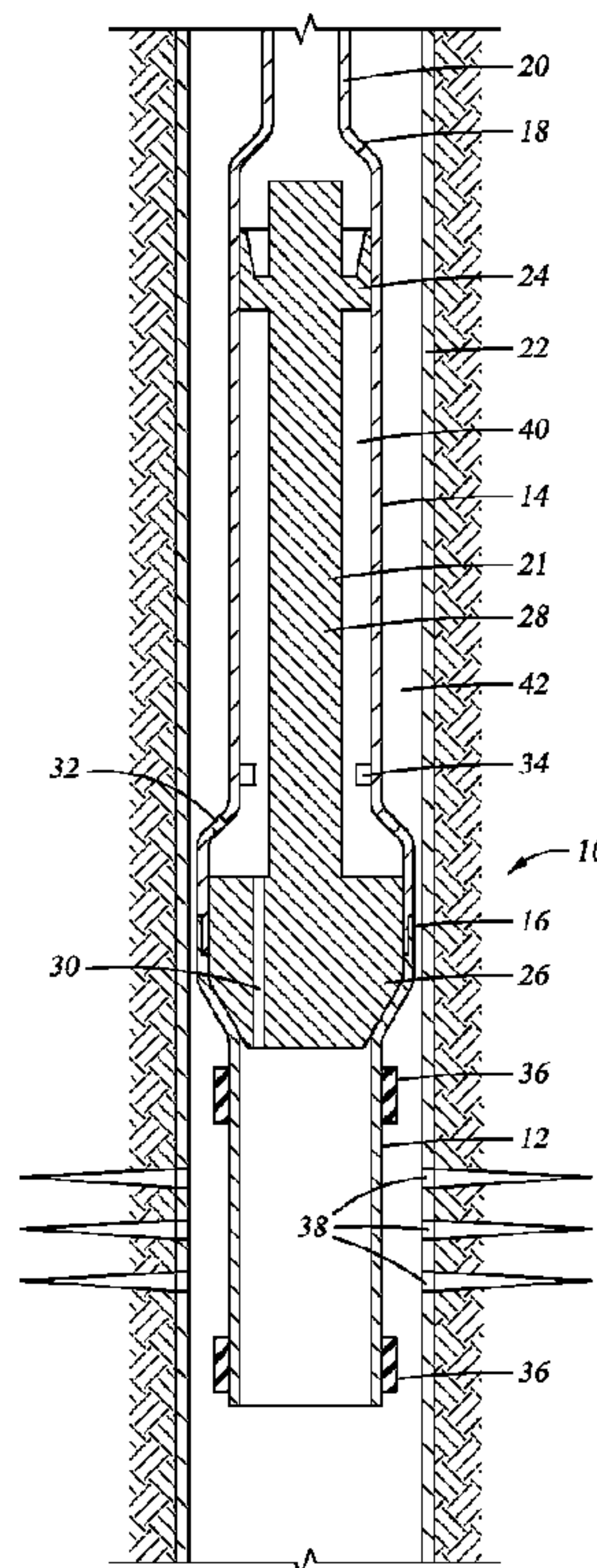




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(54) Titre : **PIECE RAPPORTEE EXTENSIBLE POUR BOITIER**
(54) Title: **EXPANDABLE CASING PATCH**



(57) **Abrégé/Abstract:**

A system comprising a housing having an upper end in fluid communication with a source of pressurized fluid and a lower end releasably coupled to an expandable tubular. A piston is disposed within and sealingly engaged with the housing. An expansion cone is coupled to the piston and is operable to radially expand the expandable tubular as it moves longitudinally therethrough. A pressure chamber is disposed within the housing and defined by the piston and the expansion cone. A first pressure relief port is disposed within the housing and is operable to allow fluid communication between the pressure chamber and an annulus external to the housing. A second pressure relief port is disposed within the expansion cone and is operable to allow fluid communication between the pressure chamber and a portion of the expandable tubular below the expansion cone.

