

## Fracturing pump and fracturing vehicle

### Abstract

The invention discloses a fracturing pump which comprises a power end, wherein the power end comprises a large gear, and two crank shafts which are positioned at two ends of the large gear; the crank shafts are connected with the large gear; the crank shafts are connected with a crosshead by connection rods; the crosshead is connected with a plunger piston; the two crank shafts are symmetrically arranged by taking the large gear as the center; the crank shafts drive the connection rods and the crosshead to push the plunger piston to do reciprocating motion. Compared with that of the prior art, the power end are in a sectional type structure design, the large gear is positioned in the middle position, and the crank shafts are symmetrically arranged at the two ends of the large gear, so that effects of dynamic balance and static balance are simultaneously met theoretically, furthermore additional moment generated by the crank shaft during rotation can be reduced, and the vibration amplitude of the fracturing pump is reduced. In addition, the invention also discloses a fracturing vehicle comparing the fracturing pump.

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#### Application CN201510644006.7A events ⓘ

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### Claims (10)

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1. a fracturing pump, comprise power end, it is characterized in that: described power end comprises a gearwheel (2) and is positioned at two bent axles (1) at described gearwheel (2) two ends, two described bent axles (1) are connected with described gearwheel (2) respectively, described in every root, bent axle (1) is all connected with crosshead (5) by connecting rod (4), described crosshead (5) is connected with plunger (3), two described bent axles (1) are symmetrical arranged centered by described gearwheel (2), described bent axle (1) drives described connecting rod (4) and crosshead (5), promote described plunger (3) reciprocating.

2. fracturing pump as claimed in claim 1, is characterized in that: described in every root, upper described connecting rod (4) quantity arranged of bent axle (1) is identical.

3. fracturing pump as claimed in claim 2, is characterized in that: bent axle (1) described in every root is set side by side with one or more rod journal successively.

4. fracturing pump as claimed in claim 3, is characterized in that: described connecting rod (4) one end on bent axle (1) described in every root is connected with rod journal, and its other end is connected with described crosshead (5).

5. fracturing pump as claimed in claim 4, it is characterized in that: bent axle (1) described in every root is set side by side with three rod journals successively, the phase difference of adjacent two described rod journals is 120 °, and connecting rod (4) quantity on bent axle (1) described in every root is three.

6. the fracturing pump according to any one of claim 1 to 5, is characterized in that: described fracturing pump also comprises fluid end, and described fluid end comprises plunger (3) and pump head body, and (3) are connected with pump head body to described plunger.

7. fracturing pump as claimed in claim 6, it is characterized in that: described pump head body is provided with plunger cavity, one end of described plunger (3) is connected with described crosshead (5), and the other end of described plunger (3) inserts in described plunger cavity movably.

8. a fracturing unit truck, comprises chassis and fracturing pump, it is characterized in that: the fracturing pump of described fracturing pump according to any one of claim 1 to 7, described fracturing pump is horizontally installed in the rear portion on described chassis.

9. fracturing unit truck as claimed in claim 8, it is characterized in that: also comprise motor and transmission system, described transmission system is connected with described motor, described fracturing pump is connected with described transmission system, described motor is connected with oil pump and fuel tank with return tube respectively with the oil inlet pipe of transmission system, for realizing the lubrication to fracturing pump.

10. fracturing unit truck as claimed in claim 9, is characterized in that: also comprise fracturing fluid intake manifold and fracturing fluid outlet manifold, described fracturing fluid intake manifold is connected with the fluid end of described fracturing pump respectively with fracturing fluid outlet manifold.

## Description

A kind of fracturing pump and fracturing unit truck

Technical field

The present invention relates to oil gas fracturing technique field, particularly a kind of fracturing pump and be provided with the fracturing unit truck of this fracturing pump.

Background technique

Pressing crack construction operation is one of important means of transformation oil-gas reservoir, for low-permeability oil gas well, generally needs the object that just can reach stable yields and volume increase by fracturing work. Fracturing pump is the working host of fracturing unit truck, is to realize the most direct actuating equipment of fracturing technology intention, primarily of parts compositions such as power end assembly and fluid end assemblies.

