

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets



(51) Publication number:

0 533 369 A1

(12)

EUROPEAN PATENT APPLICATION(21) Application number: **92307926.3**(51) Int. Cl.⁵: **E21B 21/10**(22) Date of filing: **01.09.92**(30) Priority: **16.09.91 US 760423**(43) Date of publication of application:
24.03.93 Bulletin 93/12(84) Designated Contracting States:
DE FR GB IT NL(71) Applicant: **HALLIBURTON COMPANY**
P.O. Drawer 1431
Duncan Oklahoma 73536(US)(72) Inventor: **Rogers, Henry E.**
Route 1, Box 279M
Duncan, Oklahoma 73533(US)
Inventor: **Butterfield II, Charles A.**
5220 Day Street
Duncan, Oklahoma 73533(US)(74) Representative: **Wain, Christopher Paul et al**
A.A. THORNTON & CO. Northumberland
House 303-306 High Holborn
London WC1V 7LE (GB)(54) **Temporarily held open casing filling valve.**

(57) An automatic device for allowing downhole floating equipment to fill with well fluid as it is lowered into a well. The device comprises a casing equipment housing (26) including a tubular section having an axial bore therethrough; a valve assembly (24) axially disposed in the axial bore of the tubular section, the valve assembly including a valve body (30) having a valve seat base therein; a guide spider above the valve seat base in the valve body and having a stem bolt bore therethrough; a valve poppet (32) having an upwardly-facing valve surface thereon disposed adjacent the valve seat base; a stem bolt (34) secured to the valve poppet and extending upwardly through the stem bolt bore in the guide spider; and a coil spring (36) disposed about the stem bolt biasing the valve poppet into engagement with the valve seat base; and means (48) for holding said valve poppet open, characterised by a cement sheath (28) surrounding the valve assembly and substantially filling the annular void between the valve assembly (24) and the wall of the bore of the tubular section; and wherein said holding means comprises an automatic self-filling mechanism located in the bottom of the casing equipment having a portion thereof (48) adapted to selectively engage a portion of the valve poppet (32) of the valve assembly to selectively hold the valve poppet open to allow fluids used in said well cementing operation to flow upwardly through said self-filling float device.

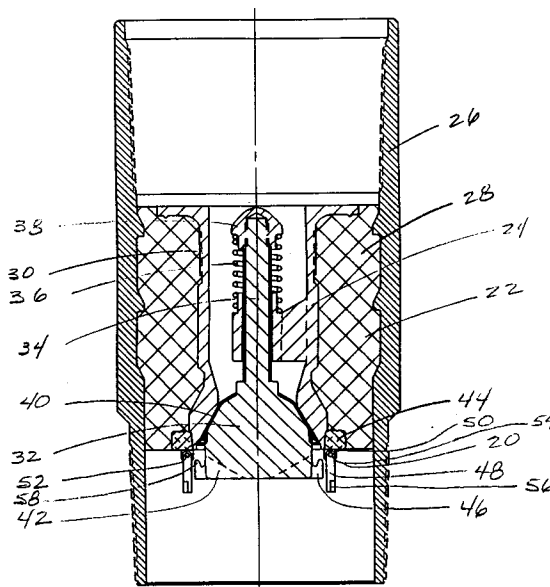


FIG. 2

EP 0 533 369 A1

This invention relates to an automatic self-filling device for floating equipment used in well cementing operations.

A number of different types of check valves are used in floating equipment employed in the cementing of casing in oil and gas wells. It is normally desired to maintain the check valves open in the floating equipment installed in the casing string being run into the well bore so that the casing can automatically fill with well fluids in the well bore from the bottom of the casing string. This results in a saving of time in comparison to manually filling the casing string from the surface as it is being run into the well bore.

One type of currently available self-filling floating equipment design uses some type of sacrificial mechanical part for maintaining the check valve in an initially open position, such as one or more shear plates, shear pins, extrusion rings, tension collars or the like. Examples of such self-filling floating equipment are shown in United States patent specifications nos. 2802482, 3385370, 3419040 and 3776250.