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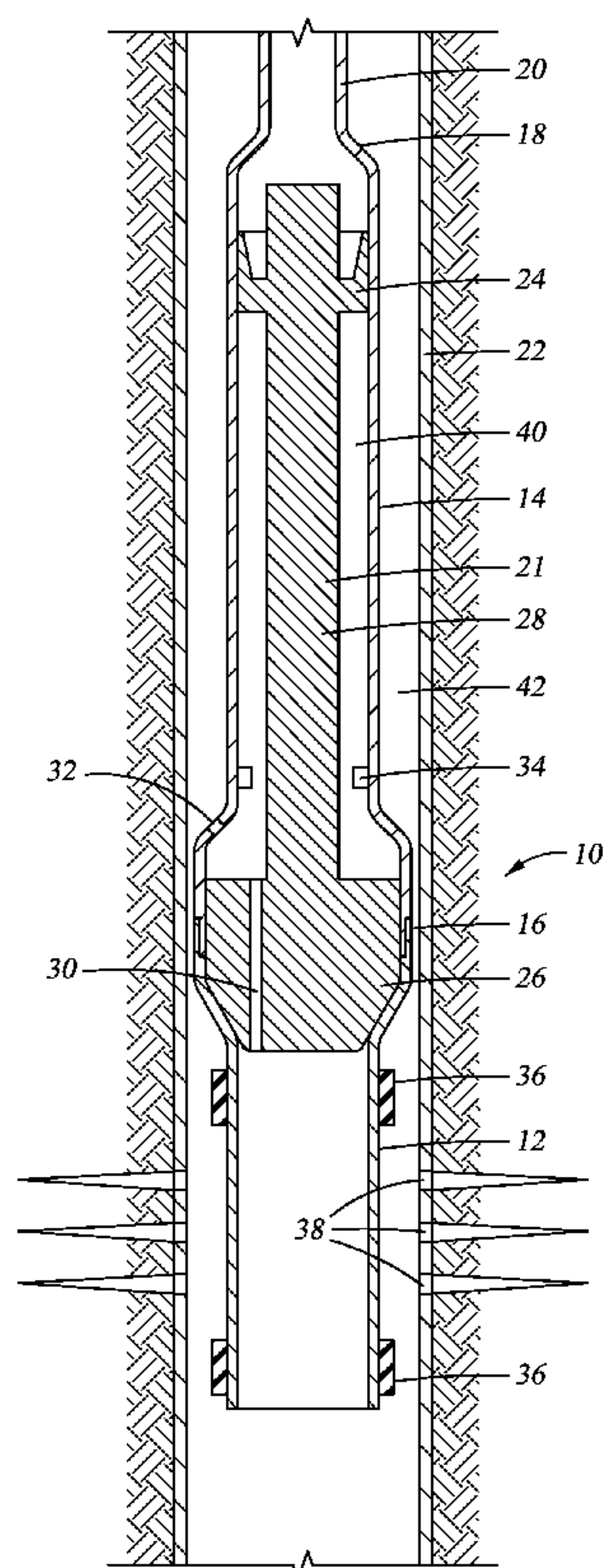
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(54) Title: EXPANDABLE CASING PATCH

Fig. 1



(57) Abstract: A system comprising a housing having an upper end in fluid communication with a source of pressurized fluid and a lower end releasably coupled to an expandable tubular. A piston is disposed within and sealingly engaged with the housing. An expansion cone is coupled to the piston and is operable to radially expand the expandable tubular as it moves longitudinally therethrough. A pressure chamber is disposed within the housing and defined by the piston and the expansion cone. A first pressure relief port is disposed within the housing and is operable to allow fluid communication between the pressure chamber and an annulus external to the housing. A second pressure relief port is disposed within the expansion cone and is operable to allow fluid communication between the pressure chamber and a portion of the expandable tubular below the expansion cone.

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EXPANDABLE CASING PATCH

[0001]

BACKGROUND

[0002] This disclosure relates generally to the construction, maintenance, and repair of wellbore tubular strings to facilitate hydrocarbon production or downhole fluid injection.

[0003] When an opening is formed in the sidewalls of an existing wellbore casing, whether through damage to the casing or because of an intentional perforation of the casing, it is often necessary to repair the opening in the existing wellbore casing. Conventional methods of repairing such openings can create unacceptable restrictions in the wellbore or fail to provide the necessary performance requirements once they are installed.

[0004] The principles of the present disclosure are directed to overcoming one or more of the limitations of the existing apparatus and processes for repairing openings in existing casing.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] For a more detailed description of the embodiments of the present disclosure, reference will now be made to the accompanying drawings, wherein:

[0006] Figure 1 is a schematic, partial section view of one embodiment of a system for repairing casing shown in an initial position;

[0007] Figure 2 is the system of Figure 1 shown in an expanded position;

[0008] Figure 3 illustrates the wellbore as repaired by the system of Figure 1;

[0009] Figure 4 is a schematic, partial section view of an alternative embodiment of a system for repairing casing shown in an initial position; and

[0010] Figure 5 is the system of Figure 4 shown in an expanded position.

