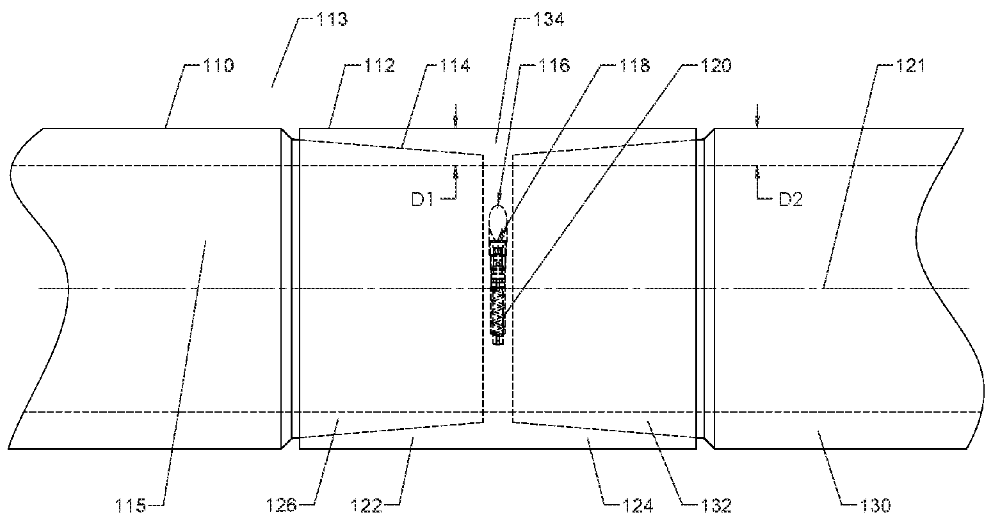


FIGURE 2

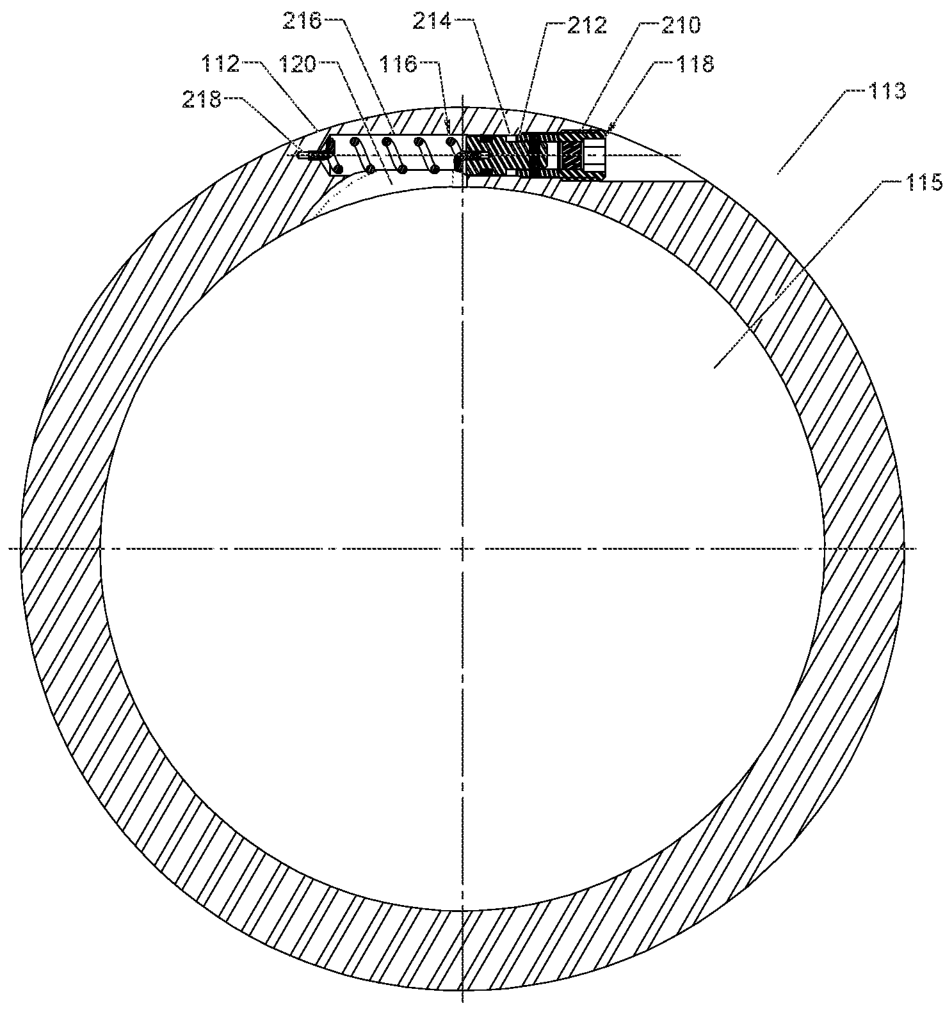
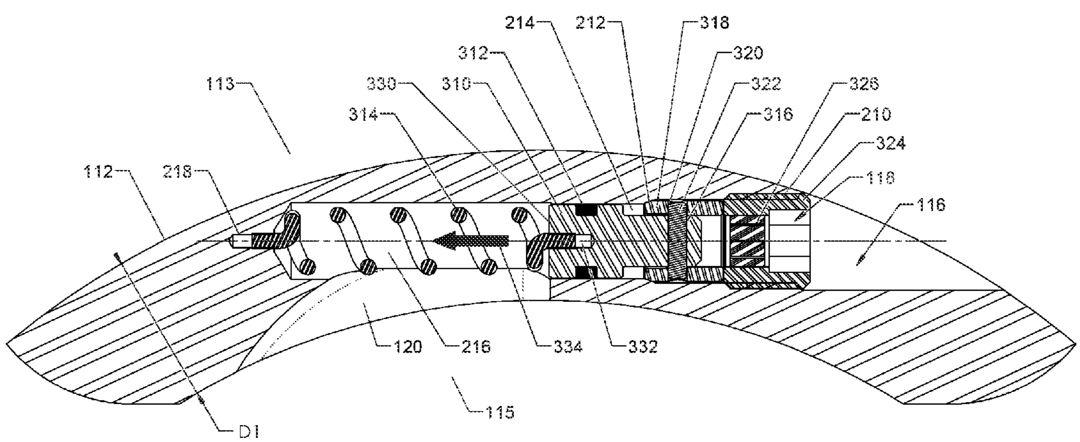


