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(54) **PULP PUMP**

ZELLSTOFFPUMPE

POMPE A PATE A PAPIER

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Description

[0001] This invention relates to a centrifugal pump for pulp suspensions of lignocellulosic material as defined in the preamble of claim 1. Such a pump is known eg from any of EP-A-0 474 478 or WO 93/11359. The invention, more precisely, relates to a pump where gas, such as air, can be separated from the pulp in the pump.

[0002] Gas following along with the pulp causes problems at pumping by centrifugal pumps. The gas in the pulp is collected to bubbles, which are accumulated in front of the impeller and thereby deteriorate the capacity of the pump. This problem can be overcome by evacuating the gas from the space in front of the impeller, for example by means of vacuum pumps of the kind of liquid-ring pumps. Such a pump can be a separate vacuum pump, the suction pipe of which is connected to the sealing space of the pulp pump, or it can be formed with a separate vacuum impeller in the form of a liquid-ring impeller, which is mounted on the shaft of the pulp pump, so that for both impellers a common operation is obtained.

[0003] In cases where a separate vacuum pump is used, the pulp pump becomes relatively complicated and expensive, because the system comprises more components compared to a pulp pump, where the vacuum impeller is mounted on the shaft of the pulp pump.

[0004] SE patent specification 502127 and EP patent specification 298949 describe embodiments of pulp pumps where the vacuum impeller is mounted on the shaft of the pulp pump. At, for example, the control of the capacity of the vacuum pump by adjustable throttling or re-setting the eccentricity of the vacuum pump housing, as shown in SE 502127, several movable parts are required in the pump housing. This requires more or less extreme designs with the risk of faulty functioning. The maintenance, furthermore, will be more complicated and expensive. In cases when the vacuum pump is controlled by means of additional air, as shown in EP 298949, a great amount of air is supplied to a pump system, at which the intention is, that air should be removed therefrom.

[0005] WO 95/15439 discloses a vacuum pump in which the vacuum function can be temporarily shut off by means of a valve. EP 0 474 478 discloses a combined centrifugal and vacuum pump where an intermediate wall separates the centrifugal pumping chamber and the vacuum pump, the intermediate wall being provided with a non-annular opening for providing a passageway between the pumping chamber and the vacuum pump. In EP 0 148 069, a basic liquid-ring pump is shown having an inlet for gas and an outlet for gas located on the same side of its housing. WO 93/11359 describes a conventional pump with built-in vacuum pump, where the vacuum impeller is mounted on the shaft of the pulp pump.

[0006] In conventional built-in vacuum pumps liquid, which is required for their function, operation, control and sealing, is supplied separately on both sides of the vacuum pump for the said purposes. This implies two con-

nections for liquid and, on the whole, higher liquid addition.

[0007] The present invention implies that the aforesaid problems can be eliminated. The manufacture and maintenance costs for the pulp pump, for example, can be reduced. The need of liquid for the operation is decreased, and control and sealing of the vacuum pump can be carried out more simply. The need of air to be added to the pump can be reduced substantially.

[0008] According to the invention, the pulp pump is formed with an integrated vacuum pump, where the gas inlet and gas outlet are located on one side of the vacuum pump housing and the respective inlet and outlet are in controllable connection with each other. Only one liquid inlet must be connected to the sealing, which in its turn supplies operational liquid to the vacuum pump. The characterizing features of the invention are defined in the attached claims.

[0009] The invention is described in greater detail in the following, with reference to the accompanying Figures illustrating an embodiment of the invention.

Fig. 1 is a cross-section of a centrifugal pump according to the invention;

Fig. 2 shows schematically the coupling between gas inlet and gas outlet to and from the vacuum pump.

[0010] The centrifugal pump shown comprises a pump housing 10 with an inlet 11 and an outlet 12 for the pulp suspension. Such pumps are used at relatively high pulp concentration, for example 6-18%. On a rotary shaft 13 in the pump housing 10 an impeller 14 is mounted, the pump blades 15 of which extend from a hub 16 outward along a wheel disk 17. On the rear side of the wheel disk 17 back blades 18 are located. The wheel disk 17 further is formed with openings 19 for the discharge of gas collected in front of the impeller.