In prior art, fracturing pump as conveying equipment generally adopts curved shaft type plunger pump, Fig. 1 is the structural representation of this curved shaft type plunger pump, as shown in Figure 1, this curved shaft type plunger pump comprises bent axle 1', multiple connecting rods 4' and multiple plungers 3' etc., the two ends of bent axle 1' are provided with gearwheel 2', multiple plungers 3' are arranged in the side of bent axle 1', one end of multiple plunger 3' can move around respectively in fluid end, between the other end that multiple connecting rod 4' is arranged on multiple plunger 3' and bent axle 1', like this when bent axle 1' rotates, driven rod 4' is made crank rod movement, connecting rod 4' so drive plunger 3' reciprocating, thus realize by fluid end, working medium being sucked and continuous High voltage output, to carry out pressure operation.

The bent axle of fracturing pump has multiple phase place in the market, but no matter which kind of phase place, be all difficult to the dynamic balancing meeting bent axle, cause bent axle to produce additional moment when rotated, cause fracturing pump to vibrate, thus cause car load to vibrate, rotating speed is higher, vibrates larger. Especially when the fracturing pump of car load arrange, the design such as the rigidity of vehicle frame improper time, vibrate more obvious. Serious vibration have impact on the quality of fit of structure, reduces the working life of component.

Summary of the invention

In view of this, the present invention proposes a kind of fracturing pump and comprises the fracturing unit truck of this fracturing pump, and to solve, existing fracturing pump bent axle is difficult to dynamic balancing, fracturing pump vibrates large, that the bent axle life-span is short technical problem.

On the one hand, the invention provides a kind of fracturing pump, comprise power end, described power end comprises a gearwheel and is positioned at two bent axles at described gearwheel two ends, and two described bent axles are connected with described gearwheel respectively, and described in every root, bent axle is all connected with crosshead by connecting rod, described crosshead is connected with plunger, two described bent axles are symmetrical arranged centered by described gearwheel, and described bent axle drives described connecting rod and crosshead, promote described plunger reciprocating.

As the improvement on the one hand of a kind of fracturing pump of the present invention, the described connecting rod quantity that bent axle described in every root is arranged is identical.

As the improvement on the one hand of a kind of fracturing pump of the present invention, bent axle described in every root is set side by side with one or more rod journal successively.

As the improvement on the one hand of a kind of fracturing pump of the present invention, the described connecting rod one end on bent axle described in every root is connected with rod journal, and its other end is connected with described crosshead.

As the improvement on the one hand of a kind of fracturing pump of the present invention, bent axle described in every root is set side by side with successively three rod journals, the phase difference of adjacent two described rod journals is  $120^\circ$ , and the connecting rod quantity on bent axle described in every root is three.

As the improvement on the one hand of a kind of fracturing pump of the present invention, described fracturing pump also comprises fluid end, and described fluid end comprises plunger and pump head body, and described plunger is connected with pump head body.

As the improvement on the one hand of a kind of fracturing pump of the present invention, described pump head body is provided with plunger cavity, one end of described plunger is connected with described crosshead, and the other end of described plunger inserts in described plunger cavity movably.

In sum, fracturing pump of the present invention, comprise power end, described power end comprises a gearwheel and is positioned at two bent axles at described gearwheel two ends, and two described bent axles are connected with described gearwheel respectively, and described in every root, bent axle is all connected with crosshead by connecting rod, described crosshead is connected with plunger, two described bent axles are symmetrical arranged centered by described gearwheel, and described bent axle drives described connecting rod and crosshead, promote described plunger reciprocating. Compared to existing technologies, power end of the present invention adopts segmentation structure design, gearwheel is mid-, the bent axle being positioned at gearwheel two ends is symmetrical arranged, in theory simultaneously can satisfying dynamic equilibrium and statically balanced effect, and then the additional moment that reduction bent axle produces when rotated, reduce the Oscillation Amplitude of fracturing pump.

Further, bent axle described in every root is set side by side with successively three rod journals, the phase difference of adjacent two described rod journals is  $120^\circ$ , connecting rod quantity on bent axle described in every root is three, now, gearwheel is one-sided is triplex structure, and fracturing pump entirety is six cylinders, allow to reduce speed of crankshaft to a certain extent, be more conducive to the working life extending bent axle.

On the other hand, the present invention also provides a kind of fracturing unit truck being equipped with this fracturing pump, comprises chassis and fracturing pump, and described fracturing pump is the fracturing pump described in any one on it, and described fracturing pump is horizontally installed in the rear portion on described chassis.

As the improvement on the one hand of a kind of fracturing pump of the present invention, described fracturing unit truck also comprises motor and transmission system, described transmission system is connected with described motor, described fracturing pump is connected with described transmission system, described motor is connected with oil pump and fuel tank with return tube respectively with the oil inlet pipe of transmission system, for realizing the lubrication to fracturing pump.

