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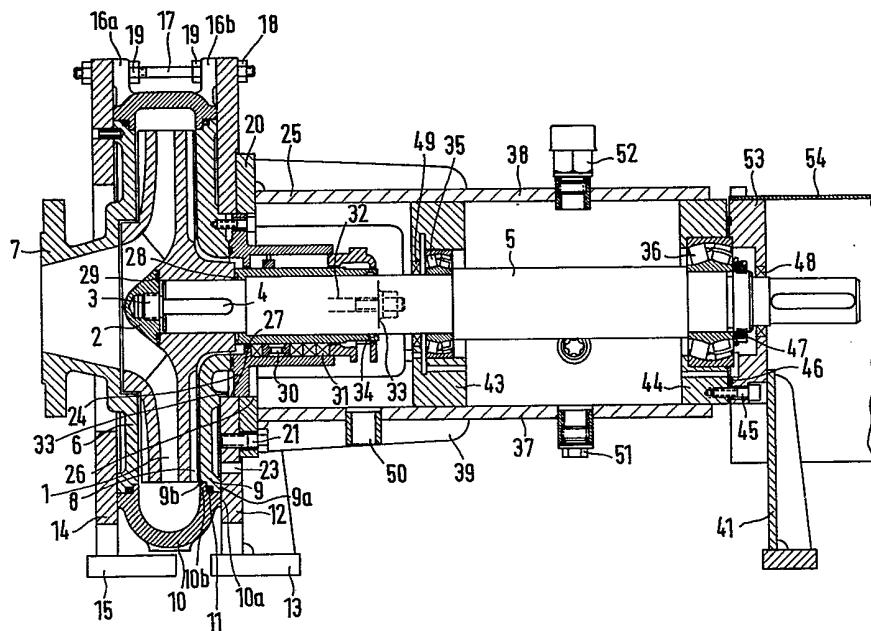
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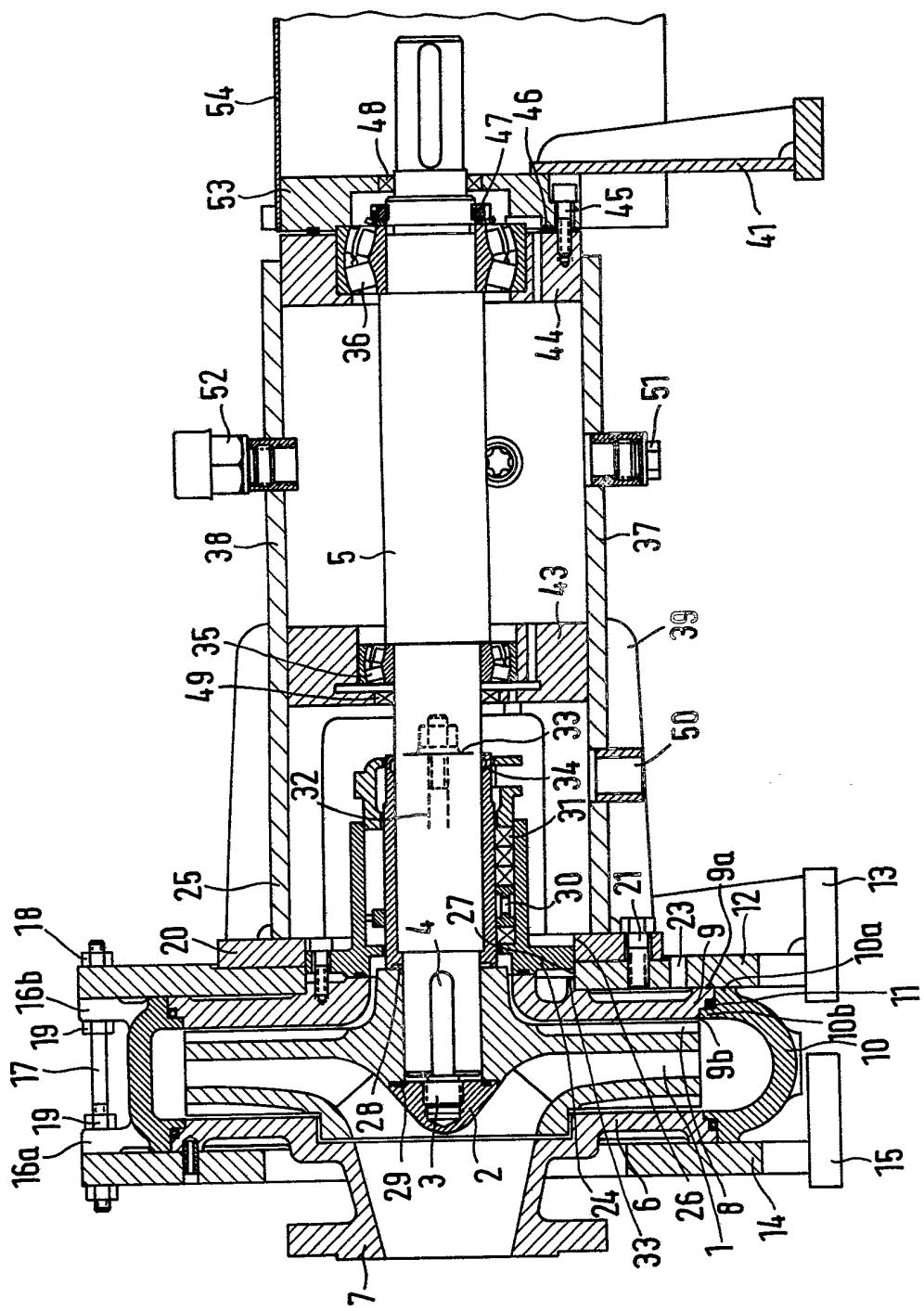
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(54) Centrifugal pumps