[0011] Behind the impeller 14 a vacuum impeller with vacuum impeller blades 20 is located, which impeller is surrounded by a vacuum pump housing 21. This vacuum pump housing 21 comprises an outer cylindric wall 22, a rear wall 23 and a front wall 24. The cylindric wall 22 is eccentric in relation to the vacuum impeller blades 20, so that a liquid ring pump is formed. In the front wall 24 a suction port 25 for gas and an exhaust port 26 for gas are located. These ports 25,26 are placed at a distance from each other in the circumferential direction counted for gas suction into the vacuum pump housing and, respectively, gas exhaust from the vacuum pump housing. This effect is brought about in a manner known per se by the rotation of the vacuum impeller blades and the volume variation in the circumferential direction of the vacuum pump housing as a consequence of the eccentric position of the cylindric wall 22.

[0012] The exhaust port 26 communicates with a chamber 27 for gas evacuation through a gas outlet 28. On the rear side of the impeller 14 between the wheel disk 17 and front wall 24 of the vacuum pump housing a

gas passage 29 for communication between the openings 19 in the wheel disk 17 and suction port 25 is located.

[0013] Behind the rear wall 23 a sealing housing 30 with a shaft sealing 31 for the vacuum pump and pulp pump is located. The sealing is intended to be flown through by liquid, which is supplied via a liquid inlet 32. The sealing housing 30 communicates also with the vacuum pump housing 21 for the supply of liquid from the sealing to the vacuum pump.

[0014] By using a common liquid inlet 32 for the sealing 31 and vacuum pump housing 21, the liquid amount can be restricted without problems. Only one liquid connection is required. The pressure difference arising between the sealing housing 30 and vacuum pump housing implies a barrier for flow in the opposite direction, i.e. only clean water will be found in the surrounding of the sealing.

[0015] The suction port 25 and exhaust port 26 of the vacuum pump housing are in controllable connection with each other, for example via an overflow channel 35 with a device 36 for vacuum control. By means of this control device 36 the connection between the suction and exhaust side can be controlled without the use of air addition from the outside in order to prevent that pulp suspension is sucked into the vacuum pump, if the pressure would be much too low. Instead of air addition from the outside, thus, a portion of the air is used which already has been sucked out of the pulp pump for the control. This implies a pump system with less air flows. At the same time the design is simpler and easier to control. The control device 36 can be a valve in the overflow channel 35, for example of the kind on/off, a throttle valve or the like. The control device can be controlled by signals from the system in a suitable way known per se.

[0016] The invention, of course, is not restricted to the embodiment shown, but can be varied within the scope of the claims with reference to the description and Figures.

Claims

1. A centrifugal pump for pumping a pulp suspension while simultaneously conducting gas away from the suspension, comprising a pump housing (10) with an inlet (11) and an outlet (12) for the pulp suspension and an impeller (14) mounted on a rotary shaft with pump blades (15), which extend from a hub (16) outward along a wheel disk (17), and openings for conducting away the gas formed in the wheel disk, and a vacuum impeller with vacuum impeller blades (20) surrounded by a vacuum pump housing (21) with a sealing (31) to the shaft, **characterized in that** a suction port (25) and, respectively, exhaust port (26) for gas to and, respectively, from the vacuum pump housing (21) are located on one side of the vacuum pump housing closest to the impeller (14), and that a liquid inlet (32) is connected to a sealing housing (30) for the sealing (31) on the other

side of the vacuum pump housing (21), and that the sealing housing in its turn communicates with the vacuum pump housing (21) for the supply of liquid to the vacuum pump housing via the sealing and **in that** the suction port (25) and exhaust port (26) of the vacuum pump housing (21) are in controllable connection with each other by means of a channel (35) with a valve (36) for controlling the vacuum in the vacuum system.