FIGURE 3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332
115
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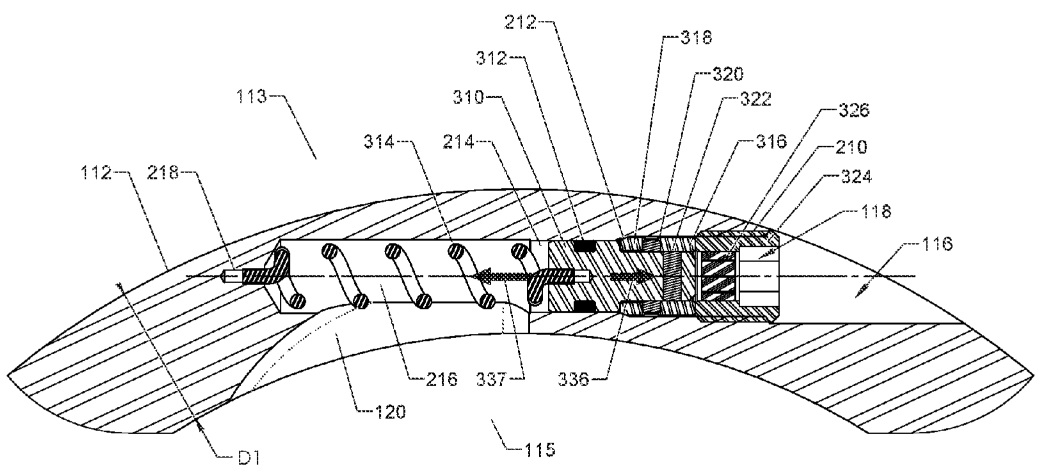
FIGURE 4


212
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337
336
120
115
D1

FIGURE 5

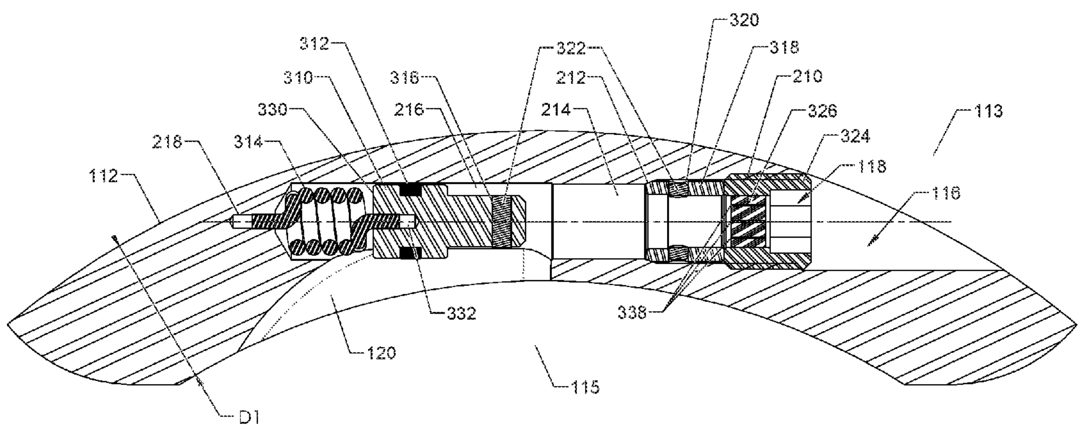
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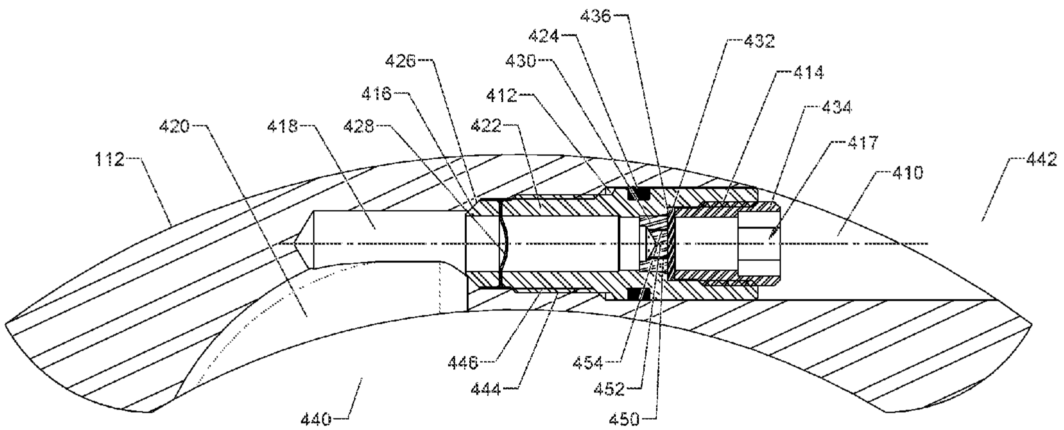
FIGURE 6