(57) The pump comprises an impeller 1 mounted on a shaft 5 in bearings 35, 36 and a casing including wear plates 6, 9 clamped between retaining plates 14, 12 by bolts 17. The retaining plates are provided with feet 13, 15 for mounting the pump on a bed. The impeller may be dismounted from the shaft via the front of the pump by removing the retaining plate 14 or via the rear of the pump by releasing the bolts 17 and withdrawing the impeller, shaft, bearing housing and plates 9, 12 as a unit from the spiral casing 10. The pump may be used in coal washing, ore mining or flue gas desulphurizing.



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SPECIFICATION

Centrifugal pump

5 The invention relates to a centrifugal pump, particularly for delivering wash water in dressing plants for minerals such as coal, flue-gas desulphurizing plants or the like, having an overhung impeller, the shaft of which is sealed, at the impeller side via a seal in a shaft 10 sealing sleeve, is mounted in two rolling bearings and which comprises a spiral casing clamped between two retaining plates and adjacent to parallel wearing walls at the exterior thereof—without being screwed to these.

15 Pumps of the above-mentioned kind are used for the delivery of solid slurries in dressing plants for minerals, flue-gas desulphurizing plants etc. A known pump of this type is described, for example, in the DE-OS 27 19 168.

20 The invention seeks to provide a pump which, like the known pump, comprises retaining plates for the hydraulic part, but is lighter in construction and more economical to manufacture than the known pump. In addition, the invention also seeks to provide a

25 construction of a pump wherein the impeller can be dismounted without the pump intake and/or pressure connection having to be undone, that is to say the impeller should be able to be dismounted selectively towards the front or the rear, without the spiral casing 30 having to be dismounted.

According to the invention, there is provided a centrifugal pump, comprising an overhung impeller, the shaft of which is sealed, at the impeller side, by a seal in a shaft sealing sleeve, is mounted in two rolling 35 bearings and which comprises a spiral casing which is clamped between two retaining plates and which is adjacent to parallel wearing walls external thereto—without being screwed to these,—wherein the retaining plates are constructed in the form of a

40 two-part housing stand for the hydraulic part. Thus it is possible, in an advantageous manner, to construct the pump to be light as a whole and to enable the impeller to be dismounted without the spiral casing having to be moved. Thus the pressure 45 connection does not have to be undone when dismounting the impeller towards the front or the rear.