Patentansprüche

1. Zentrifugalpumpe zum Pumpen einer Pülpeaufschlammung, wobei simultan Gas aus der Aufschlammung abgeleitet wird, umfassend ein Pumpengehäuse (10) mit einem Einlass (11) und einem Auslass (12) für die Pülpeaufschlammung und einem Flügelrad (14), das an einer Drehwelle mit Pumpenblättern (15) befestigt ist, die sich von einer Nabe (16) nach außen entlang einer Radscheibe (17) erstrecken, mit Öffnungen, um das in der Radscheibe gebildete Gas wegzuführen und mit einem Vakuum-Flügelrad mit Vakuum-Flügelblättern (20), die von einem Vakuum-Pumpengehäuse (21) mit einer Dichtung (31) gegenüber dem Schaft umgeben sind, **dadurch gekennzeichnet, dass** eine Saugöffnung (25), und eine Auslassöffnung (26), für Gas in das, beziehungsweise aus dem, Vakuum-Pumpengehäuse (21) an der Seite des Vakuum-Pumpengehäuses, das am nächsten zum Flügelrad (14) angeordnet ist, vorgesehen sind, und dass ein Flüssigkeitseinlass (32) mit einem Dichtgehäuse (30) zum Abdichten (31) auf der anderen Seite des Vakuum-Pumpengehäuses (21) verbunden ist, und dass das Dichtungsgehäuse seinerseits mit dem Vakuum-Pumpengehäuse (21) für die Zufuhr von Flüssigkeit zum Vakuum-Pumpengehäuse über die Dichtung kommuniziert, und **dadurch**, dass der Saugöffnung (25) und die Auslassöffnung (26) des Vakuum-Pumpengehäuses (21) miteinander über einen Kanal (35) mit einem Ventil (36) in kontrollierbarer Verbindung zur Kontrolle des Vakuums im Vakuumsystem stehen.

Revendications

1. Pompe centrifuge permettant de pomper une suspension de pâte à papier tout en conduisant simultanément le gaz à distance de la suspension, comportant une enceinte de pompe (10) dotée d'un orifice d'entrée (11) et d'un orifice de sortie (12) pour la suspension de pâte à papier et une hélice (14) montée sur un arbre rotatif équipé de pales de pompe (15), lesquelles s'étendent à partir d'un moyeu (16) vers l'extérieur le long d'un disque de roue (17), et d'ouvertures pour conduire à distance le gaz formé

dans le disque de roue et une hélice d'obtention de vide équipée de pales pour hélice d'obtention de vide (20) entourées par une enceinte de pompe à vide (21) présentant un joint d'étanchéité (31) pour l'arbre, **caractérisée en ce qu'un** orifice d'aspiration (25) et, respectivement, un orifice d'évacuation (26) destinés au gaz vers, et, respectivement, à partir de, l'enceinte de la pompe à vide (21) sont placés sur un côté de l'enceinte de la pompe à vide au plus près de l'hélice (14), et **en ce qu'un** orifice d'entrée de liquide (32) est raccordé à un logement de joint d'étanchéité (30) destiné au joint d'étanchéité (31) présent sur l'autre côté de l'enceinte de la pompe à vide (21), et **en ce que** le logement du joint d'étanchéité communique, à son tour, avec l'enceinte de la pompe à vide (21) pour alimenter en liquide l'enceinte de la pompe à vide par l'intermédiaire du joint d'étanchéité et **en ce que** l'orifice d'aspiration (25) et l'orifice d'évacuation (26) de l'enceinte de la pompe à vide (21) sont raccordés l'un à l'autre de façon à pouvoir être commandés au moyen d'un canal (35) équipé d'une vanne (36) permettant de commander le vide dans le système de vide.