436
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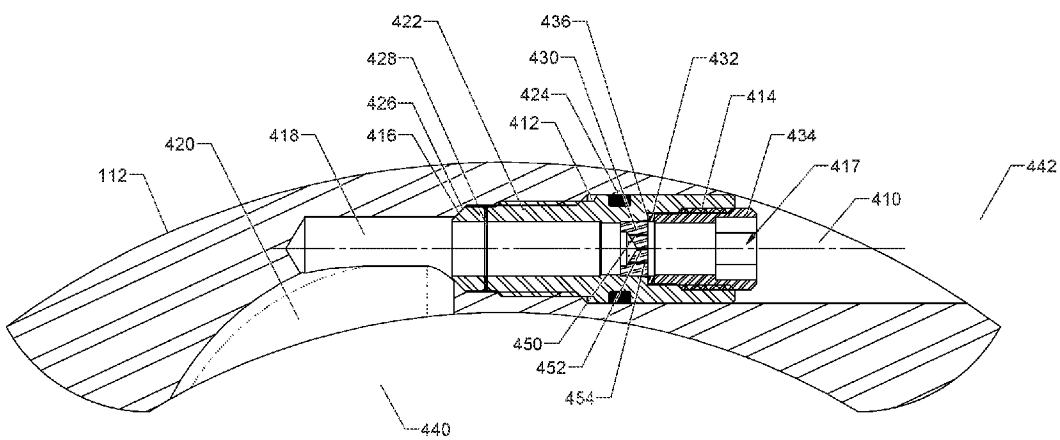
440
450

FIGURE 7


422
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442
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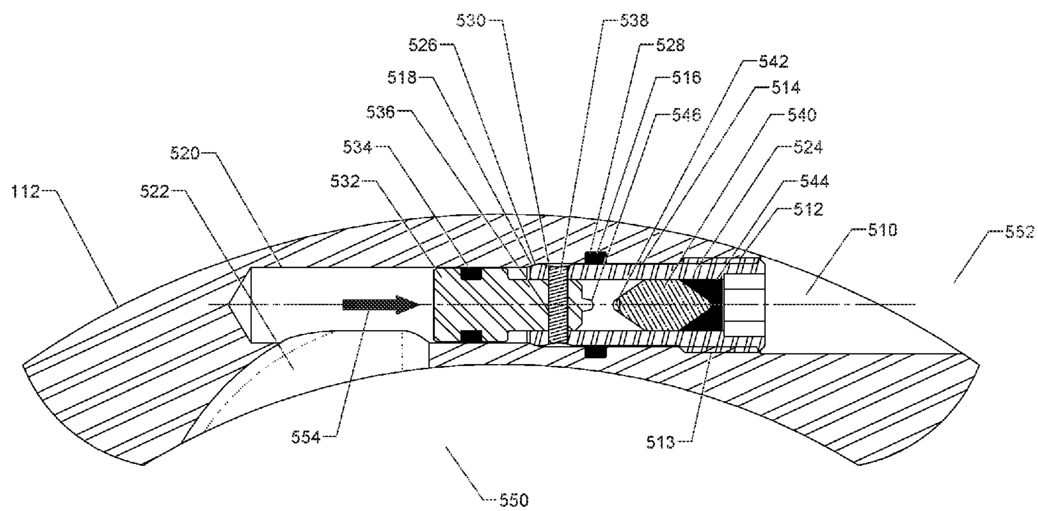
440

FIGURE 8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112
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554
513
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FIGURE 9

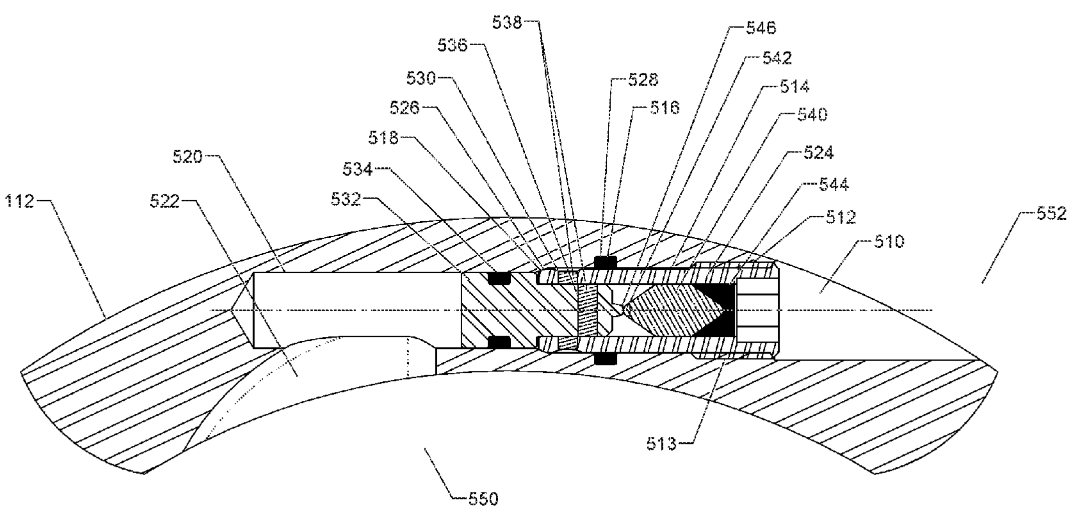
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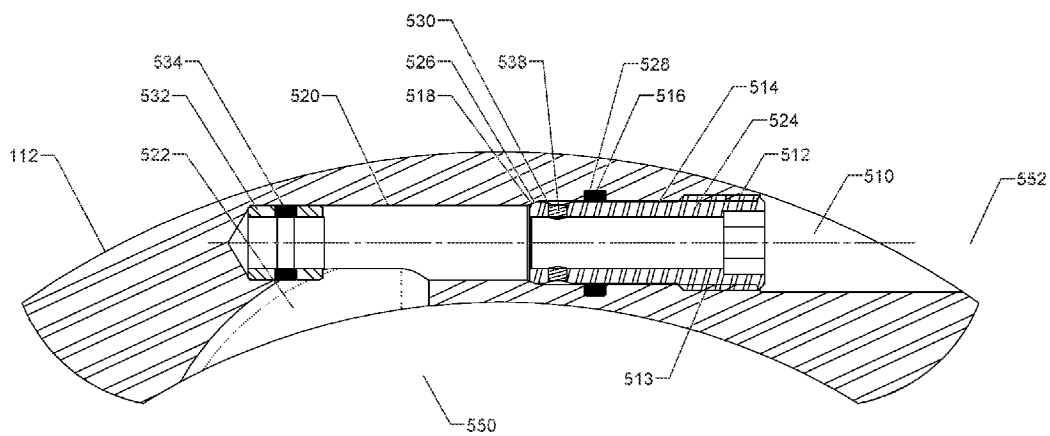
FIGURE 10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550

