Cementing Device for Well Casings

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9 Claims. (Cl. 166—1)

This invention relates to well devices, and particularly to equipment useful in cementing casings and liners in oil and similar wells.

It is the principal object of the present invention to provide an improved cementing device for well casings and other tubular members employed in wells, embodying a simple and efficient valve mechanism for controlling the discharge of fluids laterally from the casing, while positively preventing their return flow.

In the preferred application of the invention, the device is adapted to form part of a well casing string, controlling the ejection of cement laterally through the casing into the annular space intervening between it and the walls of the well bore. In its general aspects, the invention contemplates a casing member having lateral ports normally closed by a rubber or other elastic sleeve. This sleeve is confined within an annular chamber, and is adapted to contract so as to fill the entire volume of this chamber and snugly embrace the casing section through which the ports extend; thus positively preventing passage of fluid through these ports in one direction. However, the application of pressure to the fluid causes it to elongate the rubber sleeve and force the latter away from the ports to allow fluid passage or ejection through the casing section. The release of this pressure allows the sleeve to contract and assume its initial, inherent position in snug embrace engagement with the casing section to prevent return flow of fluids through its ports.

This invention has other objects which will become apparent from a consideration of the embodiment shown in the drawing accompanying and forming part of the present specification. This form will now be described in detail, but it is to be understood that such detailed description is not to be taken in a limited sense, since the scope of the invention is best defined by the claims appended hereto.

Referring to the drawing:

Figure 1 is a longitudinal sectional view of a cementing device embodying the invention, disclosed as connecting separated casing sections together; and

Figure 2 is a fragmentary view on an enlarged scale similar to Figure 1, with the valve member shown in a different operative position.

The cementing device A exemplifying the present invention is illustrated in the drawing as connecting two casing sections B, C together. The female member 10 of this device A is provided with a threaded box 11 adapted to receive a companion threaded member on an adjacent casing section B, while the male member 12 of the device similarly contains a threaded box 13 for the purpose of receiving the other companion casing section C. The male section 12 has a threaded end 14 receivable within the threaded portion 15 of the female member 10, the two members 10, 12 together forming the main body of a cementing collar or shoe.

The female body member has a depending skirt 16 spaced from the outer surface of the male member to define an annular chamber 17 open at one end 18. This chamber 17 receives a rubber or other elastic sleeve 19, one end of which is secured to the female member by the cooperating interlocking flanges 20, 21 provided respectively on the exterior of the rubber sleeve and on the interior of the skirt 16. The sleeve 19 extends from this point of attachment through the entire annular chamber 17, terminating externally thereof in an enlarged end 22 which is free to move outwardly of the chamber, but is restrained from moving to a material extent inwardly by the engagement of its externally inclined face 23 with a similarly inclined face 24 on the end of the skirt 16.

The rubber sleeve 19 is designed to control passage of fluid through ports 25 extending laterally through the male member 12 of the cementing device. For this purpose, it extends around the male member over the ports and for a material distance on both sides thereof. Initially, it completely fills the entire annular chamber 17, preventing fluid flow through the ports from the exterior to the interior of the collar or shoe. However, fluid under pressure internally of the cementing device will elongate or stretch the rubber sleeve 19 and produce an increase in its internal diameter, forming an annular space with the exterior of the male section 12 through which a stream of fluid can discharge after having exited from the ports. Release of pressure internally of the cementing device A will allow the rubber sleeve 19 to contract to its initial shape, in which it completely fills the annular chamber, and snugly and tightly embraces the exterior of the male section to prevent return flow of fluid back through the ports 25.

The sealing action of the rubber sleeve 19 is increased by the cooperation between the inclined face 23 of its enlarged terminus 22 and the inclined face 24 on the skirt 16. It will be noted that these faces are inclined inwardly away from the open end 18 of the chamber 17, so that a contraction of the rubber sleeve will cause its inclined face 23 to move the enlarged free end 22 radially inwardly into firmer sealing engagement with the exterior of the male member 12. Fluid pressures externally of the device serve to increase this sealing action due to the cooperability of the inclined faces 23, 24. This sealing action is further improved by tapering the end 26 of the enlarged portion to form.
a lip 27 tending to grip the exterior of the collar. In manufacturing the device, it is preferred that the normal internal diameter of the rubber sleeve 18 be slightly less than the external diameter of the ported section of the male member 12. After the rubber sleeve has been mounted in the skirt 16 of the female member 10 with the flanges 20, 21 interlocking, the male member 12 is inserted into the rubber sleeve 18 and screwed into the female member to complete the assembly. In effect, this inserting operation causes the rubber sleeve 18 to be stretched over the male member, the slight disparity between their respective internal and external diameters insuring a snug sealing engagement between the two and increasing the effective action of the sleeve in preventing reverse flow of fluids back into the casing. Such differences in diameter, however, do not prevent elongation of the rubber sleeve outwardly of the chamber 17 under the action of pressure to allow fluid discharge from the casing.