Another type of self-filling floating equipment design uses an indexing mechanism to maintain the check valve in an initially open position. An example of such an indexing type mechanism is shown in United States patent specifications nos. 3957114 and 4067358.

In a different type of floating equipment design, shown in United States patent specification no. 4,712,619, it is desirable to have an automatic self-filling mechanism. One way of providing the automatic self-filling feature is to have an elastomeric strap having lugs thereon which are used to initially hold the valve member open. However, this arrangement is not very satisfactory for a number of reasons.

We have now devised an improved self-filling float device which can operate automatically in well cementing operations. The automatic self-filling mechanism of the present invention preferably comprises an arm and ear adapter arrangement associated with the valve poppet of the floating equipment.

According to the present invention, there is provided a self-filling float device for use in a well bore cementing operation, said self-filling float device comprising a casing equipment housing including a tubular section having an axial bore therethrough; a valve assembly axially disposed in the axial bore of the tubular section, the valve assembly including a valve body having a valve seat base therein; a guide spider above the valve seat base in the valve body and having a stem bolt bore therethrough; a valve poppet having an upwardly-facing valve surface thereon disposed adjacent the valve seat base; a stem bolt secured to

the valve poppet and extending upwardly through the stem bolt bore in the guide spider; and a coil spring disposed about the stem bolt biasing the valve poppet into engagement with the valve seat base; and means for holding said valve poppet open, characterised by a cement sheath surrounding the valve assembly and substantially filling the annular void between the valve assembly and the wall of the bore of the tubular section; and wherein said holding means comprises an automatic self-filling mechanism located in the bottom of the casing equipment having a portion thereof adapted to selectively engage a portion of the valve poppet of the valve assembly to selectively hold the valve poppet open to allow fluids used in said well cementing operation to flow upwardly through said self-filling float device.

Preferably, the mechanism includes at least one ear located on the bottom of the valve poppet of the valve assembly; an adapter secured in the bottom of the casing equipment housing; and an auto-filling arm having a portion thereof secured to the adapter and having a portion thereof adapted to engage a portion of the ear on the bottom of the valve poppet.

In order that the invention may be more fully understood, reference is made to the accompanying drawings, wherein:

Fig. 1 is a cross-sectional view of a prior art floating equipment insert having a strap and lug automatic self-filling feature.

Fig. 2 is a cross-sectional view of a first embodiment of the present invention, given by way of example only.

Fig. 3. is a cross-sectional view of a second embodiment of the present invention, given by way of example only.

Referring to Fig. 1, the prior art insert assembly 10 is shown for floating equipment as described in United States patent specification no. 4712619. Also shown with the insert assembly 10 is a prior art automatic self-filling attachment 12 for the insert assembly 10.

The self-filling attachment 12 comprises an elastomeric strap having a pair of standoff lugs 14 formed on the ends thereof. The attachment 12 is secured to the bottom of the poppet valve 16 of the insert assembly 10 by means of adhesive bonding.

After securing the attachment 12 to the poppet valve 16, the poppet valve 16 is opened, the lugs 14 inserted between the valve 16 and valve seat 18, and the valve 16 is released so that the lugs 14 are trapped between the valve 16 and valve seat 18. In this manner, when a piece of floating equipment having the insert assembly 10 and attachment 12 thereon is installed in a casing string run into a well bore, since the poppet valve 16 is open, the casing string will automatically fill with fluids

from the well bore as it is run thereinto. To remove the lugs 14 from between the poppet valve 16 and valve seat 18 large volumes of fluid are pumped through the insert assembly 10 to force the poppet valve 16 open thereby releasing the lugs 14 to fall downwardly.

Referring to Fig. 2, the automatic self-filling mechanism 20 of a first embodiment of the present invention is shown installed on a piece of floating equipment 22.