DETAILED DESCRIPTION

[0011] In the drawings and description that follow, like parts are typically marked throughout the specification and drawings with the same reference numerals. The drawing figures are not necessarily

to scale. Certain features of the invention may be shown exaggerated in scale or in somewhat schematic form and some details of conventional elements may not be shown in the interest of clarity and conciseness. The present disclosure is susceptible to embodiments of different forms. Specific embodiments are described in detail and are shown in the drawings, with the understanding that the present disclosure is to be considered an exemplification of the principles of the invention, and is not intended to limit the invention to that illustrated and described herein. It is to be fully recognized that the different teachings of the embodiments discussed below may be employed separately or in any suitable combination to produce desired results.

[0012] Unless otherwise specified, any use of any form of the terms “connect”, “engage”, “couple”, “attach”, or any other term describing an interaction between elements is not meant to limit the interaction to direct interaction between the elements and may also include indirect interaction between the elements described. In the following discussion and in the claims, the terms “including” and “comprising” are used in an open-ended fashion, and thus should be interpreted to mean “including, but not limited to ...”. The terms “pipe,” “tubular member,” “casing” and the like as used herein shall include tubing and other generally cylindrical objects. In addition, in the discussion and claims that follow, it may be sometimes stated that certain components or elements are in fluid communication. By this it is meant that the components are constructed and interrelated such that a fluid could be communicated between them, as via a passageway, tube, or conduit. The various characteristics mentioned above, as well as other features and characteristics described in more detail below, will be readily apparent to those skilled in the art upon reading the following detailed description of the embodiments, and by referring to the accompanying drawings.

[0013] Referring initially to Figure 1, casing repair system 10 comprises an expandable tubular 12 coupled to a housing 14 by a releasable connection 16. Housing 14 has an upper end 18 that is coupled to a fluid conduit 20 that supplies pressurized fluid to system 10. Fluid conduit 20 may be a drill pipe, coiled tubing, wireline-run pump, or other system operable to support system 10 within the wellbore casing 22 and provide pressurized fluid to the system. Expandable tubular 12 includes sealing members 36 that are operable to sealingly engage wellbore casing 22 after the tubular is expanded.

[0014] Patch system 10 also comprises expansion assembly 21 comprising piston 24, expansion cone 26, and mandrel 28. Piston 24 is disposed within and sealingly engaged with housing 14. Piston 24 is coupled to cone 26 by mandrel 28. Cone 26 is disposed partially within expandable tubular 12 and is operable to radially expand tubular 12 as the cone moves longitudinally therethrough. Cone 26 has a pressure relief port 30 that allows fluid communication across the cone. Housing 14 also

includes a pressure relief port 32 that provides fluid communication across the housing and mandrel stop 34 that limits the movement of mandrel 28 relative to the housing.

[0015] In operation, system 10 is lowered into wellbore casing 22 until sealing members 36 are located on either side of casing penetrations 38. Once in the desired location, fluid conduit 20 supplies pressurized fluid to the upper end 18 of housing 14. The pressurized fluid applied to piston 24 causes the piston, mandrel 28, and expansion cone 26 to move longitudinally relative to housing 14. This motion causes expansion cone 26 to move longitudinally through expandable tubular 12, which causes the tubular to be radially expanded.

[0016] As piston 24 moves through housing 14, fluid within pressure chamber 40, defined by the piston and expansion cone 26, is expelled through relief port 32 into annulus 42. Pressure relief port 30 allows fluid trapped below expandable tubular 12 to flow into pressure chamber 40 and out into annulus 44 through relief port 32. As expansion cone 26 moves longitudinally through and radially expands expandable tubular 12, sealing members 36 are also radially expanded into sealing engagement with wellbore casing 22.

[0017] Referring now to Figure 2, expansion cone 26 has fully expanded expandable tubular 12. The motion of expansion cone 26 is stopped when piston 24 reaches mandrel stop 34. Sealing members 36 are engaged with wellbore casing 22, hydraulically isolating casing penetrations 38 from the wellbore. Once, expandable tubular 12 has been fully expanded releasable connection 16 can be disconnected, such as by rotating housing 14 relative to tubular 12. Disconnecting releasable connection 16 allows expandable tubular 12 to separate from housing 14. Housing 14, along with piston 24, expansion cone 26, and mandrel 28 can be retrieved from the wellbore, leaving expandable tubular in place, as is shown in Figure 3.