FIGURE 11

CASING MOUNTED METERING DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. patent application Ser. No. 14/219,658 filed on Mar. 19, 2014, which in turn claims priority to U.S. Provisional Patent Application No. 61/803,600 that was filed on Mar. 20, 2013.

FIELD OF INVENTION

[0002] Embodiments of the present invention generally relate to methods and apparatuses for a downhole operation. More particularly, the invention relates to methods and apparatuses for controlling the flow of fluids from a hydrocarbon formation into the interior of the tubular.

BACKGROUND

[0003] When producing an oil or gas well it is desirable to control the fluid flow into or out of the production tubular, for example, to balance inflow or outflow of fluids along the length of the well. For instance, some horizontal wells have issues with a heel and toe effect, where differences in pressure or the amount of the various fluids that are present at a particular location can lead to premature gas or water breakthrough significantly reducing the production from the reservoir. Inflow control devices have been positioned in the completion string at the heel of the well to stimulate inflow at the toe and balance fluid inflow along the length of the well. In another example, different zones of the formation accessed by the well can produce at different rates. Inflow control devices may be placed in the completion string to reduce production from high producing zones, and thus stimulate production from low or non-producing zones.

SUMMARY

[0004] The concepts described herein encompass various types of inflow control devices. In one embodiment, a first hole is bored transversely, or across the sidewall, in a coupling. A second hole is bored from or otherwise formed in the interior of the coupling to intersect the first hole in the sidewall of the coupling. The two holes cooperate to permit fluid communication between the interior of the tubing and annulus. A housing having a throughbore and a piston that is pinned, with the shear pin, in the housing throughbore is inserted into the first hole and locked in place typically by threads on the exterior of the housing that match threads on the interior of the first hole. Typically, the piston is sized so that one end may fit into the housing throughbore while the other end is sized to fit into the first hole. Additionally, the end of the piston sized to fit in the first hole has a circumferential groove cut into the periphery so that a seal may be placed in the circumferential groove thereby sealing the piston against fluid leaking past the piston towards the exterior of the tubular. Finally, a biasing device, such as a spring, is added to bias the piston away from the housing.

[0005] In order to actuate the inflow control device described above, fluid pressure inside the tubular is increased in order to apply force to the end of the piston thereby forcing the piston further into the housing throughbore. The fluid pressure inside the tubular may be increased as many times as is required as long as the pressure necessary to shear the shear pin and to overcome the spring bias is not surpassed. However, when sufficient pressure is applied to the interior of the tubular and the piston is forced to move further into the housing throughbore the shear pin is sheared releasing the piston toe move relatively freely in the housing throughbore. When the pressure inside of the tubular is released the bias device pulls the piston out of the housing throughbore allowing fluid access between the interior of the tubular and the exterior the tubular although the nozzle in the housing limits the amount of fluid that may pass.

[0006] In another embodiment of an inflow control device a first hole is formed transversely, or across the sidewall, in a coupling. A second hole is formed from the interior of the coupling to intersect the first hole in the sidewall of the coupling so that the two holes together permit fluid communication between the interior of the tubing and annulus. A housing having a throughbore is inserted into the first hole and locked in place typically by threads on the exterior of the housing that match threads on the interior of the first hole. In many instances a circumferential groove is cut in the housing allowing a seal to be inserted into the housing to seal the potential fluid pathway between the exterior of the housing and the first hole although in some instances the groove may be cut into the sidewall of the first hole. Typically, the housing includes a rupture disc on the end of the housing towards the interior of the tubular. The rupture disc may be incorporated into the housing or may be a separate assembly as long as the rupture disc prevents fluid flow into the interior of the housing from the interior of the tubular when the fluid pressure in the interior of the tubular is below a specified pressure. The throughbore of the housing also incorporates a series of shoulders where the shoulders are arranged to support parts of the inflow control device placed on the shoulder from the exterior of the tubular, in other words the shoulders provide support for parts of the inflow control device to resist pressure applied from the exterior or annular region of the tubular. The first shoulder or the shoulder furthest away from the exterior of the tubing retains and supports an erodible or frangible support disc. The erodible support disc may have holes, aligned with the throughbore, that pass through the erodible support disk to allow fluid to pass through after the rupture disc ruptures. The second shoulder, slightly closer to the exterior of the tubing than the first shoulder supports a sealing disk. The sealing disk is supported by both the erodible support disc and the second shoulder. The sealing disk prevents fluid, including high-pressure fluid, from moving through the inflow control device from the exterior of the tubing towards the interior of the tubing. A nozzle is inserted into the through bore usually slightly closer to the exterior of the tubing the sealing disk to allow the nozzle to be easily replaced. In some instances, the nozzle may be part of the through bore.

[0007] In order to actuate the inflow control device described above, fluid pressure inside the tubular is increased in order to rupture the rupture disc. The fluid from inside the tubular then flows past the rupture disc and to the erodible support disc. The fluid then flows through the holes in the erodible support disc allowing the fluid to apply force to the sealing disk. Typically, the sealing disk is not supported, or maybe lightly supported, towards the exterior of the tubular allowing the fluid from the interior of the tubular to push the sealing disk out of the inflow control device. After the rupture disk and the sealing disk have been removed by fluid under pressure from the interior of the tubular fluid communication is established between the exterior to the interior of the tubular. Over time, as fluid passes through the holes in the erodible support disc, the erodible support disc dissolves or is eroded away allowing fluid to flow between the interior of the tubular and the exterior of the tubular at a flow rate determined by the nozzle in the throughbore.

[0008] In another embodiment of an inflow control device a first hole is formed transversely, or across the sidewall, in a coupling. A second hole is formed from the interior of the coupling to intersect the first hole in the sidewall of the coupling so that the two holes together permit fluid communication between the interior of the tubing and annulus. A housing having a throughbore is inserted into the first hole and locked in place, typically by threads, on the exterior of the housing that match threads on the interior of the first hole. In many instances a circumferential groove is cut in the housing or first hole sidewall to allow a seal to be inserted into the groove to seal the fluid pathway between the exterior of the housing and the first hole. A piston that is typically pinned with a shear pin in the housing throughbore is inserted into the first hole. Typically, the piston is sized so that one end may fit into the housing throughbore while the other end is sized to fit into the first hole. Additionally, the end of the piston sized to fit in the first hole may have a circumferential groove cut into the periphery so that a seal may be added sealing the piston into the first hole. An explosive charge including a primer is located in the housing throughbore on the side of the piston towards the annulus of the tubular. A charge seal is then placed in the housing throughbore on the side of the explosive charge towards the annulus of the tubular. The charge seal prevents fluid, including high-pressure fluid, from moving through the inflow control device from the exterior of the tubing towards the interior of the tubing. A nozzle may be included in the housing throughbore. In some instances, the nozzle may be part of the through bore.

[0009] In order to actuate the inflow control device described above, fluid pressure inside the tubular is increased to a level that causes the piston to shear the shear pin thereby allowing the piston to move further into the housing throughbore. As the piston moves further into the housing throughbore the piston strikes or otherwise causes the primer to the fire causing the explosive charge to detonate. The force of the explosive charge detonating removes the charge seal and forces the piston out of the through bore. Fluid communication is thereby established between the exterior to the interior of the tubular. Overtime, as fluid passes through the holes in the erodible support disc, the erodible support disc dissolves or is eroded away allowing fluid to flow between the interior of the tubular and the exterior of the tubular at a flow rate determined by the nozzle in the through bore.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] So that the manner in which the above recited features of the present invention can be understood in detail, a more particular description of the invention, briefly summarized above, may be had by reference to embodiments, some of which are illustrated in the appended drawings. It is to be noted, however, that the appended drawings illustrate only typical embodiments of this invention and are therefore not to be considered limiting of its scope, for the invention may admit to other equally effective embodiments.

[0011] FIG. **1** depicts a tubing string having multiple couplings were each coupling incorporates an inflow control device.

[0012] FIG. **2** depicts a coupling having a tubular threaded into each end thereof where the coupling includes an inflow control device.

[0013] FIG. **3** depicts an end view of the coupling including an inflow control device.

[0014] FIG. **4** depicts a portion of a coupling with a closeup view of an inflow control device prior to actuation.

[0015] FIG. **5** depicts a portion of a coupling with a closeup view of an inflow control device where pressure is being exerted upon the piston from the interior of the tubular thereby shearing the shear pin.

[0016] FIG. **6** depicts a portion of a coupling with a closeup view of an inflow control device after pressure from the interior of the tubular has been relieved allowing the bias device to remove the piston from the housing throughbore.

[0017] FIG. **7** depicts a portion of a coupling with a closeup view of an alternative inflow control device prior to actuation.

[0018] FIG. **8** depicts a portion of a coupling with a closeup view of an alternative inflow control device after pressure has been exerted upon the rupture disk from the interior of the tubular and the same fluid has passed through the holes in the support disc to remove the sealing disk from the through bore of the housing.

[0019] FIG. **9** depicts a portion of a coupling with a closeup view of another alternative inflow control device prior to actuation.

[0020] FIG. **10** depicts a portion of a coupling with a closeup view of another alternative inflow control device after sufficient pressure has been applied from the interior of the tubing to shear the shear pin and allow the piston to contact the primer.