The impeller shaft may be mounted in a bearing carrier comprising two bush members and made in the form of a welded structure. Thus a not inconsiderable reduction in cost results also with regard to the bearing carrier in comparison with the known pump.

The bearing carrier may comprise an end flange which is connected by bolting to the rear housing stand member. Thus, for dismounting the impeller 55 towards the rear, it is easily and simply possible to separate the bearing carrier from the stand member by undoing a few screws.

The end flange may comprise an inner recess which has the same diameter as an inner recess in the rear 60 housing stand member, a common retaining flange, which preferably forms part of the shaft sealing sleeve, disposed in the inner recesses of the stand member and of the end flange. Thus an optimum connection of bearing carrier and housing stand is 65 possible with a satisfactory guiding of the two parts in

relation to one another and the said possibility also results of a rapid dismounting of the bearing carrier by simply undoing screws, in order to be able to dismount the impeller towards the rear. At the same 70 time, provision is made for a satisfactory central guiding of the impeller shaft in the bearing carrier and in the rear housing stand member in operation.

The wearing wall may form a casting with the pump intake which is preferably constructed in the form of a 75 diffuser. Thus a simpler design of the suction side of the pump results in comparison with the known construction. The assembly times are shortened and the number of individual parts and the weights are reduced.

80 The housing stand members may be constructed in the form of plane plates with a smooth clamping surface for the spiral casing and the wearing walls. Thus particularly economical smooth housing stand members result.

85 The rear wearing wall may comprise a cast-on ring which engages in the inner recess in the rear housing stand member. Thus a simple, reliable centring of the rear wearing wall results which further renders it possible, in an advantageous manner, to keep the 90 spiral casing centres between the housing stand members via this wearing wall at the bearing-carrier side.

The spiral casing may be held by the housing stand members via smooth clamping surfaces. A particularly simple construction of the console members results through this measure, which leads to a manufacture of the centrifugal pump which is very economical as a whole.

The spiral casing may comprise holding lugs— 100 preferably cast on—facing radially outwards. It is possible, in an advantageous manner, to bolt the spiral casing and the housing stand members simply to one another, at the outside, via the holding lugs. So long as at least one housing stand member remains in 105 its position, then the spiral casing is also held in position, so that a rapid and simple remounting of the removed parts is possible.

The wearing walls may comprise a recess at the outside, in which corresponding rings of the spiral 110 casing engage. Thus a satisfactory, laterally guided connection of the wearing walls to the spiral casing results, without the system of unit-construction-like assembly of the individual parts of the centrifugal pump being lost.

115 A seal—particularly in the form of a concealed O-ring seal—may be disposed at the radial recess in the wearing walls. Thus a particularly favourable, simple sealing of the spiral casing results, which certainly does not allow any escape of the liquid being 120 delivered, to the outside, despite the spiral casing being only clamped. The seal can be fully protected by the construction and is then not subject to abrasive stress.

The wearing walls and the spiral casing may have 125 bearing shoulders, which locate the spiral casing, to bear against the housing stand members. This measure also serves the easy and rapid assembly, in an advantageous manner, combined with low manufacturing costs.

130 The impeller may have long rear blades. Thus a

relief of the impeller shaft seal results. The liquid being delivered is almost without pressure in the region of the impeller shaft and a suction effect out of the stuffing box can even be achieved.

5 The housing stand members may be bolted to one another in a manner known per se, by bolts outside on the spiral casing. Thus a particularly simple possibility results for the mounting and/or dismounting of the front and rear housing stand members, the spiral 10 casing and the wearing walls. In this case, it is a particular advantage that the holding lugs of the spiral casing can also be connected to the housing stand members by the same bolts.

Finally, the pump may have a coupling protection 15 sleeve. Thus an improvement in the possibilities for using the pump results.

The invention will now be described in greater detail, by way of example, with reference to the drawing the single figure of which is a sectional view 20 of one form of centrifugal pump in accordance with the invention.