[0018] Referring now to Figures 4 and 5, casing repair system 50 comprises an expandable tubular 52 coupled to a housing 54 by a releasable connection 56. Housing 54 has an upper end 58 that is coupled to a fluid conduit 60 that supplies pressurized fluid to system 50. System 50 also comprises an expansion assembly 62 including a piston 64, mandrel 66, connection latch 68, and expansion cone 70. Connection latch 68 is operable to engage releasable connection 56 and disengage expandable tubular 52 from housing 54 once the connection latch is disposed adjacent to the releasable connection, as is shown in Figure 5.

[0019] In operation, casing repair system 50 is positioned in wellbore 72 using drillpipe, coiled tubing, wireline, or other conveyance devices as are known in the art. Casing repair system 50 may be positioned in wellbore 72 so that seal members 74 are disposed on either side of casing penetrations

76. Once in system 50 is in position, pressurized fluid is supplied to housing 54 by conduit 60. The pressurized fluid can be supplied by pumps at the surface or by a pump run into the wellbore.

[0020] The pressurized fluid in housing 54 causes piston 64, mandrel 66, latch 68, and expansion cone 70 to move longitudinally relative to housing 54. This motion causes expansion cone 70 to move longitudinally through and radially expand expandable tubular 52. As piston 64 moves through housing 54, fluid within pressure chamber 78, defined by the piston and expansion cone 70, is expelled through relief port 80 into annulus 82. Pressure relief port 84 allows fluid trapped below expandable tubular 52 to flow into pressure chamber 78 and out into annulus 82 through relief port 80. As expansion cone 70 moves longitudinally through and radially expands expandable tubular 52, sealing members 74 are also radially expanded into sealing engagement with wellbore casing 86, as is shown in Figure 5.

[0021] Referring still to Figure 5, expansion cone 70 has fully expanded expandable tubular 52. The motion of expansion assembly 62 is stopped when piston 64 reaches mandrel stop 88. In certain embodiments, the engagement of connection latch 68 and releasable connection 54 may alternatively stop the motion of expansion assembly 62. Sealing members 74 are engaged with wellbore casing 86, hydraulically isolating casing penetrations 76 from the wellbore. Connection latch 68 engages releasable connection 56 and disconnects expandable tubular 52 from housing 54. Housing 54, along with expansion assembly 62 can be retrieved from the wellbore, leaving expandable tubular 52 in place.

[0022] While the disclosure is susceptible to various modifications and alternative forms, specific embodiments thereof are shown by way of example in the drawings and description. It should be understood, however, that the drawings and detailed description thereto are not intended to limit the disclosure to the particular form disclosed, but on the contrary, the intention is to cover all modifications, equivalents and alternatives falling within the spirit and scope of the present disclosure.

What is claimed is:

1. A system comprising:

- a housing having an upper end in fluid communication with a source of pressurized fluid;
- an expandable tubular releasably coupled to a lower end of said housing;
- a piston disposed within and sealingly engaged with said housing;
- an expansion cone coupled to said piston and operable to radially expand said expandable tubular as it moves longitudinally therethrough;
- a pressure chamber disposed within said housing and defined by said piston and said expansion cone;
- a first pressure relief port disposed within said housing and operable to allow fluid communication between said pressure chamber and an annulus external to said housing; and
- a second pressure relief port disposed within said expansion cone and operable to allow fluid communication between said pressure chamber and a portion of said expandable tubular below said expansion cone.

2. The system of claim 1 further comprising a mandrel coupled between said piston and said expansion cone.

3. The system of claim 2 further comprising a mandrel stop disposed within said housing and operable to limit longitudinal movement of said mandrel once said expandable tubular has been radially expanded.

4. The system of claim 1 further comprising a seal assembly coupled to an outer surface of said expandable tubular.

5. The system of claim 1 further comprising a connection latch coupled to said piston, wherein said connection latch is operable to release said expandable tubular from said housing.

6. The system of claim 1 wherein said housing is released from said expandable tubular by rotation of said housing relative to said expandable tubular.