As the improvement on the one hand of a kind of fracturing pump of the present invention, described fracturing unit truck also comprises fracturing fluid intake manifold and fracturing fluid outlet manifold, and described fracturing fluid intake manifold is connected with the fluid end of described fracturing pump respectively with fracturing fluid outlet manifold.

Fracturing unit truck of the present invention obviously has whole beneficial effects of aforementioned fracturing pump, does not repeat them here.

#### Accompanying drawing explanation

The accompanying drawing forming a part of the present invention is used to provide a further understanding of the present invention, and schematic description and description of the present invention, for explaining the present invention, does not form inappropriate limitation of the present invention. In the accompanying drawings:

Fig. 1 is the structural representation of curved shaft type plunger pump in correlation technique;

Fig. 2 is the part-structure schematic diagram of fracturing pump of the present invention;

Fig. 3 is the side view of Fig. 2.

Fig. 1 description of reference numerals

- 1 ' bent axle
- 2 ' gearwheel
- 3 ' plunger
- 4 ' connecting rod

Fig. 2 to Fig. 3 description of reference numerals

- 1 bent axle
- 2 gearwheels
- 3 plungers
- 4 connecting rods
- 5 crossheads

#### Embodiment

It should be noted that, when not conflicting, the embodiment in the present invention and the feature in embodiment can combine mutually. Below with reference to the accompanying drawings and describe the present invention in detail in conjunction with the embodiments.

For setting forth the present invention better, when described fracturing pump is horizontally installed in chassis, bent axle 1 is arranged along the length direction on chassis.

Basic thought of the present invention is: the structure that the present invention adopts gearwheel 2 mid-, power end is divided into left and right two-part, one-sided preferably three cylinders, the phase place of both sides bent axle 1 is all  $120^\circ$ , and be arranged symmetrically with relative to gearwheel 2, like this, bent axle 1 not only meets static balancing, satisfying dynamic equilibrium simultaneously, and then the vibration of fracturing pump is reduced from root.

As shown in Figure 2, a kind of fracturing pump, comprise power end and fluid end, this power end comprises a gearwheel 2, two bent axles 1, connecting rod 4 and crosshead 5, two bent axles 1 are arranged at the two ends of gearwheel 2 respectively and are connected with gearwheel 2, every root bent axle 1 is all provided with connecting rod 4, every root bent axle 1 is connected with crosshead 5 by connecting rod 4, fluid end comprises plunger 3 and pump head body, aforementioned crosshead 5 is connected with plunger 3, plunger 3 is connected with pump head body, two bent axles 1 are symmetrical set centered by gearwheel 2, bent axle 1 driving rod 4 and crosshead 5, promote plunger 3 reciprocating, complete successively in the chamber of pump head body and suck and discharge fracturing work.

Preferably, connecting rod 4 quantity that every root bent axle 1 is arranged is identical, every root bent axle 1 is set side by side with one or more rod journal successively, so the quantity of connecting rod 4 can be one or more. Meanwhile, connecting rod 4 one end on every root bent axle 1 is connected with rod journal, and its other end is connected with crosshead 5, can ensure that the bent axle 2 at gearwheel about 2 two ends is symmetrical arranged better, and then realize static balancing and dynamic balancing by above-mentioned setting.

In addition, it is worth mentioning, in the preferred embodiment of the present invention, every root bent axle 1 is set side by side with three rod journals successively, the phase difference of adjacent two rod journals is  $120^\circ$ , and connecting rod 4 quantity on every root bent axle 1 is three. Namely the two ends, left and right of gearwheel 2 are three cylinders, and are symmetrical arranged, and fracturing pump entirety is six cylinder plunger pumps, under same displacement, cylinder number is more, and rotating speed relatively just can be less, therefore the rotating speed of reduction bent axle 1 to a certain degree can be allowed, be conducive to the working life extending bent axle 1.

Particularly, pump head body is provided with plunger cavity, one end of aforementioned plunger 3 is connected with crosshead 5, and the other end of plunger 3 then inserts in this plunger cavity movably, for realizing the suction of fracturing pump and discharging fracturing work.