[0021] FIG. **11** depicts a portion of a coupling with a closeup view of another alternative inflow control device after the explosive charges detonated thereby removing the charge seal and the piston from the housing through bore.

DETAILED DESCRIPTION

[0022] As depicted in FIG. **1** an inflow control device **118** has been designed for use with a liner string completion in a deviated or horizontal application. Individual tubular joints of liner are joined using a threaded coupling **112**. A first hole **116** has been drilled into the wall of the coupling **112** which houses the inflow control device **118**.

[0023] As depicted in FIGS. **2** and **3** a second hole **120** is drilled through the wall of the coupling **112** which intersects the first hole **116** such that it permits communication of fluids between the tubing and annulus of the liner string. In certain instances, the first hole may be drilled in to the coupling such that the first hole allows for fluid communication between the exterior of the coupling to the interior of the coupling through the first hole. In one embodiment, an inflow control device is placed into the hole to moderate the fluid flow through the hole between the interior of the coupling and the exterior of the coupling.

[0024] The inflow control device **118** is placed inside the first hole **116**, and once installed, creates a pressure barrier between the tubing **110** and coupling **112** assembly and the annular area **113** exterior of the tubing **110** and coupling **112** assembly while still sensing pressure from both the tubing interior **115** and the annular area **113**. The inflow control device **118** typically is capable of withstanding cyclical, hydrostatic annular area pressure or the application of high pressure in the tubing interior **115**. Typically, such pressure cycles may be 3000 psi hydrostatic annular area **113** pressure or 3000 psi tubing interior **115** pressure for five cycles. The application of pressure in excess of the normally expected pressure should cause the inflow control device **118** to actuate, allowing at least some fluid communication between the tubing interior **115** and the annular area **113**. Typically, such excess pressure may be about 3,700 psi-5, 000 psi before the tubing pressure causes the device to actuate, allowing fluid communication between tubing and annulus. Once actuated the inflow control device **118** creates a user-selectable orifice for flow restriction, which can be changed at any time prior to run-in. Typically, the user selectable orifice may be between 4-6 millimeters.

[0025] Typically, the coupling **112** is a standard casing coupling. The first hole is typically formed by drilling, milling, casting or any other means known in the art. The typical coupling **112** shown in FIG. **2** has a first box end **122**, a second box end **124**, and a center **121**. A first tubing **110** has a first pin end **126** that is threadedly attached to the first box end **122** of the coupling **112**. A second tubing **130** has a second pin end **132** that is threadedly attached to the second box end **124** of the coupling **112**. Between the first box end **122** and the second box end **124** the coupling **112** typically has a region **134** that has about the same wall thickness D1 as the wall thickness D2 as the tubings **110** and **130**. The first hole **112** is typically formed in the coupling **112** in the region **134**.

[0026] FIGS. **4-6** depict an embodiment of an inflow control device **118** in coupling **112**. A first hole **116** is formed in the region **134** of the coupling **112**. In certain instances, the first hole **116** may be cut full bore or partial bore through the coupling **112** with a plug inserted from the opposing end to plug at least a portion of the bore and in many instances may provide an anchor for the spring **314**, such as a second female thread **218** or a ferrule. The first hole **116** typically consists of a first female thread **210**, an angled shoulder **212**, a hone bore **214**, a hone relief bore **216**, and a second female thread **218**. A second hole **120** has been cut through the wall of the coupling **112** such that it intersects the first hole **116** to permit fluid communication between the tubing interior **115** and annular area **113**.

[0027] A piston **310** with a seal **312** is placed in the hone bore **214** of the first hole **116** such that it creates a pressure barrier between tubing interior **115** and annular area **113**. The front face **330** of piston **310** has a bore **332** having a female thread. A spring **314** may be threadedly attached to the bore **332** of the piston **310**. In the first state, depicted in FIG. **4**, the spring **314** is extended and exerts an axial force on the piston **310** as depicted by arrow **334**. There is a radial hole **316** through the piston **310**. Towards the annular area **113** adjacent to piston **310**, a shear sleeve **318** is mated against the angled shoulder **212**. The shear sleeve **318** has a radial hole **320** through its wall which aligns with the radial hole **316** in the piston **310**. A shear pin **322** is placed through the mating holes **316** and **320**. Towards the annular area **113** adjacent to shear sleeve **318**, a flow nozzle **324** with a male thread is threaded into the female thread **210**. The flow nozzle **324** may have an internal diameter sized to restrict fluid flow between the tubing interior **115** and annular area **113** of the well to a desired rate. This internal diameter can be adjusted based on the requirements of a specific well environment. An erodible and/or dissolvable metering disk **326** may reside in the internal diameter of the flow nozzle **324**. The metering disk **326** may have one or more holes through it to permit fluid communication between the tubing interior **115** and annular area **113**. The flow nozzle **324** is threaded into the first hole **116** such that it is adjacent to shear sleeve **316**. The flow nozzle **324** locks all internal parts in place within the coupling **112**. Various sizes of flow nozzles **324** can be used, and can be interchanged at any time without affecting operation of the device **118**, without requiring disassembly of the device **118**, and without the need for specialized tooling.

[0028] Pressure applied to the annular area **113** of the well acts on the piston **310** creating an axial force in the direction of arrow **334** on piston **310** which tends to shear the shear pin **320**. The shear pin **320** is sized such that it can withstand constant applied pressure from the annular area **113** without actuating the inflow control device **118**. Typically, the shear pin is sized such that it can withstand about 3,000 psi constant applied pressure from the annular area **113** without actuating the inflow control device **118**.

