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Erklärungen gemäß Regel 4.17:

— *hinsichtlich der Identität des Erfinders (Regel 4.17 Ziffer i)*

— *Erfindererklärung (Regel 4.17 Ziffer iv)*

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— *mit internationalem Recherchenbericht (Artikel 21 Absatz 3)*

[Fortsetzung auf der nächsten Seite]

(54) Title: PIN JOINT FOR AN ECCENTRIC SCREW PUMP

(54) Bezeichnung : BOLZENGELENK FÜR EINE EXZENTERSCHNECKENPUMPE

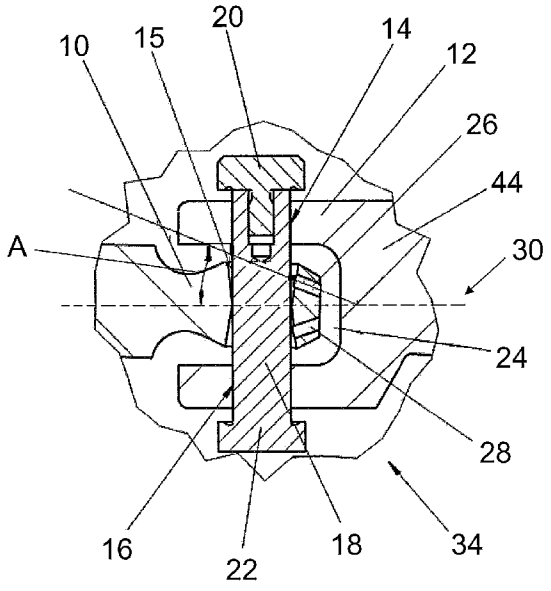

Fig. 2

(57) Abstract: The disclosure relates to a pin joint for eccentric screw pumps. The special design of the inner joint head of the pin joint, with its bores for the flushing liquid and the length of the joint pin, makes it possible also to carry out cleaning using the CIP method.

(57) Zusammenfassung: Die Offenbarung betrifft ein Bolzengelenk für Exzenterschneckenpumpen. Durch die besondere Gestaltung des inneren Gelenkkopfes des Bolzengelenks mit seinen Bohrungen für die Spülflüssigkeit und die Länge des Gelenkbolzens wird die Reinigung auch im CIP Verfahren ermöglicht.

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— *vor Ablauf der für Änderungen der Ansprüche geltenden Frist; Veröffentlichung wird wiederholt, falls Änderungen eingehen (Regel 48 Absatz 2 Buchstabe h)*

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PIN JOINT FOR AN ECCENTRIC SCREW PUMP

The invention relates to an open pin joint and a method for operating this pin joint for eccentric screw pumps in the hygiene sector. The joint has an inner and an outer joint head, wherein each joint head comprises at least one diametrical bore, which is penetrated by a pin which is provided at both ends with a cap in each case. The inner spherical joint head has a convex bore course in the region of the pin.

A pin joint for an eccentric screw pump emerges from DE 10 2006 058 166 A1. The pin joint is surrounded by a collar in order to keep the lubricant in the region of the joint. When the lubricant is replaced, the interior of the joints can also comprise a central lubricant channel per joint in order to remove the lubricant. Since the joint does not have to be completely cleaned for the replacement of lubricant, this design of the joint may be sufficient.

DE 101 16 641 A1 discloses a pin joint with a part of a drive shaft and a part of a coupling rod. An end region of the drive shaft is provided with a coaxial plug-in socket. The coupling pin of the coupling rod projects into this plug-in socket. For the cleaning of the interior of the plug-in socket, the wall of the latter comprises two diametrical flushing bores.

The problem of the present invention is to design a pin joint which can also be used for the hygiene sector, wherein attention is focused in particular on the difficult, but necessary cleaning of the bore of the inner joint head which accommodates a joint pin.

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The inventive technical solution to the problem may be achieved by a pin joint embodying the present invention. Developments of the invention are given in the dependent sub-claims.