Compared to existing technology, power end of the present invention adopts segmentation structure design, comprise a gearwheel 2 and be positioned at two bent axles 1 at gearwheel 2 two ends, every root bent axle 1 is all connected with crosshead 5 by connecting rod 4, crosshead 5 is connected with plunger 3, two bent axles 1 are symmetrical arranged centered by gearwheel 2, gearwheel 2 is mid-, the bent axle 1 being positioned at gearwheel 2 two ends is symmetrical arranged, in theory simultaneously can satisfying dynamic equilibrium and statically balanced effect, and then the additional moment that reduction bent axle produces when rotated, reduce the Oscillation Amplitude of fracturing pump. Especially be three cylinders at gearwheel about 2 two ends when being arranged symmetrically with, the rotating speed of bent axle 1 can be reduced to a certain extent, be conducive to the working life extending bent axle 1.

On the other hand, present invention also offers a kind of fracturing unit truck, comprise chassis, fracturing pump, motor and transmission system, described fracturing pump is fracturing pump described on it, and fracturing pump is horizontally installed in the rear portion on described chassis, transmission system is connected with motor, and fracturing pump is connected with transmission system, motor is connected respectively at oil pump and fuel tank with return tube with the oil inlet pipe of transmission system, for realizing the lubrication to fracturing pump.

Further, aforementioned drive system comprises oil pump and oil hydraulic motor, and motor is for driving oil pump, oil pump is connected with oil hydraulic motor, and oil pump is connected with fuel tank, and oil pump is used for providing pressure oil for oil hydraulic motor, oil hydraulic motor is connected with fracturing pump, for driving fracturing pump. Fracturing pump is driven by oil hydraulic motor, drives two of two ends, left and right bent axles 1 to rotate, bent axle 1 driving rod 4 and crosshead 5 by gearwheel 2, promotes plunger 3 reciprocating, is discharged by working medium with certain pressure.

Meanwhile, the fracturing unit truck in the present invention also comprises fracturing fluid intake manifold and fracturing fluid outlet manifold, and fracturing fluid intake manifold is connected with the fluid end of fracturing pump respectively with fracturing fluid outlet manifold, and it is connected with the pump head body of fluid end particularly.

Fracturing unit truck of the present invention obviously has simultaneously can satisfying dynamic equilibrium and static balancing, the Oscillation Amplitude of fracturing pump, and even the Oscillation Amplitude of car load is all less, the advantage that working life of bent axle is longer.

The foregoing is only preferred embodiment of the present invention, not in order to limit the present invention, within the spirit and principles in the present invention all, any amendment done, equivalent replacement, improvement etc., all should be included within protection scope of the present invention.

Patent Citations (6)

| Publication number             | Priority date | Publication date | Assignee         | Title                                                           |
|--------------------------------|---------------|------------------|------------------|-----------------------------------------------------------------|
| <a href="#">US6007305A</a> *   | 1996-12-19    | 1999-12-28       | Caterpillar Inc. | Internal combustion engine with integral crankshaft driven pump |
| <a href="#">CN102628438A</a> * | 2012-04-06    | 2012-08-08       | 宝鸡石油机械有限责任公司     | Five-cylinder plunger pump crankshaft structure                 |
| <a href="#">CN103557131A</a> * | 2013-10-10    | 2014-02-05       | 浙江大学             | Multi-row-type fracturing pump                                  |
| <a href="#">CN203783839U</a> * | 2013-12-30    | 2014-08-20       | 三一重型能源装备有限公司     | Fracturing pump transmission system and fracturing truck        |
| <a href="#">CN204572381U</a> * | 2015-04-08    | 2015-08-19       | 鄞善县天川石油机械有限责任公司  | 700 type pump skids                                             |
| <a href="#">CN205025746U</a> * | 2015-10-08    | 2016-02-10       | 三一重型能源装备有限公司     | Fracturing pump and fracturing unit truck                       |
| Family To Family Citations     |               |                  |                  |                                                                 |

\* Cited by examiner, † Cited by third party

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| Publication number             | Priority date | Publication date | Assignee       | Title                                                                                                            |
|--------------------------------|---------------|------------------|----------------|------------------------------------------------------------------------------------------------------------------|
| <a href="#">CN110005357A</a> * | 2019-04-12    | 2019-07-12       | 西安科技大学         | A kind of anti-jamming hole anti-vibration anti-reflection device and vibration anti-jamming anti-jamming method |
| <a href="#">CN111425177A</a> * | 2020-04-30    | 2020-07-17       | 三一石油智能装备有限公司   | Fracturing pump and fracturing truck                                                                             |
| <a href="#">CN111441925A</a> * | 2020-04-03    | 2020-07-24       | 烟台杰瑞石油装备技术有限公司 | Light five-cylinder plunger pump                                                                                 |
| Family To Family Citations     |               |                  |                |                                                                                                                  |