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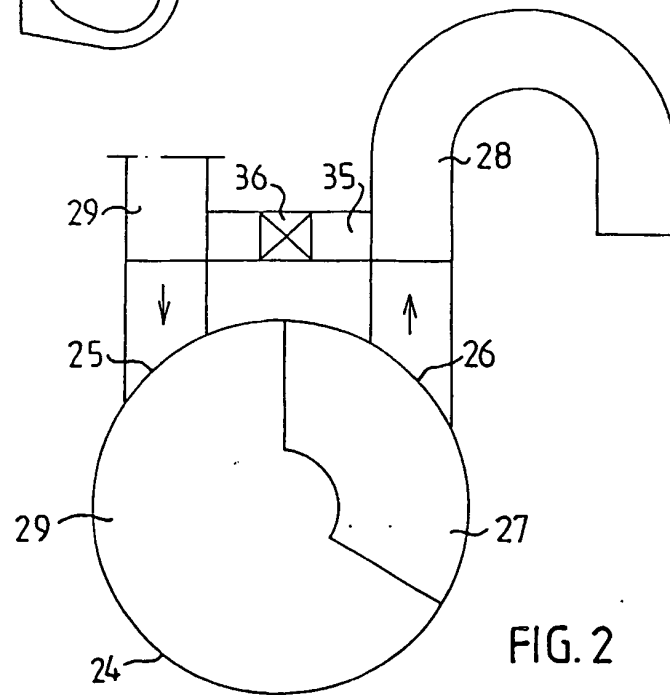
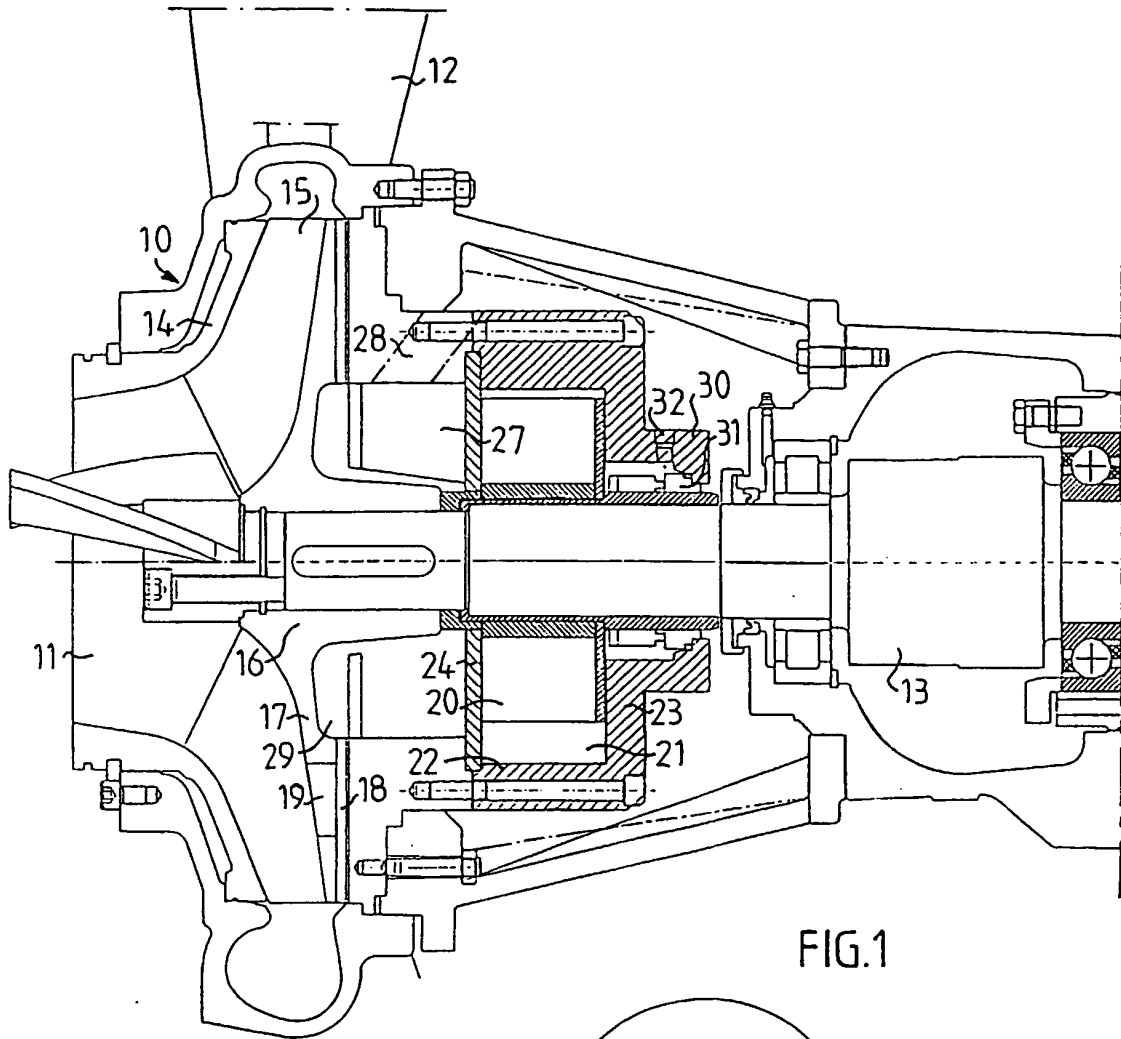
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REFERENCES CITED IN THE DESCRIPTION

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