Also described herein is a spherical joint head comprises at its end face at least two channels which are disposed eccentrically with respect to the longitudinal axis.

According to an aspect of the present invention, there is provided an open pin joint for an eccentric screw pump in the hygiene sector, with an inner and an outer joint head, wherein each joint head comprises at least one diametrical bore, which is penetrated by a pin which is provided at both ends with a cap in each case, wherein the inner joint head is provided at its end face with at least two channels, which are disposed eccentrically with respect to the longitudinal axis of a jointed shaft, wherein the channels each extend at an angle A of 10° to 30° from the longitudinal axis of a drive shaft in the direction of the outer side of the pin joint.

The cleaning liquid thus flows in the paraxial region of the drive shaft into the inner joint head and flows radially offset to the inlet at the inner side of the inner joint head. The cleaning of the joint or joints accordingly takes place radially from the longitudinal axis of the jointed shaft from the inner joint head to the outer joint head.

In order that the flushing liquid passes into every region of the gap between the pin and the inner and outer joint head, the pin extends in its length by at least 5% of the cap diameter beyond the external diameter of the outer joint heads. The effect of lengthening the pin is that the

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pin can move radially in the joint and a relative motion component thus results in the joint gaps, which leads to circulation of the cleaning liquid. The cross-section of the pin/pins is reduced compared to the cross-section of the bores.

For the further improvement of the flow of the cleaning liquid, the channels for the cleaning liquid are disposed in such a way that they each emerge in the case of the inner joint head in the region of the pin, in which region its bore diverges from the longitudinal axis of the jointed shaft radially in the direction of the respective outer joint head.

The cleaning of the open pin joint according to the invention takes place during the rotation of the joint or joints, wherein the flushing liquid exerts a radially acting pressure on the flushing liquid on account of the eccentric wobbling motion of the joint. The wobbling motion causes a constant reduction and increase in the cylindrical annular space between the pin and the bore of the inner joint head. Each joint head connection thus represents its own pump for the flushing liquid. Since the flushing liquid is introduced eccentrically into the joint, where the gap between the joint head and the pin is at its smallest, the quantity of flushing liquid corresponding to the pin joint according to the invention is much greater per unit of time. The flushing liquid is displaced from the inner region into the outer region of the pin joint.

The invention is described, by way of non-limiting example only, with reference to the accompanying drawings, as set out below.

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In the figures:

Fig. 1 shows an eccentric screw pump with two open pin joints in accordance with an embodiment of the present invention.

Fig. 2 shows a detail with a pin joint with flushing liquid bores according to an embodiment of the present invention.

Fig. 3 shows a detail with a pin joint with parallel flushing liquid bores according to an embodiment of the present invention.

Fig. 4 shows a plan view of the pressure flange of the eccentric screw pump according to an embodiment of the present invention.

Fig. 1 shows an eccentric screw pump 36 with a stator 38 in which a rotor 40 is located. Rotor 40 moves eccentrically in stator 38 and, for this purpose, is connected via a jointed shaft 42 to an intermediate shaft 44, and the

latter to drive shaft 46 of a drive (not represented). A pressure flange 48 sits on one end of the stator, said pressure flange being clamped with pump housing 52 by means of screws 50. Suction port 54 sits on the upper side of pump housing 52, via which suction port the medium to be conveyed enters into pump housing 52.

Suction port 54 is located in the immediate vicinity of sealing housing 56 and seal 58, which can be embodied as a slip-ring seal. Suction port 54 is disposed tangential to or on pump housing 52. Seal 58 sits on intermediate shaft 44, which is rigidly connected to drive shaft 46. Jointed shaft 42 is connected non-rotatably by joints, here pin joints 34, both to intermediate shaft 42 and also to rotor 40.