I claim:

1. A well cementing apparatus, including a ported tubular member adapted to comprise part of a casing string, a member surrounding the ported area of said tubular member and spaced therefrom to form an annular chamber, and an elastic sleeve substantially entirely filling said chamber to prevent fluid passage through the ports, but adapted to be elongated by fluid under pressure from within said tubular member to allow fluid passage from the interior to the exterior of the cementing apparatus, the ported area of said tubular member being larger in the direction of said open end than the external diameter of the ported surface of said tubular member to form an annular passage through which fluid may flow from said ports.

2. A well cementing apparatus, including a ported tubular device adapted to be connected to a casing string and having an annular chamber surrounding its ports, and an elastic member substantially entirely filling said chamber, but adapted to be deformed by fluid under pressure to allow fluid passage through said ports.

3. A well cementing apparatus, including a ported tubular device adapted to be connected to a casing section and having an annular chamber surrounding its ports open at one end, and an elastic member substantially entirely filling said chamber, but adapted to be elongated in the direction of said open end by fluid pressure to form an annular passage through which fluid may flow from said ports.

4. A well cementing apparatus, including a ported tubular device adapted to be connected to a casing section and having an annular chamber surrounding its ports open at one end, and an elastic member substantially entirely filling said chamber to snugly embrace the ported surface of said tubular device, said elastic member being elongated in the direction of said open end by fluid pressure from within said tubular member to form an annular passage through which fluid may flow from said ports.

5. A well cementing apparatus, including a ported tubular member adapted to be connected to a casing section, a member surrounding the ported portion of said tubular member and spaced therefrom to form an annular chamber open at one end, and an elastic sleeve secured to one of said members and extending through said chamber toward the open end thereof to substantially entirely fill said chamber and snugly embrace the ported surface of said tubular member, said sleeve being elongated in the direction of said open end by fluid pressure from within said tubular member to form an annular passage through which fluid may flow from said ports.

6. A well cementing apparatus, including co-operative tubular members adapted to form part of a casing string, one of said members having lateral ports extending therethrough and the other member being provided with a skirt surrounding said ports in spaced relation thereto to form an annular chamber open at one end, and an elastic sleeve secured to one of said members and extending through said chamber toward the open end thereof to inherently tend to completely subdue the cross-sectional area of said chamber and snugly embrace the ported tubular member, said sleeve being elongated in the direction of said open end by fluid pressure from within said tubular member to form an annular passage through which fluid may flow from said ports.

7. A well cementing apparatus, including co-operative tubular members adapted to form part of a casing string, one of said members having lateral ports extending therethrough and the other member being provided with a skirt surrounding said ports in spaced relation thereto to form an annular chamber open at one end, and an elastic sleeve secured to one of said members and extending through said chamber toward the open end thereof to inherently tend to completely subdue the cross-sectional area of said chamber and snugly embrace the ported tubular member, said sleeve having an enlarged terminal portion externally of said chamber cooperable with the end of said skirt to force the sleeve into engagement with the ported tubular member.

8. A well cementing apparatus, including a ported tubular device adapted to form part of a casing string and having a skirt surrounding its ports in spaced relation thereto to form an annular chamber open at one end, and a rubber sleeve secured to said device and extending through said chamber toward the open end thereof to inherently tend to completely subdue the cross-sectional area of said chamber and snugly embrace the ported surface of said tubular device, said sleeve having an enlarged terminal portion externally of said chamber, said portion having a face inclined inwardly away from the open end of the chamber cooperable with a companion face on the end of said skirt to force the sleeve radially into engagement with the ported tubular device.

9. A well cementing apparatus, including a ported tubular device adapted to form part of a casing string and having a skirt surrounding its ports in spaced relation thereto to form an annular chamber open at one end, and a rubber sleeve secured to said device and extending through said chamber toward the open end thereof to inherently tend to completely fill said chamber and snugly embrace the ported surface of said tubular device, said sleeve having an enlarged terminal portion externally of said chamber provided with a face inclined inwardly away from the open end of the chamber and cooperable with a companion face on the end of said skirt to force the sleeve into engagement with the ported tubular device, said sleeve having a looser unrestrained internal diameter than the external diameter of the ported surface of said tubular device.

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