The floating equipment 22 comprises a poppet valve assembly 24, short casing section or collar 26, and a cement filler material 28 which retains the poppet valve assembly 24 in the collar 26.

The poppet valve assembly 24 comprises a tubular valve body 30, valve poppet 32, stem bolt 34, valve spring 36, and valve spring retainer cap 38. The valve poppet 32 has an elastomeric covering 40 thereon to seal against a portion of the valve body 30. The valve poppet 32 is formed having a plurality of lugs 42 on the bottom thereof.

The automatic self-filling mechanism shown in Fig. 2 comprises an adapter 44, plurality of valve poppet ears 46 secured to the bottom of the valve poppet 32, and a plurality of auto-fill arms 48 secured to the adapter 44 at lugs 50 thereon by means of pins 52.

The valve poppet ears 46 may be integrally formed on the valve poppet 32 or may be separately formed and secured to the bottom of the valve poppet 32 by any suitable means, such as adhesive bonding.

The adapter 44 is secured to the valve body 30 and cement 28 to retain the adapter 44 in position on the body 30.

Each auto-fill arm 48 is formed having a hole 54 through one end therein and having a recess 56 in the other end thereof, in which, portion 58 of an ear 46 may be received therein.

Referring to Fig. 3, the automatic self-filling mechanism 120 of a second embodiment of the present invention is shown installed on a piece of floating equipment 122.

The floating equipment 122 comprises a poppet valve assembly 124, short casing section or collar 126, and a cement filler material 128 which retains the poppet valve assembly 124 in the collar 126.

The poppet valve assembly 124 comprises a tubular valve body 130, valve poppet 132, stem bolt 134, valve spring 136, and valve spring retainer cap 138. The valve poppet 132 has an elastomeric covering 140 thereon to seal against a portion of the valve body 130. The valve support 132 is formed having a plurality of lugs 142 on the bottom thereof.

The automatic self-filling mechanism shown in Fig. 3 comprises an elastomeric adapter 144, a

plurality of valve poppet ears 146 secured to the bottom of the valve poppet 132 and a plurality of auto-fill arms 148 secured to the adapter 144.

The adapter 144 is secured to the valve body 130 and cement to retain the adapter 144 in position on the body 130.

Each auto-fill arm 148 is formed having one end thereof secured to the adapter 144 and having at least one recess 150 in the other end thereof, in which, a portion 152 of an ear 146 may be received therein.

OPERATION OF THE INVENTION

Referring to Fig. 2, the automatic self-filling mechanism 20 is installed in a piece of floating equipment 22, a float collar. When the equipment 22 is installed in a string of casing (not shown), the valve poppet 32 will be held open by the auto-fill arms 48 engaging the poppet ears 46 on the valve poppet 32.

Since the valve poppet 32 is in the open position, as the string of casing is run into the well, fluid may flow through the piece of floating equipment 22 to fill the casing. When it is desired to close the valve poppet 32, fluid is pumped downwardly through the poppet valve assembly 24 of the floating equipment 22 at a rate sufficient to cause the valve poppet 32 to be forced open until the auto-fill arms 48 no longer engage the poppet ears 46 on the valve poppet 32. When pumping of the fluid ceases, the valve poppet 32 will close and seat on the valve body 30.

The operation of the automatic self-filling mechanism 120 shown in Fig. 3 is the same as that described with respect to Fig. 2 and the automatic self-filling mechanism 20.