In the drawing 1 designates the impeller with rear blades 8. The impeller 1 is pushed onto the shaft 5 and keyed thereto, for torque transmission, by a key 4. The 25 impeller 1 is held axially by a shaft nut 2 which is screwed onto the shaft end 3 provided with a thread. In order to prevent liquid from penetrating past the shaft nut into the region between the shaft 5 and the impeller 1, a seal 20, preferably an O-ring seal, is 30 disposed behind the shaft nut 2.

Extending externally round the impeller 1 is a spiral 35 casing 10 with holding lugs 16a and 16b, the number of which amounts to 2 or a multiple thereof and which are pushed onto the holding bolts 17. The holding bolts 17, which normally only have external nuts 18, comprise an extended thread, in this situation, to hold the lugs 16a and 16b, so that the spiral casing is secured to retaining plates 12, 14 (forming a housing stand) is possible by nuts 19 via the bolts 17 and the 40 holding lugs 16a and 16b.

The wearing walls 6 and 9 are disposed at each side of the impeller 1. The wearing wall 6 is made integral with a diffusor 7 and is pinned to the housing stand plate 14 which has the shape of a plane plate with a 45 welded-on foot.

Disposed between the spiral casing 10 and the wearing walls 6 and 9 are O-ring seals 11 which prevent liquid being delivered from being able to pass through the gap between the wearing walls 6 and 9 50 and the spiral casing 10. The seal is disposed, in a completely protected manner, in recesses, but nevertheless it permits an easy and simple mounting and dismounting of the wearing walls and of the spiral casing. The retaining plates 12 and 14 comprise feet 13 55 and 15 so that the housing stand of the centrifugal pump can be connected to a bed, easily and simply, via bores (not shown) in the feet.

The retaining plate 12 is connected, via the screws 21, to a flange 20 which has the same internal 60 diameter 26 as the rear retaining plate 12 so that a joint centring is effected via the flange 24. The flange 20 is rigidly connected to half bushes 37 and 38 of a bearing carrier and causes the centring of the bearing carrier in relation to the rear retaining plate 12.

65 The wearing wall 9 has, at its inner diameter at the

bearing-carrier side, seals 27 which are preferably likewise constructed in the form of O-rings and prevent liquid from being able to pass between the wearing wall 9 and the shaft sealing sleeve or the like 70 25.

Another O-ring seal 28 ensures the sealing of the rear space of the impeller 1 with respect to the shaft 5. The sealing of the shaft 5 towards the bearings 35 and 36 is effected either with the seal shown below the 75 shaft, via packing 31 and the ring 30 or—with the seal shown above the shaft 5—with a sliding-ring seal 26. The seals are disposed on a shaft protection sleeve 24. When packings are used, tension bolts 32 are used which act on a gland 33 with integrated spray protection.

A socket 50 is provided to draw off any leakage water. Reinforcing corners 39, which rigidly connect the two parts 37 and 38 of the bearing carrier to the flange 20, serve for stiffening as well as for connection 80 to the flange 20.

The shaft 5 runs in the bearings 35 and 36 which are preferably constructed in the form of self-aligning roller bearings. The bearings 35 and 36 are sealed off from the outside via spring-loaded leather seals 48 90 and 49.

Furthermore, the two half bushes 37 and 38 have valves 51 and 52 through which the bearing-carrier housing can be filled or emptied. At the drive side, the bearing 36 is located via the shaft nut 47 which is 95 covered externally by a bearing cover 53. This is screwed to the bearing carrier by screws 45.

Although the pump described already can be securely located by bolting the feet 13 and 15, it preferably also comprises an additional foot 41 which 100 is rigidly welded to the bearing cover 53. This ensures that the feet 13 and 15 and the additional foot 41 are satisfactorily in alignment. The result is a particularly stable construction of the pump according to the invention which further renders it possible to use 105 standardized bed dimensions.

