Therefore, it is an object of the present invention to provide an improved piston cup assembly, the assembly having an improved cup backing and sealing ring combination.

It is a further object of the present invention to provide an improved piston cup assembly wherein an improved cup backing arrangement is available for making sealing contact with the cylinder wall.

It is yet another object of the present invention to provide an improved cup backing plate assembly wherein a polytetrafluoroethylene seal ring is disposed in back of the expanded piston cup, the polytetrafluoroethylene seal ring providing a substantially uniform seal with the cylinder wall on both the forward and retracting strokes.

Other and further objects of the present invention will become apparent to those skilled in the art upon a study of the following specification, appended claims and accompanying drawings wherein:

FIGURE 1 is an exploded vertical sectional view of an improved expanded piston cup assembly made in accordance with the present invention;

FIGURE 2 is a top plan view of the assembly shown in FIGURE 1;

FIGURE 3 is a cross-sectional view of the assembled piston cup assembly, disposed within the confines of a cylinder, as it would appear during the pressure pumping strokes; and

FIGURE 4 is a view similar to that of FIGURE 3 but showing the disposition of the piston during the retraction stroke.

In accordance with the preferred modification of the present invention, the piston cup assembly generally designated 10 includes a base mounting plate 11, a guide ring 12, a second guide and backing member 14 with a recessed portion 16 for receiving the ring 12, a cup spreader 15, and a piston cup 18 disposed in contact with the backer 14 and maintained in contact with the face of the member 14 by the spreader 15. The piston cup 18 has a complementary resilient seal ring member 19, disposed along the member 14, and is provided with a conventional resilient O ring 20 which is adapted to provide a compressional force urging the ring 19 into contact with the cylinder walls. A through-bolt 21 extends between the spreader 15 and the base mounting member 11, the member 11 being internally threaded to receive the bolt 21 therein. The through-bolt 21 is utilized to maintain the assembly 10 under a modest degree of working compressional force. The O ring 23 is resilient and is utilized to force the peripheral portion 22 of the cup 18 outwardly.

The piston cup 18 is fabricated from resilient rubber as is conventional in the art. The O ring 20 is likewise fabricated from resilient rubber, and the seal ring 19, which is spaced closely from the wall engaging peripheral area 22 is fabricated from molded polytetrafluoroethylene.

The ring 19 is preferably slightly oversized with respect to the inner diameter of the cylinder in which the piston assembly is operating. In this connection, for a cylinder having an inner diameter of one inch, the sleeve is preferably of the order of 0.010 inch oversize. The sidewall of the seal ring 19 is relatively thin, preferably having a wall thickness of about 0.1 inch for a ring operating in a one inch cylindrical sleeve. The resilient backing 14 is maintained by the combination of the piston cup 18 and the O ring 20 is sufficient to maintain the surface of the ring 19 in constant and firm engagement with the surface of the pumping sleeve or cylinder walls. In this connection, the axial length of the ring 19 is preferably of the order of one-eighth inch, and it will be observed that this dimension is approximately equal to the diameter of the O ring 20. This arrangement is preferred inasmuch as each of the parts in the assembly must be firmly held in place, and must not be permitted to have any play existing between the
components. The guide member 14 is arranged to snugly fit against one of the edges of the ring 19, the guide 12 being held against the other edge, and thereby retain the assembly in place adjacent to the cup spreader 15. The guide 12 which is preferably fabricated from molded carbon is designed to operate as a guide for preventing contact between the metallic elements 11 and 14 with the inner wall surfaces of the pumping cylinder. The danger of scoring these walls due to contact with moving metal is accordingly effectively diminished. The spacing between the elements 11 and 14 and the cylinder wall is very small, and due to limitations in draftsmanship, these dimensions have been shown on an exaggerated scale.

In operation, particularly during the pressure or pumping stroke, a suitable source of reciprocating energy is utilized to move the assembly 10 in the direction of the arrow in FIGURE 3. The peripheral portions 22 of the resilient cup member 18 are accordingly urged outwardly into intimate contact with the inner walls of the cylinder 25. During this stroke, the ring 19 is maintained in sealing contact with the surface of the cylinder 25 and accordingly a firm substantially leak-proof seal is available in back of the cup 18. During the retracting stroke, the periphery 22 of the cup 18 is not firmly engaged with the cylinder walls, but actually is only in running contact therewith. The ring 19, on the retracting stroke, is at all times held in firm engagement with the walls of the cylinder 25. In this connection, as indicated previously, any cavitation which may occur at the periphery 22 of the piston cup 18 due to air leakage between the surface 22 of the cup 18 and the inner surface of the wall is essentially eliminated since there is a minimum of air leakage around the contacting surface of the ring 19 and the cylinder wall. In addition, during pumping operation, and particularly when high pressures are being developed, a certain quantity of fluid may leak between the surface 22 and the cylinder wall, and accordingly reside in the area confined between this surface and the ring 19. Since on the retracting stroke, the pressures are minimal, the material may be retained in this area and spread along the surface of the cylinder wall and thus provide a cooling film between the surfaces of the cup 18 and the cylinder wall. It is also possible that the ring leaves a low friction film deposit along the surface of the cylinder wall. While the exact process or mechanism responsible for the improvement is not known with certainty, it has been found that the arrangement of the present invention is highly advantageous for extending the life of the piston cups such as the cup 18.

It will be appreciated that the various specific examples given herein are for purposes of illustration only and are not to be construed as a limitation to the scope of the present invention. Therefore, those skilled in the art may depart from these specific embodiments without departing from the spirit and scope of the present invention.

What is claimed is:
1. In an expanded reciprocatory piston cup assembly having assembly retaining means, a resilient piston cup disposed at the outer free end of said assembly and having an outer peripheral surface area and means in combination with said surface area for providing firm engagement between said surface area and the inner walls of a pumping cylinder during both stroke cycles of the reciprocating pumping action; a resilient backing seal for said piston cup disposed in closely spaced relationship thereto, said resilient backing seal comprising a relatively thin ring member arranged to make sealing contact with said inner walls and means for constantly urging said ring member outwardly into engagement with said cylinder wall, said ring member being fabricated from molded polytetrafluoroethylene.
2. The expanded piston cup assembly as defined in claim 2 being particularly characterized in that said thin ring member has a nominal outer diameter which exceeds the diameter of said pumping cylinder.
3. The expanded piston cup assembly as defined in claim 2 being particularly characterized in that said thin ring member is disposed adjacent to the outer peripheral area of said resilient piston cup, and wherein during the reciprocating pumping action, said thin ring member and said piston cup make overlapping contact with certain portions of the inner wall of said pumping cylinder.

References Cited

UNITED STATES PATENTS
1,711,450 4/1929 Davis 92—194
2,784,013 3/1957 Groen 277—165
3,092,427 6/1963 Sadler et al. 92—194

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,343,844

September 26, 1967

John Leschisin

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, line 41, for "jumped" read -- pumped --; column 4, line 26, for the claim reference numeral "2" read -- 1 --.

Signed and sealed this 1st day of October 1968.

(SEAL)

Attest:
Edward M. Fletcher, Jr.
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents