United States Patent

McClung

[15] 3,655,301

[45] Apr. 11, 1972

[54] FLUID PUMP

[72] Inventor: Clifford F. McClung, 2761 East 45th Place, Tulsa, Okla. 74105

[22] Filed: May 28, 1970

[21] Appl. No.: 41,319

[52] U.S. Cl. 417/437, 92/205, 92/60.5, 92/13.8

[51] Int. Cl. F01b 31/04, F16j 1/06, F04b 49/00

[58] Field of Search 74/589; 92/60.5, 118, 13.8, 92/119; 91/211-213; 417/464

[56] References Cited

UNITED STATES PATENTS

2,259,020	10/1941	Wineman	74/589
3,499,387	3/1970	Zippel	92/118
2,218,214	10/1940	O'Leary	74/589
2,243,117	5/1941	Patterson	74/589
1,591,226	7/1926	Mueller	92/205
2,871,072	1/1959	Parks et al.	74/589
1,775,733	9/1930	Phipps	74/589

FOREIGN PATENTS OR APPLICATIONS

566,769	1/1945	Great Britain	92/205

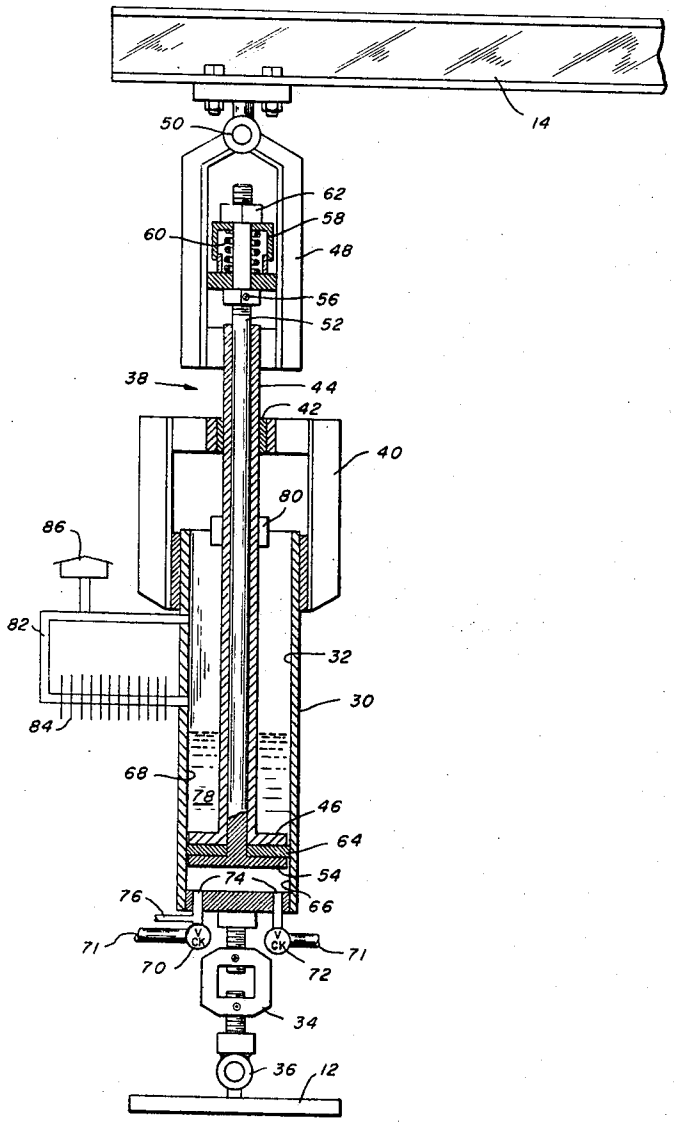
Primary Examiner—William L. Freeh

Attorney—Head & Johnson

[57] ABSTRACT

A fluid pump having a piston member reciprocally disposed within a hollow cylinder utilizes the oscillating action of an external walking beam as a prime mover thereof. Turnbuckle means secure the cylinder of the compressor to a stationary surface and further provide a means for adjusting the compression ratio. The piston member possesses the ability to compensate for piston ring wear thereby maintaining the piston ring in sealing engagement with the inner wall of the cylinder.

1 Claim, 2 Drawing Figures



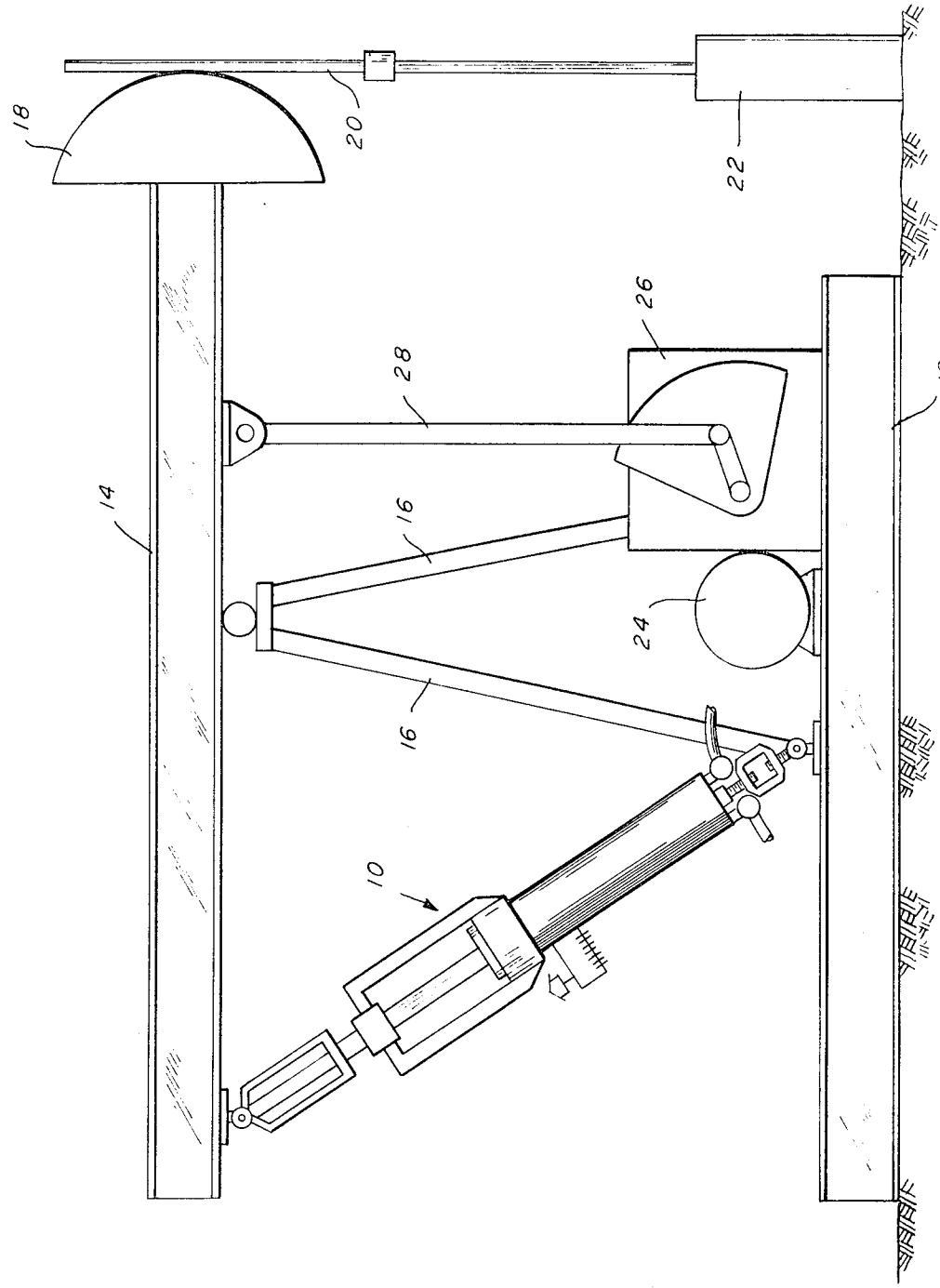


FIG. 1

INVENTOR.
CLIFFORD F. McCLUNG
BY Head & Johnson
ATTORNEYS

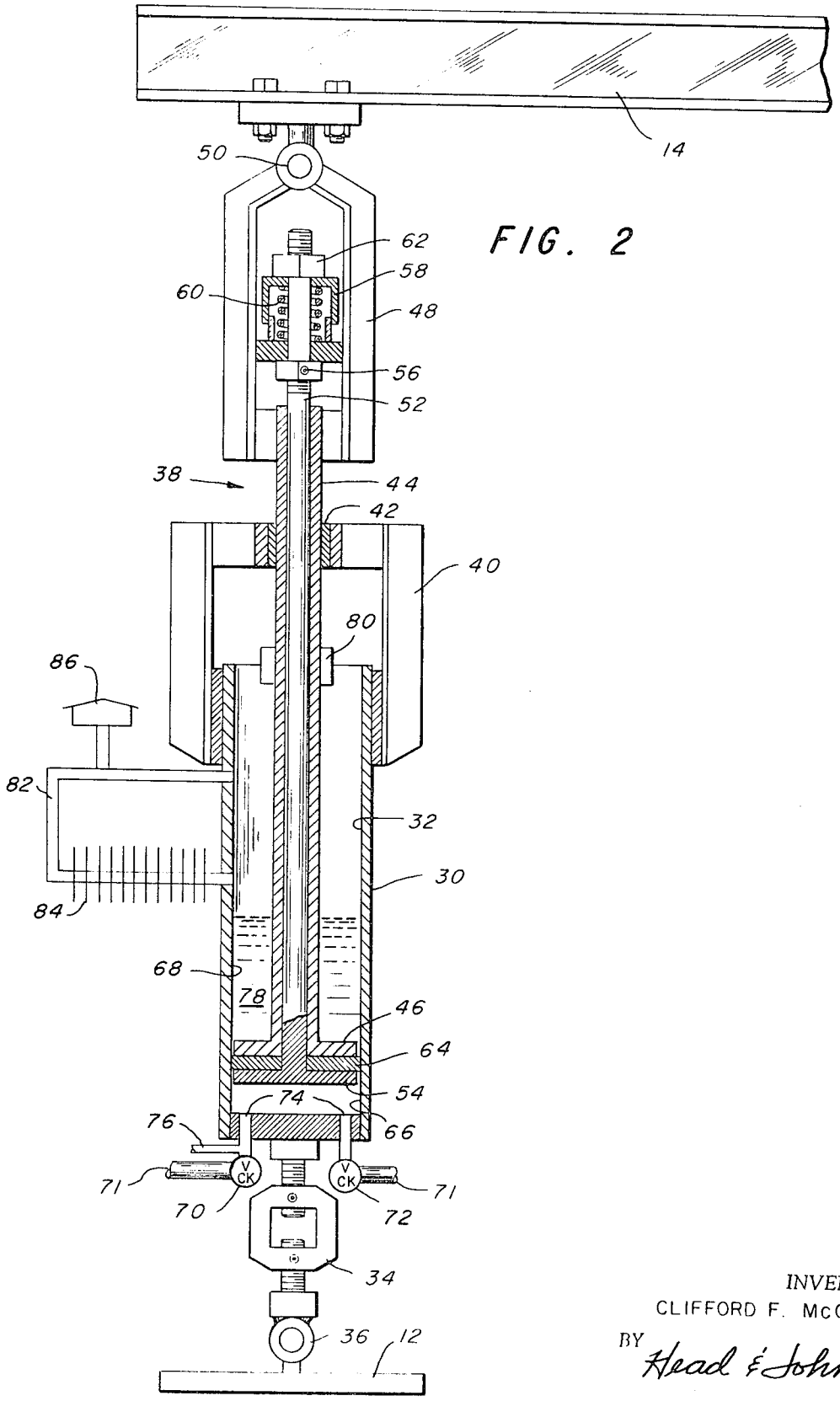


FIG. 2

INVENTOR.
CLIFFORD F. McCLUNG
BY Head & Johnson
ATTORNEYS

FLUID PUMP

BACKGROUND OF THE INVENTION

This invention relates to a pump and more particularly to a fluid pump for use in conjunction with gas and/or oil well equipment.

In many instances in oil and gas production, it is necessary to provide a relatively economical fluid pump to be used in the oil field. One such type of pump is the type utilizing an external prime mover. Present fluid pumps utilizing an external prime mover generally include a hollow cylinder secured at the lower end thereof to a stationary object and piston means disposed within the cylinder. The upper end of the piston means is interconnected to a prime mover which reciprocates the piston means within the cylinder to compress the gas. Such fluid pumps have a common shortcoming in the fact that due to the fluid pumps being articulated only at the attachment of the lower end of the cylinder, the direction of the driving force of the prime mover is not at all times along the axis of longitudinal reciprocation of the piston means thus requiring the expense of a crosshead or other device. A further shortcoming of such presently manufactured fluid pumps is the absence of means for operably compensating for piston ring wear. Thus upon deterioration of the piston ring seal the fluid pumps must be taken out of operation, dismantled and the worn piston replaced, all done at the expense of considerable maintenance time.

It is therefore an object of this invention to present a fluid pump which overcomes the aforementioned difficulties.

More particularly, it is an object of this invention to present a fluid pump having articulation at all points of interconnection with external objects and having means for operably adjusting the piston ring seal.

A still further object of this invention is to present a pump capable of a variety of applications in oil field production operations.

SUMMARY OF THE INVENTION

Generally the fluid pump comprises a elongated cylinder having therein a longitudinally reciprocatable piston means. The lower end of the cylinder is attached by means of an articulating joint through turnbuckle means to a stationary element and the piston is likewise interconnected to the rearward end of the walking beam of a pumping unit. External valving means control the ingress and egress of gas to and from the cylinder while the upward and downward movement of the walking beam reciprocates the piston means within the cylinder to pump the fluid. The piston means includes a pliable piston ring which is operably compressible to compensate for wear thereof.

DETAILED DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side view of a typical well site showing the attachment of the pump of this invention to a typical well pumping unit.

FIG. 2 of the drawing shows the pump unit in partial cross section.

DETAILED DESCRIPTION OF THE INVENTION

Turning now to FIG. 1 of the drawings, there is shown therein a typical well pumping unit to which the fluid pump **10** of this invention is attached. The well pumping unit generally comprises a stationary base **12** and a walking beam **14** pivotally supported on struts **16** and having at the forward end thereof a horsehead **18**. Horsehead **18** reciprocates, within the well casing (not shown), a polish rod and sucker rod **20** which passes through a stuffing box **22** within the well casing. A walking beam powering means such as a motor **24** and gearing **26** interconnected to the beam by a linkage arm **28** imparts oscillating action to the walking beam.

Although the subsequent discussion will decide the fluid pump of the invention in connection with a walking beam type well pumping unit as the prime thereof, it is to be understood the fluid pump will just as efficiently and easily operate with other oil field equipment as the prime mover thereof.

Looking now at FIG. 2, the fluid pump **10** includes an elongated enclosed cylinder **30**, defining an internal chamber **32**. The lower end of the cylinder **30** is attached to stationary base **12** of the pumping unit by means of a turnbuckle fitting **34** which includes a lower knuckle joint **36**.

Longitudinally slidably received within chamber **32** is a piston member **38** which is interconnected to the rearward end of walking beam **14** which serves as a prime mover for reciprocating piston member **38** within the cylinder.

A yoke **40** suitable secured to the upper end of the cylinder **30** has therethrough a central aperture which receives a bearing **42** which serves to guide the piston member **38** during the reciprocation thereof.

Turning now to the specific construction and interconnections of piston member **38**, a tubular piston rod **44** has at the lower end thereof a transverse horizontal upper flange **46** having a diameter slightly less than the diameter of cylinder **30**. The upward end of the tubular piston rod **44** is secured to a bridge **48** which in turn is secured at the upper end thereof through an upper knuckle joint **50** to the rearward end of walking beam **14**. Slidably received within the interior of tubular piston rod **44** is an inner piston rod **52** which controlling terminates at the lower end thereof with a transverse lower flange **54** also having a diameter less than the diameter of cylinder **30**. The upper end of inner piston rod **52** projects upwardly into the interior gap of bridge **48** and has thereon male threads to which is threadably engaged a lower tension nut **56** which includes set screw means. Sleeved over the upper end of inner piston rod **52** and contingent with the upper surface of lower tension nut **56** is a telescoping spring barrel **58** which is permanently affixed to bridge **48** and encompasses a tension spring **60**. An upper tension nut **62** also threadably engaging the threads on the upper end of piston **52** provides means for controlling the compression of spring **60**.

Interposed between the upper flange **46** and lower flange **54** is a pliable piston ring **64** which is snugly fitted against the inner wall of cylinder **30** to form a leakproof piston seal and to divide chamber **32** into a lower reservoir **66** and upper reservoir **68**. With piston ring **64** so interposed between the flanges **46** and **54** the piston seal can easily be maintained. As piston ring **64** deteriorates due to the normal wear during reciprocation of piston member **38** the inner piston rod **52** can be moved upwardly relative to tubular piston rod **44** thereby compressing pliable piston ring **64** to force the outer edges thereof into tight fitting engagement with the inner wall of cylinder **30**. The upward movement of the inner piston rod **52** is accomplished by manipulation of tension nuts **56** and **62** which permits spring **60** to expand which in turn forces inner piston rod **52** upwardly to compress piston ring **64** into sealing engagement with the inner wall of cylinder **30**. Multiple piston rings can be staked in series between spaces, not shown, as required by operating conditions.