Claims

1. A self-filling float device for use in a well bore cementing operation, said self-filling float device comprising a casing equipment housing (26,126) including a tubular section having an axial bore therethrough; a valve assembly (24,124) axially disposed in the axial bore of the tubular section, the valve assembly including a valve body (30,130) having a valve seat base therein; a guide spider above the valve seat base in the valve body and having a stem bolt bore therethrough; a valve poppet (32,132) having an upwardly-facing valve surface thereon disposed adjacent the valve seat base; a stem bolt (34,134) secured to the valve poppet and extending upwardly through the stem bolt bore in the guide spider; and a coil spring (36,136) disposed about the stem bolt biasing the valve poppet into engagement with the

valve seat base; and means (48,148) for holding said valve poppet open, characterised by a cement sheath (28,128) surrounding the valve assembly and substantially filling the annular void between the valve assembly (24,124) and the wall of the bore of the tubular section; and wherein said holding means comprises an automatic self-filling mechanism located in the bottom of the casing equipment having a portion thereof (48,148) adapted to selectively engage a portion of the valve poppet (32,132) of the valve assembly to selectively hold the valve poppet open to allow fluids used in said well cementing operation to flow upwardly through said self-filling float device.

5

10

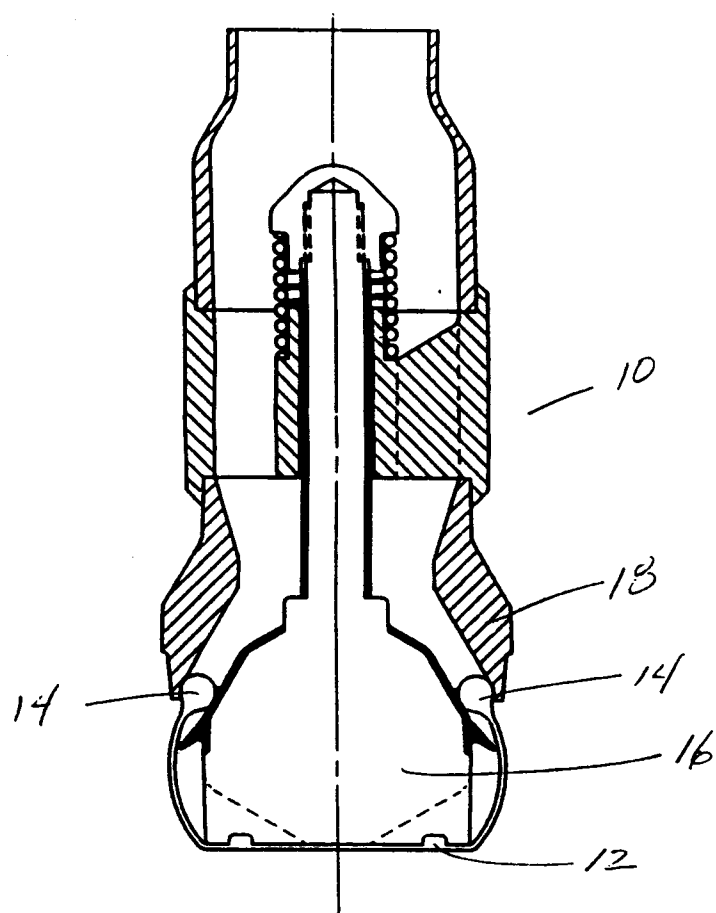
15

2. A device according to claim 1, wherein the automatic self-filling mechanism includes at least one ear (46,146) located on the bottom of the valve poppet (32,132) of the valve assembly; an adapter (44,144) secured in the bottom of the casing equipment housing; and an auto-filling arm (48,148) having a portion thereof secured to the adapter and having a portion thereof (56,156) adapted to engage a portion of the ear on the bottom of the valve poppet. 20
3. A device according to claim 2, wherein said ear (46,146) is integrally formed on the valve poppet (32,132) of the valve assembly. 25
4. A device according to claim 2, wherein said ear (46,146) is fastened on the valve poppet (32,132) of the valve assembly. 30
5. A device according to claim 2, wherein the adapter (44,144) is formed having a lug (50) thereon having a hole therein. 35
6. A device according to claim 5, wherein said auto-filling arm (48,148) has a hole in one end thereof and a recess (56,156) in the other end to receive a portion of the (46,146) ear therein. 40
7. A device according to claim 6, wherein the ear (46,146) of the automatic self-filling mechanism is formed having a portion thereof adapted to be received in the recess (56,156) of the auto-filling arm (48,148). 45
8. A device according to claim 7, wherein the auto-filling arm (48,148) is secured to the adapter (44,144) by means of a pin (52) engaging a portion of the hole in the auto-filling arm and engaging a portion of the hole in the lug (50) on the adapter (44, 144). 50

55

9. A device according to claim 2, wherein the auto-filling arm (48,148) is formed having a recess (56,156) in one end thereof to receive a portion of the ear (46,146) therein.

10. A device according to claim 9, wherein the ear (46,146) of the automatic self-filling mechanism is formed having a portion (58) thereof adapted to be received in the recess (56,156) of the auto-filling arm (48,148).



PRIOR ART

FIG. 1

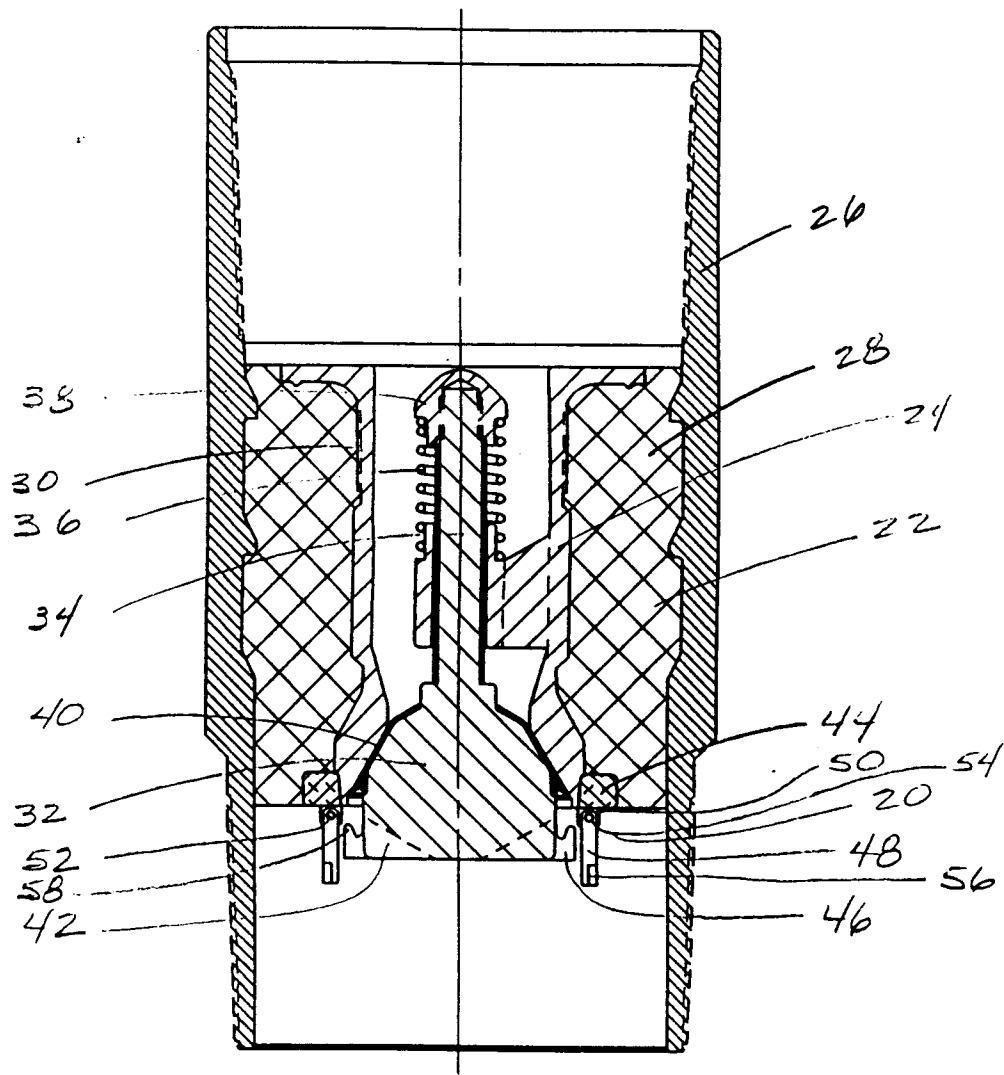


FIG. 2

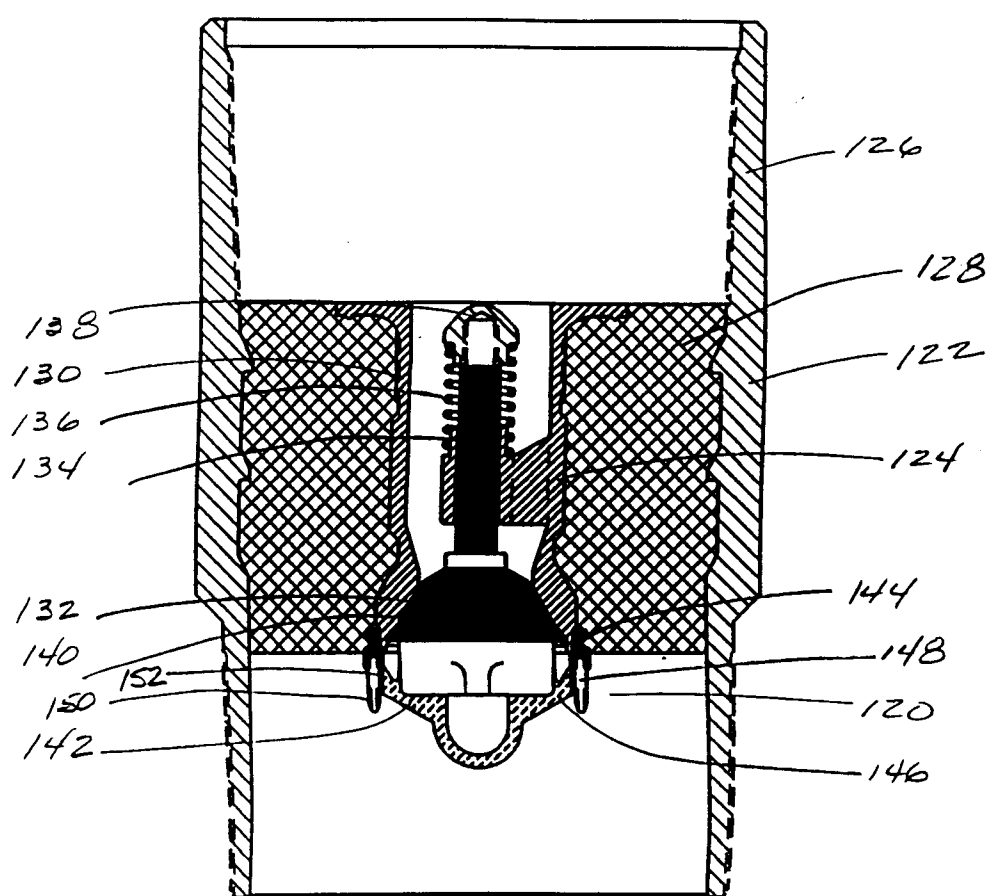


FIG. 3



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 30 7926

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	US-A-1 811 885 (HILL) * page 1, line 58 - line 85; figure 1 * ---	1	E21B21/10
A,D	US-A-4 712 619 (STEPP ET AL.) * column 1, line 65 - column 2, line 22; figure 1 * ---	1	
A,D	US-A-3 419 040 (THIBODEAUX) * column 1, line 63 - column 2, line 36; figures * -----	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			E21B F16K
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 07 DECEMBER 1992	Examiner LINGUA D.G.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document	