[0029] FIG. **5** depicts an intermediate position of the inflow control device **118** where pressure applied to the tubing interior **115** acts on the front face **330** of piston **310**. This pressure creates an axial force on the piston **310** in the direction of arrow **336** which tends to shear the shear pin **320**. The shear pin **320** is sized such that it can withstand about 3,000 psi applied pressure from the tubing interior **115** five times without being sheared. However, when higher pressure, typically between 3,700 and 5,000 psi, is applied to the tubing, the shear pin **320** shears, allowing the piston **310** to travel outward while maintaining a seal in its hone bore **214**. The piston **310** travels outward until it shoulders against the shear sleeve **316**. In this condition, the inflow control device **118** continues to maintain the seal between the tubing interior **115** and the annular area **113** as long as tubing pressure is maintained. Decreasing pressure in the tubing interior **115** causes a decreasing outward force in the direction of arrow **336** on the piston **310**, allowing the spring **314** to pull, as indicated by arrow **337**, the piston **310** away from the annular area **115** until the seal **312** is past the end of the hone bore **214** and is inside the hone relief bore **216**. At this point, fluid communication is achieved between the tubing interior **115** and annular area **113**.

[0030] As depicted in FIG. **5**, the spring **314** continues to pull the piston **310** inward until the spring reaches its relaxed state. At this point, the piston **310** is far enough away from the annular area **113** that full flow capacity is achieved between the tubing interior **115** and annular area **113**, with the flow nozzle **324** acting as the primary restriction in the system. Once fluid begins to flow across the metering disk **326**, the metering disk **326** may begin to erode and/or dissolve. Because of the flow restriction created by the small holes **338** in the metering disk **326**, prior to the metering disk **326** eroding or dissolving away, it may be possible to build pressure inside the tubing even if a number of devices **118** in the completion string have opened and are communicating fluid between the tubing interior **115** and the and annular area **113**. Thereby allowing the operator to develop sufficient pressure in the tubing interior **115** to ensure that all inflow control devices **118** in the well are actuated prior to full flow being established between the tubing interior **115** and annular area **113**. Typically, the metering disks **326** each erode and/or dissolve over a short period of time as a result of production through the completion string, leaving the flow nozzles **324** as the primary flow restrictions in the completion string.

[0031] FIGS. **7** and **8** depict an alternate embodiment of an inflow control device **417**. A port **410** placed in the wall of the coupling **112** consists of a hone bore **412**, a female thread **444**, an angled sealing shoulder **416**, and a hole for fluid communication **418**. A slot **420** has been cut through the wall of the coupling **112** such that it intersects the port **410** to permit fluid communication between the tubing interior **440** and annular area **442**.

[0032] A housing **422** with a seal **424** and a male thread **446** is inserted into the port **410** in the coupling **112** such that it threads into a female thread **444** in the coupling **112**, and its seal **420** resides in the hone bore **412**. The housing **422** is threaded in and tightened until a metal-to-metal pressure seal is achieved between an angled nose of the housing **426** and the angled sealing shoulder **416**. The housing **422** has an integral rupture device **428**. A small erodible and/or dissolvable metering disk **430** has been press-fit into the end of the housing **422** nearest to the annular area **442**. The metering disk **430** may have one or more holes such as holes **450**, **452**, and **454** through its thickness to permit fluid communication between the tubing interior **440** and annular area **442**. A sealing disk **432** is placed inside the housing **410** adjacent to the metering disk **430**. The sealing disk **432**, housing **422**, and seal **424**, isolate pressure in the annular area **442** from the rupture device **428** and metering disk **430**. Behind the sealing disk **432**, a flow nozzle **434** with a male thread is threaded into the female thread **414** inside the housing **422**. The flow nozzle **434** is tightened into the housing **422** such that the flow nozzle **434** creates a seal between itself and the sealing disk **432**, as well as between the sealing disk **432** and a shoulder **436** inside the housing **422**. The flow nozzle **434** has a specific internal diameter sized to restrict fluid flow between the tubing interior **440** and annular area **442** of the well to a desired rate. This internal diameter can be adjusted based on the requirements of a specific well environment. Various sizes of flow nozzles **434** can be used, and can be interchanged at any time without affecting operation of the device **118** and typically without the need for specialized tooling.

[0033] Pressure in the annular area **442** typically does not affect the inflow control device **118**, as the rupture device **428** does not sense pressure from the annular area **442**. The sealing disk **432** is supported by the metering disk **430**, which allows the sealing disk **432** to seal pressure in the annular area **442** without yielding. Therefore, pressure can be applied to the annular area **442** as needed without actuating the inflow control device **118**.

[0034] Pressure applied to the tubing interior **440** acts on the side of the rupture device **428** that is exposed to the tubing interior **440**. The rupture device **428** is typically sized such that a designated pressure may be applied to the tubing over many cycles without affecting the rupture disk **428**. However, when a pressure in excess of the designated pressure is applied, the rupture disk **428** ruptures in a controlled and predictable manner.

[0035] As depicted in FIG. **8**, once the pressure limit of the rupture disk **428** is reached, the rupture disk **428** ruptures, allowing fluid to flow through the metering disk **430**. The fluid communication holes **450**, **452**, and **454** in the metering disk **430** permit fluid from the tubing interior **440** to apply pressure to the sealing disk **432**, which is not supported towards the annular area **442**. Therefore, the sealing disk **432** breaks or otherwise be removed as pressure is applied from the tubing interior **442** establishing fluid communication between the tubing interior **440** and annular area **442**.