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Similar Documents

| Publication                     | Publication Date | Title                                                             |
|---------------------------------|------------------|-------------------------------------------------------------------|
| <a href="#">CN209654022U</a>    | 2019-11-19       | A kind of hydraulic pressure drive injection device               |
| <a href="#">CN210769169U</a>    | 2020-06-16       | High-power five-cylinder plunger pump                             |
| <a href="#">CN110617318B</a>    | 2024-12-03       | A five-cylinder plunger pump with an integral power end structure |
| <a href="#">EP2205877B1</a>     | 2017-09-27       | Quintuplex mud pump                                               |
| <a href="#">US20210123425A1</a> | 2021-04-29       | High power quintuplex plunger pump                                |
| <a href="#">US20210123434A1</a> | 2021-04-29       | Multi-point supported five cylinder plunger pump                  |
| <a href="#">CN205025746U</a>    | 2016-02-10       | Fracturing pump and fracturing unit truck                         |
| <a href="#">US5246355A</a>      | 1993-09-21       | Well service pumping assembly                                     |
| <a href="#">US20040219040A1</a> | 2004-11-04       | Direct drive reciprocating pump                                   |
| <a href="#">CN201818454U</a>    | 2011-05-04       | Five-cylinder single-acting slurry pump                           |
| <a href="#">CN103742381B</a>    | 2016-05-25       | Fracturing pump system and fracturing unit truck                  |
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| <a href="#">CN205503376U</a>    | 2016-08-24       | Oil-field brine is handled and is used plunger pump               |

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| <a href="#">CN2924063Y</a>     | 2007-07-18 | Five-cylinder horizontal piston slurry pump                    |
| <a href="#">CN105134581A</a>   | 2015-12-09 | Fracturing pump and fracturing vehicle                         |
| <a href="#">CN203067205U</a>   | 2013-07-17 | Novel coal bed methane well fixing pump                        |
| <a href="#">CN113167260A</a>   | 2021-07-23 | Hydrogen Compressor                                            |
| <a href="#">CN203297049U</a>   | 2013-11-20 | Novel coal bed gas fracturing pump                             |
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| <a href="#">CN212717025U</a>   | 2021-03-16 | Seven-cylinder plunger pump                                    |
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| <a href="#">WO2022020980A1</a> | 2022-02-03 | Seven-cylinder plunger pump                                    |
| <a href="#">CN204900232U</a>   | 2015-12-23 | Plunger type fracturing pump and oil fracturing unit truck     |

Priority And Related Applications

Priority Applications (1)

| Application                       | Priority date | Filing date | Title                                               |
|-----------------------------------|---------------|-------------|-----------------------------------------------------|
| <a href="#">CN201510644006.7A</a> | 2015-10-08    | 2015-10-08  | A kind of fracturing pump and fracturing unit truck |

Applications Claiming Priority (1)

| Application                       | Filing date | Title                                               |
|-----------------------------------|-------------|-----------------------------------------------------|
| <a href="#">CN201510644006.7A</a> | 2015-10-08  | A kind of fracturing pump and fracturing unit truck |

Legal Events

| Date       | Code | Title                                                           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------|------|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2015-12-09 | C06  | Publication                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 2015-12-09 | PB01 | Publication                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 2016-01-06 | C10  | Entry into substantive examination                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 2016-01-06 | SE01 | Entry into force of request for substantive examination         |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 2017-01-18 | C41  | Transfer of patent application or patent right or utility model |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 2017-01-18 | TA01 | Transfer of patent application right                            | <b>Effective date of registration:</b> 20161228<br><b>Address after:</b> 102206 South Beijing city of Changping District science and Technology Park 31 manufacturing center of Beijing Liu Lu Li<br><b>Applicant after:</b> 31 petroleum Intelligent Equipment Co., Ltd.<br><b>Address before:</b> 102206 Changping District City, North Road, Beijing, the 31 Industrial Park<br><b>Applicant before:</b> SANY HEAVY ENERGY EQUIPMENT CO., LTD. |
| 2017-08-29 | GR01 | Patent grant                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 2017-08-29 | GR01 | Patent grant                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

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|----------------------------------------------------------------|----------------------|----|-------|
| ■ biological transmission                                      | claims,description   | 12 | 0.000 |
| ■ fuel tank                                                    | claims,description   | 4  | 0.000 |
| ■ lubrication                                                  | claims,description   | 3  | 0.000 |
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