7. A system comprising:
- an expandable tubular;
 - a housing coupled to said expandable tubular by a releasable connection;
 - a piston disposed within and sealingly engaged with said housing;
 - an expansion cone at least partially disposed within said expandable tubular and coupled to said piston by a mandrel;
 - a pressure chamber disposed within said housing and defined by said piston and said expansion cone;
 - a first pressure relief port disposed within said housing and operable to allow fluid communication between said pressure chamber and an annulus external to said housing; and
 - a second pressure relief port disposed within said expansion cone and operable to allow fluid communication between said pressure chamber and a portion of said expandable tubular below said expansion cone.
8. The system of claim 7 further comprising a mandrel stop disposed within said housing and operable to limit longitudinal movement of said mandrel once said expandable tubular has been radially expanded.
9. The system of claim 7 further comprising a connection latch coupled to said mandrel, wherein said connection latch is operable to engage the releasable connection and release said expandable tubular from said housing.
10. The system of claim 7 further comprising a seal assembly coupled to an outer surface of said expandable tubular.
11. The system of claim 7 further comprising a connection latch coupled to said piston, wherein said connection latch is operable to engage the releasable connection and release said expandable tubular from said housing.

12. The system of claim 7 wherein the releasable connection is released by rotation of said housing relative to said expandable tubular.

13. A method comprising:

constructing an expansion system by coupling an expandable tubular to a housing with a releasable coupling and disposing an expansion cone at least partially within the expandable tubular, wherein the expansion cone is coupled by a mandrel to a piston sealingly engaged with the housing;

disposing the expansion system in a wellbore;

applying a pressurized fluid to the piston so as to move the expansion cone longitudinally through the expandable tubular and radially expand the expandable tubular into engagement with the wellbore;

releasing the expandable tubular from the housing; and

retrieving the housing, the expansion cone, and the piston from the wellbore.

14. The method of claim 13 wherein the housing includes a first pressure relief port that provides fluid communication between an annulus external to the housing and a pressure chamber formed in the housing by the piston and the expansion cone, and wherein the expansion cone includes a second pressure relief port that provides fluid communication between the pressure chamber in the housing and a portion of the expandable tubular below the expansion cone.

15. The method of claim 13 further comprising stopping the longitudinal movement of the expansion cone once the expandable tubular is fully expanded.

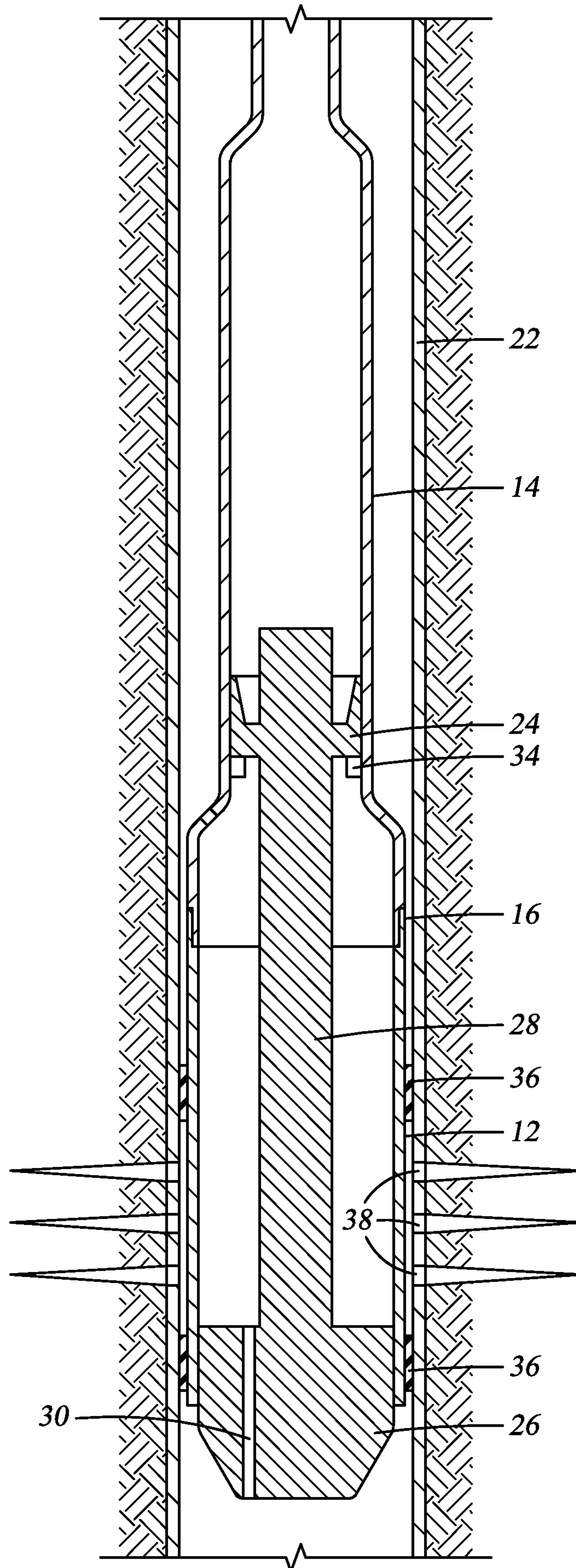
16. The method of claim 15 wherein the longitudinal movement of the expansion cone is stopped by the piston engaging a mandrel stop disposed within the housing.

17. The method of claim 15 wherein the longitudinal movement of the expansion cone is stopped when a connection latch coupled to the expansion cone engages the releasable coupling.

18. The method of claim 13 wherein the expandable tubular is released from the housing by rotating the housing relative to the expandable tubular.

19. The method of claim 13 wherein the expandable tubular is released from the housing by a connection latch engaging with the releasable coupling.

2/5

Fig. 2

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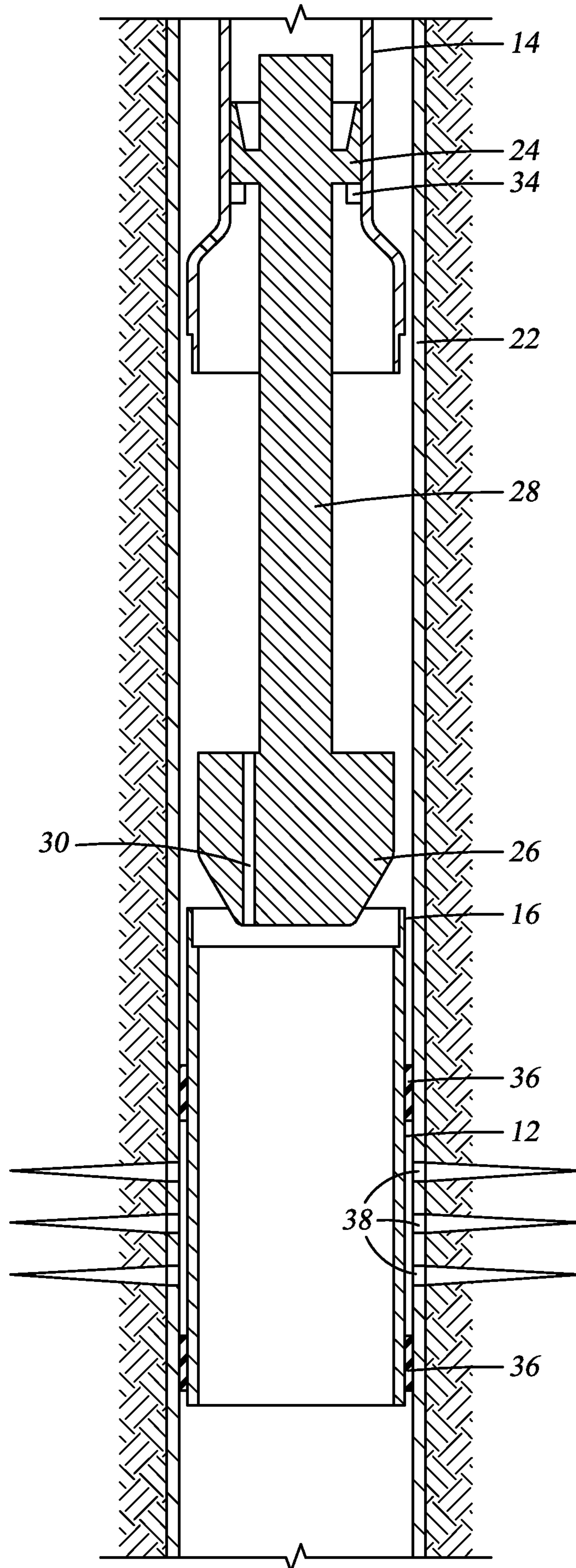
Fig. 3

Fig. 4