A variant of a pin joint 34 is represented in fig. 2. The example shows an inner joint head 10 and an outer joint head 12. Both joint heads 10, 12 are provided with bores 14, 15, 16, through which a pin 18 extends. The pin is constituted cylindrical between its caps 20, 22. Bore 15, on the other hand, is rounded inwardly in a convex manner in the region of the pin, so that the course of the bore diverges from inside outwards, i.e. widens. This widening of bore 15 gives pin 15 the necessary freedom of movement with respect to inner joint head 10. When pin joint 34 rotates, inner joint head 10 performs a wobbling motion which arises due to eccentrically rotating rotor 40, which transmits this motion via the jointed shaft to the two pin joints 34.

Two channels 26, 28 begin at end face 24 of inner joint head 10, said channels extending into diametrical bore 15. Flushing liquid passes through these bores from the pump housing in a targeted manner into bore 15 and here removes residues of the conveyed medium. Since the bores do not run centrally along longitudinal axis 30 of intermediate shaft

44, but at an angle A of 10° to 30°, this radially directed flow assists removal from or cleaning of bore 15. On account of the wobbling motion of joint head 10, the radially widening inner faces of bore 15 push the flushing liquid out of the internal region of joint head 10. The channels in head end 60 of the joint head emerge, at a distance from longitudinal axis 30, in the region of bore 15 in the already diverging surface region.

A further possibility for cleaning a pin joint with flushing liquid is represented in fig. 3. Here too, joint head 10 comprises a diametrically running bore 15 and, in this example of embodiment too, bore 15 widens from longitudinal axis 30 radially in the direction towards outer joint head 12. Bores 26, 28 run parallel to longitudinal axis 30 of joint head 10 and intermediate shaft 44. Channels 26, 28 emerge inside bore 15 in the joint head 10 in the region of bore 15 which widens radially in the direction towards outer joint head 12. The circulation of the flushing liquid in the region of diametrical bore 15 is achieved by the motion of pin 18. Pin 18 comprises two caps 20, 22 which, depending on the position of pin joint 34, lie adjacent to the respective upper side of pin joint 34. As a result of the relative motion of pin 18 along its longitudinal axis, the gaps in bores 14, 16 are also flushed. Cap 20 is part of a screw which is part of pin 18.

A plan view of pressure flange 48 of the eccentric screw pump 36 is reproduced in fig. 4. Tangentially disposed suction port 54 in the pump housing can also be seen from this view. As a result of this tangential arrangement of the suction port, the flushing liquid acquires, upon the entry into the pump housing, also referred to as the pump inlet housing, a swirling flow component and therefore, already in the inlet region, flushes the inner side of the

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pump housing up to outlet 62 along a self-generating helical flow.

The reference in this specification to any prior publication (or information derived from it), or to any matter which is known, is not, and should not be taken as an acknowledgment or admission or any form of suggestion that that prior publication (or information derived from it) or known matter forms part of the common general knowledge in the field of endeavour to which this specification relates.

While various embodiments of the present invention have been described above, it should be understood that they have been presented by way of example only, and not by way of limitation. It will be apparent to a person skilled in the relevant art that various changes in form and detail can be made therein without departing from the spirit and scope of the invention. Thus, the present invention should not be limited by any of the above described exemplary embodiments.

Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", and variations such as "comprises" and "comprising", will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of integers or steps.

List of reference numbers

10	joint head
12	joint head
14	bore
15	bore
16	bore
18	pin
20	cap
22	cap
24	end face
26	channel
28	channel
30	longitudinal axis
34	pin joint
36	eccentric screw pump
38	stator
40	rotor
42	jointed shaft
44	intermediate shaft
46	drive shaft
48	pressure flange
50	screws
52	pump housing
54	suction port
56	sealing housing
58	seal
62	outlet
64	axis

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. An open pin joint for an eccentric screw pump in the hygiene sector, with an inner and an outer joint head, wherein each joint head comprises at least one diametrical bore, which is penetrated by a pin which is provided at both ends with a cap in each case, wherein the inner joint head is provided at its end face with at least two channels, which are disposed eccentrically with respect to the longitudinal axis of a jointed shaft, wherein the channels each extend at an angle A of 10° to 30° from the longitudinal axis of a drive shaft in the direction of the outer side of the pin joint.