External valve means **70** and **72** connect via conduits **71** to an inlet source (not shown) and outlet collecting system (not shown) and operatively control the ingress and egress of fluid into reservoir **66** through ports **74** in the lower end of cylinder **30**. A safety relief valve conduit **76** is provided between valve **70** and ports **74**. The locating of valves **70** and **72** externally of cylinder **30** rather than internally is particularly advantageous since such enables different type valves and valve seats to be easily interchanged, thus one fluid pump can be used on different fluids with a minimum of changeover expense and time.

Lubricating oil **78** within reservoir **68** continuously bathes the inner wall of cylinder **30** to reduce friction and increase the life of the piston ring **64**. To prevent escapage of the lubricating oil **78**, a rod wiper **80** located at the upper end of cylinder **30** wipes the piston rod **44** clean during reciprocation.

Where the frequency of reciprocation is sufficiently large to excessively heat lubricating oil **78** an external heat exchanger

82 with associated fins 84 may be used to cool the oil and increase the life expectancy of the piston and valve seals. An air filter 86 may also be installed when operating conditions deem such appropriate.

As is evident from the above discussion this invention has produced an inexpensive, economical to operate fluid pump. The use of external valving 70 and 72 and associated flexible hoses eliminates the need for internal valves and simplifies the maintenance thereof. Also due to articulation of the knuckle joints 36 and 50 at both ends of the fluid pump, the direction of the driving force imparted to piston member 38 is at all times along the longitudinal axis thereof, thereby assuring optimum utilization of the driving force.

Since the use of an external prime mover results in a fixed piston travel once the compressor has been connected to the walking beam, the compression ration of the compressor is altered by means of operably adjusting turnbuckle 34.

In operation, the prime mover when actuated reciprocates the piston member 38 within the cylinder 30. During the upstroke fluid is forced into reservoir 66 through valve 70 and during the downstroke fluid is driven out of the chamber through valve 72 into fluid carrying conduits which carry the same to a transmission line or other carrying systems.

The fluid pump 10 of this invention can be applied to a variety of applications. By way of example, on many low capacity gas wells, it is necessary to compress the gas at the well site before transporting the same onto a sales line or a gas plant. With proper gas seats inserted in valves 70 and 72, the economical fluid pump of this invention can pump the gas from the well basin to the transmission line; thereby making the gas well economically feasible to operate and further conserving small quantities of gas usually flared to the air, thus adding to the general supply of valuable fuel and simultaneously reducing pollution of the environment.

As a further example, by inserting water seats in valves 70 and 72, fluid pump 10 can become an injection pump for use in conjunction with a secondary water flood system. In this application, piston 38 is interconnected as previously discussed to walking beam 14 which becomes part of the recovery well pumping equipment, and valves 70 and 72 are fluidly connected to an injection fluid source and the tubing of an injection well respectively. Upon energization of the recovery well equipment, walking beam 14 will pump oil and/or gas from the producing zone and simultaneously therewith fluid injection pump 10 will inject water into the well basin of the injection well. Likewise fluid pump 10 can be used to inject gas into an injection well.

As a still further example, the fluid pump with water seats in valves 70 and 72 can be used to inject salt water into salt water disposal wells while simultaneously therewith walking beam 14 pumps oil and/or gas from the production zone.

During the detailed description of the preferred embodiment specific language has been used for the sake of clarity. However, it is to be understood that such words used are not words of limitation and include all equivalents which operate in a similar manner to accomplish a similar purpose.

What is claimed:

1. A fluid pump for pumping gas at a well sit utilizing the well pumping unit as a prime mover comprising:

a tubular cylinder defining an elongated chamber;

piston means reciprocably disposed within said chamber;

said piston means comprising:

a. an elongated tubular piston rod having at the lower end thereof an upper transverse flange, said piston rod having the lower end thereof disposed within said cylinder and the upper end thereof articulatively interconnected to said prime mover;

b. an inner elongated piston rod having at the lower end thereof a lower transverse flange; said inner piston rod being slidably received within said tubular piston and having the upper end thereof extending beyond the upper end of said tubular piston rod;

c. a pliable non-metallic donut shaped piston ring interposed between said upper and lower flanges, and in sealing engagement with the inner wall of said chamber; and

d. means interconnecting the upper ends of said piston rods and adapted to operably slide said inner piston rod relative to said tubular piston rod whereby said pliable piston ring is compressed radially outward to maintain said sealing engagement with the inner wall of said chamber;

turnbuckle means articulatively attaching said cylinder to a stationary surface whereby adjustment of said turnbuckle varies the compression ratio of said apparatus; and

external valving means interconnected to said housing for adjustably controlling the ingress and egress of fluid into and from said chamber whereby reciprocation of said piston means compresses said gas.

* * * * *