The ability to dismount the impeller at both sides can be clearly seen from the drawing. If dismounting towards the front, that is to say at the suction side, is necessary, the suction line is first undone, then the 110 front retaining plate 14 is removed and the pump intake 7 with the front wearing wall 6 is withdrawn towards the front. Then, after releasing the shaft nut 2, the impeller can be unscrewed from the impeller shaft 5 and taken out. In the event of dismounting towards 115 the rear, the screws 17 are first released, after which the complete bearing carrier with the rear retaining plate 12, the wearing wall 9 and the impeller 1 with the impeller shaft 5 can be withdrawn from the spiral casing 10 which is still rigidly connected to the front 120 retaining plate 14 with the foot 15. In the course of this, disconnection of the suction line is no more necessary than disconnection of the pressure line at the spiral casing 10.

The pump according to the invention has been 125 designed specially for the delivery of media with light solid loading in coal washing plants, for ore mining and for flue-gas desulphurizing plants; without departing from the scope of the invention, however, it can equally well be used for all other media laden with solids or even for pure water.

CLAIMS

1. A centrifugal pump comprising an overhung impeller, the shaft of which is sealed, at the impeller side, by a seal in a shaft sealing sleeve, is mounted in two rolling bearings and which comprises a spiral casing which is clamped between two retaining plates and which is adjacent to parallel wearing walls external thereto—without being screwed to these—wherein the retaining plates are constructed in the form of a two-part housing stand for the hydraulic part.
2. A centrifugal pump as claimed in claim 1, wherein the impeller shaft is mounted in a bearing carrier which comprises two bush members and which is made in the form of a welded structure.
3. A centrifugal pump as claimed in claim 2, wherein the bearing carrier comprises an end flange which is connected by bolting to the rear housing stand part.
4. A centrifugal pump as claimed in claim 3, wherein the end flange has an inner recess which has the same diameter as an inner recess in the rear housing stand part.
5. A centrifugal pump as claimed in claim 4, wherein disposed in the inner recess and of the rear housing stand part and of the end flange, is a common retaining flange.
6. A centrifugal pump as claimed in claim 5, wherein the common retaining flange forms part of the shaft-sealing sleeve.
7. A centrifugal pump as claimed in any one of claims 1 to 6, wherein the wearing wall at the suction side forms casting with the pump intake.
8. A centrifugal pump as claimed in claim 7, wherein the pump intake is constructed in the form of a diffusor.
9. A centrifugal pump as claimed in any one of claims 1 to 7, wherein the housing stand parts are constructed in the form of plane plates with a smooth clamping surface for the spiral casing and the wearing walls.
10. A centrifugal pump as claimed in any one of claims 7 to 9, wherein the rear wearing wall comprises a cast-on ring which engages in the inner recess of the rear console housing stand part member.
11. A centrifugal pump as claimed in any one of claims 1 to 10, wherein the spiral casing is held by the housing stand parts via smooth clamping surfaces.
12. A centrifugal pump as claimed in any one of claims 1 to 11, wherein the spiral casing comprises holding lugs facing radially outwards.
13. A centrifugal pump as claimed in claim 12, wherein the holding lugs are cast on.
14. A centrifugal pump as claimed in any one of claims 1 to 13, wherein the wearing walls comprise, externally at the impeller side, a recess in which corresponding rings of the spiral casing engage.
15. A centrifugal pump as claimed in claim 14, wherein a seal is disposed at the radial recess of the wearing walls.
16. A centrifugal pump as claimed in claim 14, wherein the seal is in the form of a concealed O-ring seal.
17. A centrifugal pump as claimed in claim 14, 15 or 16, wherein the wearing walls and the spiral casing have bearing shoulders locating the spiral casing to bear against the housing stand.
18. A centrifugal pump as claimed in any one of claims 1 to 17, wherein the impeller comprises long rear blades.
19. A centrifugal pump as claimed in any one of claims 1 to 18, wherein the housing stand parts are bolted to one another by bolts externally on the spiral casing.
20. A centrifugal pump as claimed in any one of claims 1 to 19, wherein a coupling protection is provided.
21. A centrifugal pump substantially as described herein with reference to the drawing.

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