2. An open pin joint according to claim 1, wherein the pin extends by at least 5% of the cross-section of caps 20, 22 beyond the outer joint heads of the pin joint 32.

3. An open pin joint according to claim 1 or 2, wherein the cross-section of the pin is smaller than the diametrical bores of the joint heads and is therefore mobile in the bore.

4. An open pin joint according to any one of claims 1 to 3, wherein the channels emerge into a region between the inner joint head and the pin in which surfaces of the inner joint head diverge in the direction of the outer joint head.

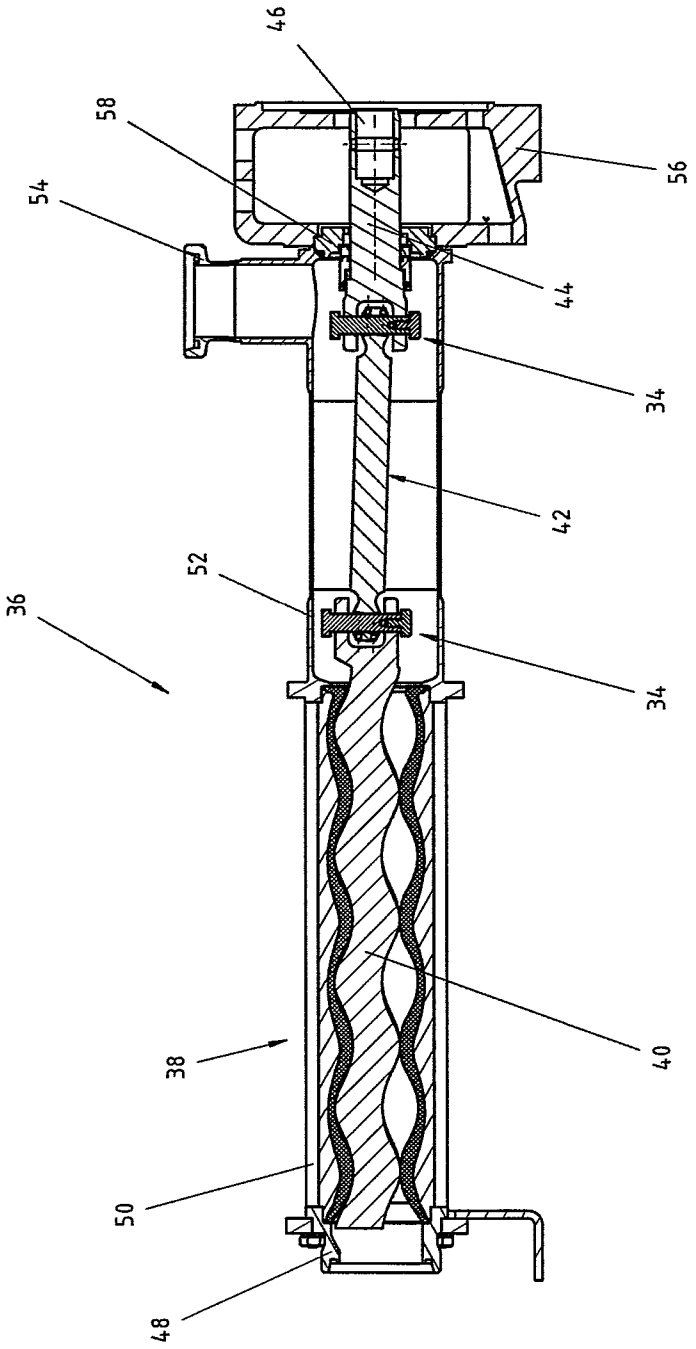

Fig.1

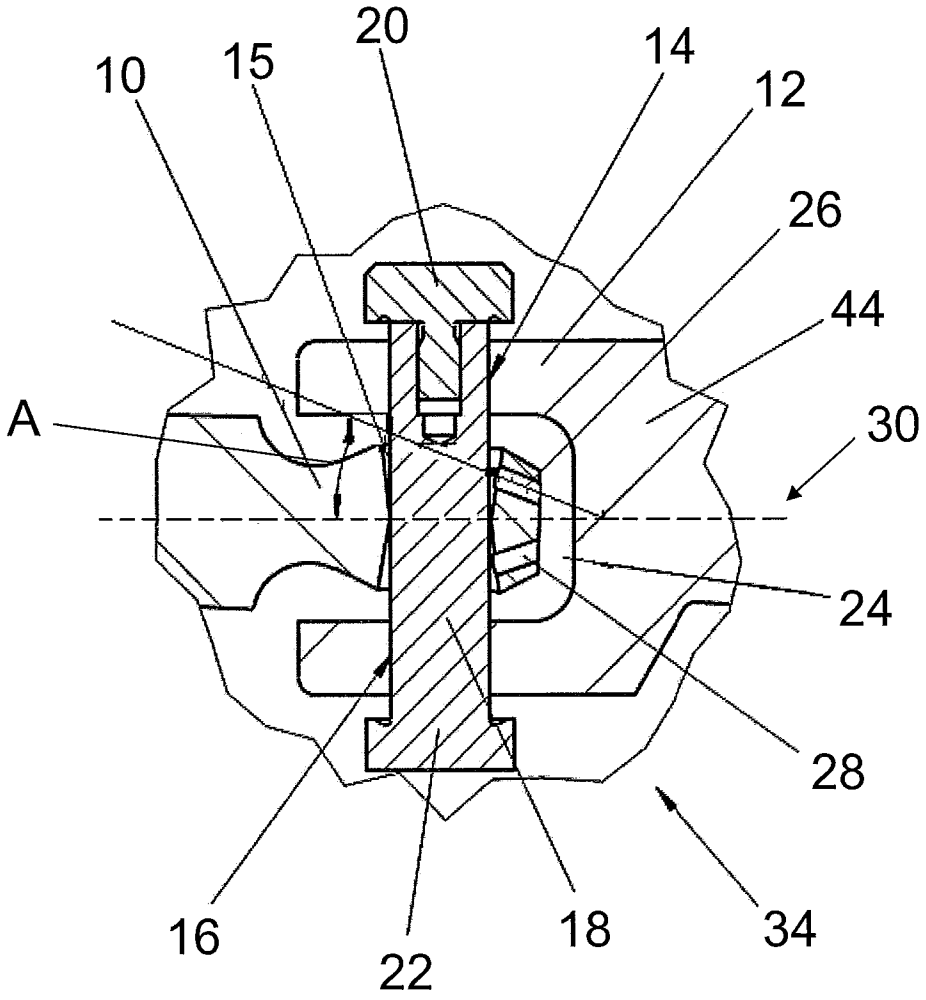

Fig. 2

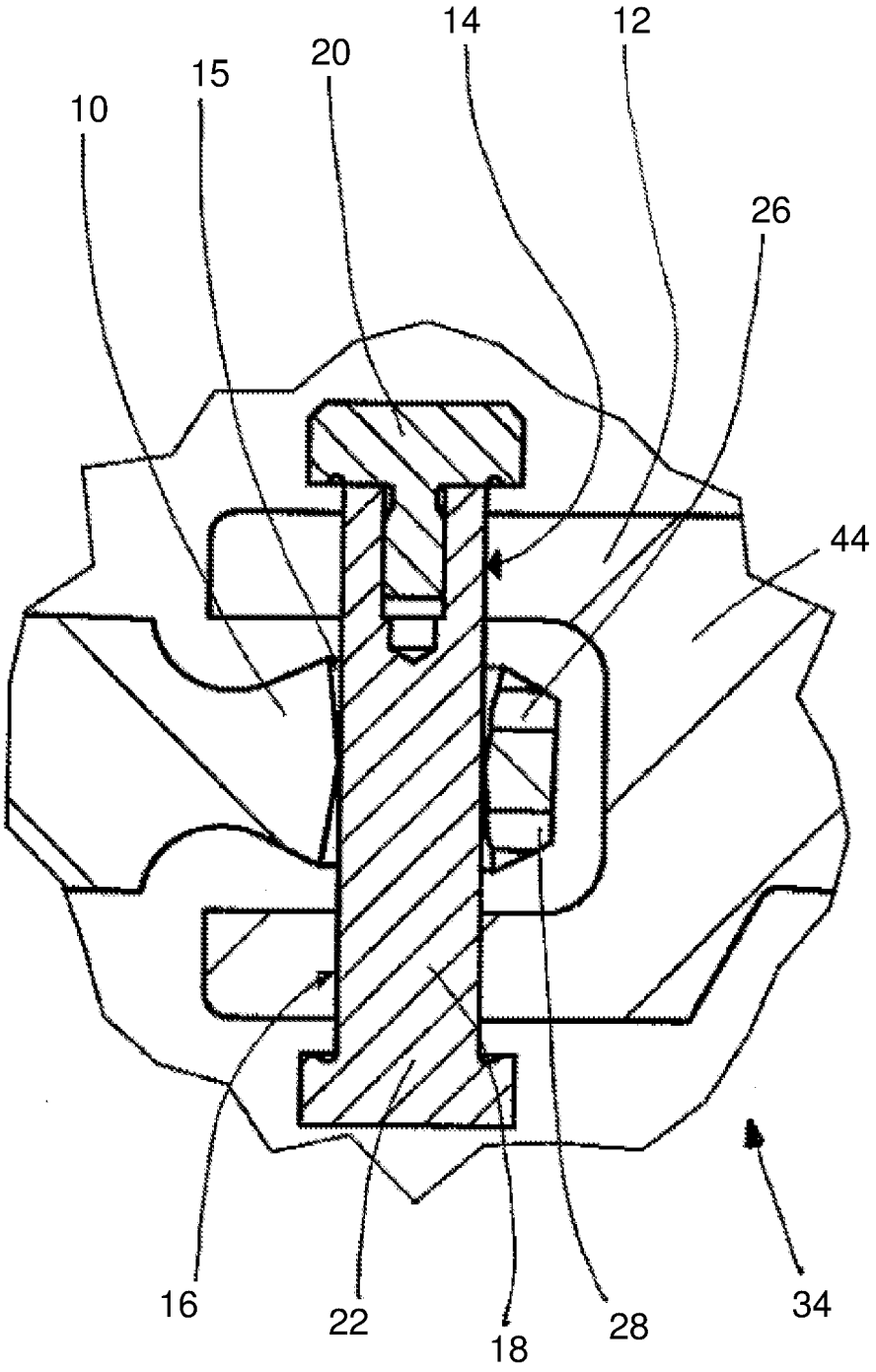

Fig. 3

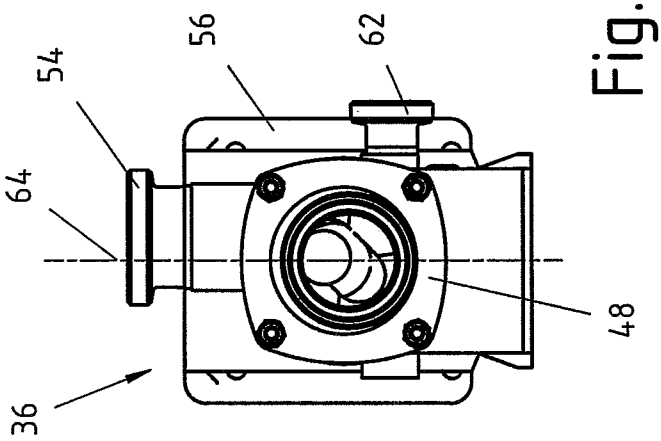

Fig.4