[0036] Typically, the metering disk **430** is made of an erodible and/or dissolvable material such as polyglycolic acid. Fluid flow in either direction across the metering disk **430** tends to erode and/or dissolve the metering disk **430** at a predictable rate. Prior to the metering disk **430** eroding and/or dissolving, pressure can still be built up in the tubing interior **440** because of the temporary flow restriction created by the small holes **450**, **452**, and **454** in the metering disk **430**, allowing the operator to develop sufficient pressure in the tubing interior **440** to ensure that all inflow control devices **118** in the completion string may be actuated prior to full flow being established between the tubing and annulus. The metering disks **430** then erode over a time as a result of production through the completion string, leaving the flow nozzle **434** as the primary flow restriction in the completion string.

[0037] Typically, the rupture disk **428** is sized such that 3,000 psi may be applied to the tubing interior **440** about five times. The rupture disk **428** ruptures in a controlled and predictable manner when between 3,700 and 5,000 psi is applied to the tubing interior **440**.

[0038] An alternate embodiment is depicted in FIGS. **9-11**. A port **510** formed in the wall of the coupling **112** consists of a female thread **512**, a bore **514** with a seal groove **516**, an angled shoulder **518**, and a hone bore **520**. A slot **522** has been cut through the wall of the coupling **112** such that it intersects the port **510** to permit fluid communication between the tubing interior **550** and annular area **552**.

[0039] A housing **524** with a male thread **513** is threaded into the female thread **512** in the port **510** until the angled shoulder **526** on the housing **524** mates against the angled shoulder **518**. A seal is created between the outer diameter of the housing **524** and a housing seal **528** that resides in the seal groove **516**. A first radial hole **530** has been drilled through the housing **524**. A piston **532** with a piston seal **534** is located inside the hone bore **520**. A second radial hole **536** has been drilled through the end of the piston **532**. The piston **532** is located such that the second radial hole **536** is aligned with the first radial hole **530**. A shear pin **538** is inserted through first radial hole **530** and second radial hole **536**, locking the piston **532** and housing **524** together. An explosive charge **540**, such as a shaped charge, with an integral primer **542** is inside the housing **524** such that the primer **542** faces the piston **532**. A charge seal **544** is located behind the explosive charge **540**. The charge seal **544** forms a seal inside the inner diameter of the housing **524**. The piston **532** has a small protrusion **546** on its outer face that is designed to engage the primer **542** on the explosive charge **540**.

[0040] Pressure applied to the annular area **552** of the well does not affect the inflow control device, as the housing seal **528** and charge seal **544** create pressure barriers inside the port **510**. Therefore, pressure can be applied to the annular area **552** without actuating the inflow control device.

[0041] Pressure applied to the tubing interior **550** of the well acts upon the piston **532**. This pressure creates a force on the piston **532**, in the direction of arrow **554**, which tends to shear the shear pin **538**. The shear pin **538** is sized such that it can withstand pressure applied from the tubing interior **550** over several cycles without being sheared.

Typically, the shear pin **538** is sized such that it can withstand about 3,000 psi applied pressure from the tubing interior **550** about five times without shearing. However, when higher pressure is applied to the tubing, the shear pin **538** shears, allowing the piston **532** to travel outward while maintaining a seal in the hone bore **520**. Typically, the shear pin **538** shears when pressure between 3,700 and 5,000 psi is applied to the tubing interior **550**. The piston **532** travels outward until the protrusion **546** contacts the primer **542** on the explosive charge **540**. When the protrusion **546** contacts the primer **542**, it ignites the explosive charge **540**, which applies pressure to create a hole through the piston **532**, as well as eliminate the charge seal **544**. At this point, fluid communication between the tubing an annulus is achieved, with the inner diameter of the housing **524** functioning as the primary flow restriction in the completion string.

[0042] Bottom, lower, or downward denotes the end of the well or device away from the surface, including movement away from the surface. Top, upwards, raised, or higher denotes the end of the well or the device towards the surface, including movement towards the surface. While the embodiments are described with reference to various implementations and exploitations, it is understood that these embodiments are illustrative and that the scope of the inventive subject matter is not limited to them. Many variations, modifications, additions and improvements are possible.

[0043] Plural instances may be provided for components, operations or structures described herein as a single instance. In general, structures and functionality presented as separate components in the exemplary configurations may be implemented as a combined structure or component. Similarly, structures and functionality presented as a single component may be implemented as separate components. These and other variations, modifications, additions, and improvements may fall within the scope of the inventive subject matter.

What is claimed is:

1. A downhole device comprising:
a tubular having, a center, an exterior region and an interior region;
a flowpath connecting the exterior region to the interior region;
a housing in the flowpath;
wherein the housing has a throughbore;
an erodible disk;
a sealing disk;
wherein the erodible disk supports the sealing disk preventing a first fluid flow from the exterior region to the interior region; and
a rupture disk preventing a second fluid flow from the interior region from reaching the erodible disk below a predetermined pressure.

2. The downhole device of claim **1**, wherein the erodible disk has fluid ports aligned with the flowpath.

3. The downhole device of claim **1**, wherein the throughbore has a nozzle aligned with the flowpath.

4. The downhole device of claim **1**, wherein the throughbore is a nozzle aligned with the flowpath.

5. The downhole device of claim **1**, wherein the second fluid flow from the interior region removes the sealing disk to allow the second fluid flow to reach the exterior region.

6. The downhole device of claim **1**, wherein the erodible disk is polyglycolic acid.

7. The downhole device of claim **1**, wherein the throughbore is generally perpendicular to the fluid flow through the tubular.

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