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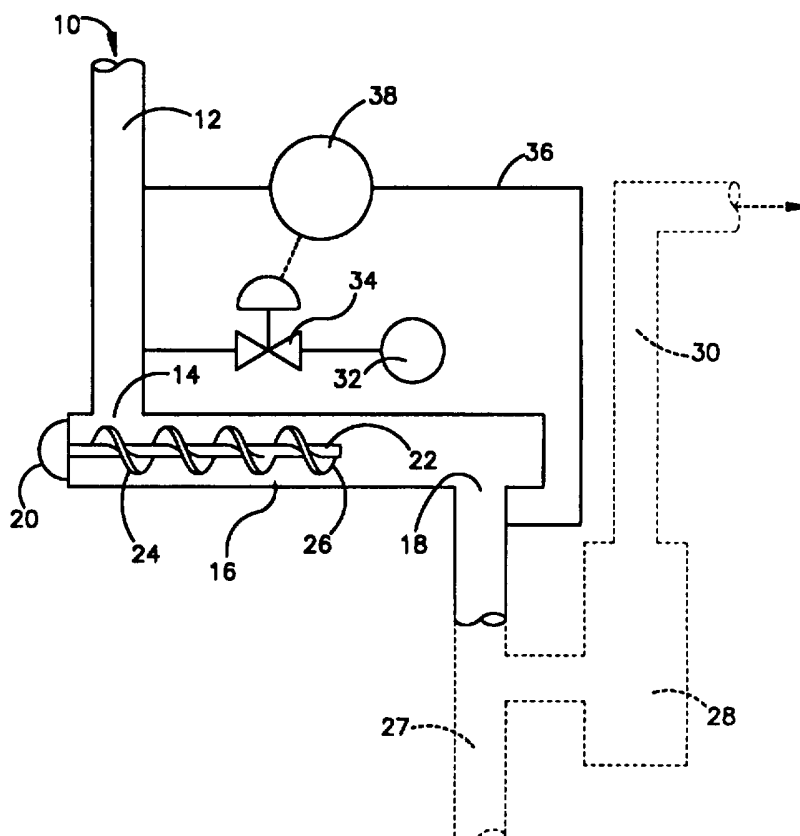
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(54) Title: MEANS FOR GAS-SEALINGLY CONVEYING SHREDDED PULP

(57) Abstract

A wall passageway, having openings therein only at opposite, inlet (14) and outlet (18) ends thereof, has a shaft (22) journaled therein. The shaft carries a screw (24) for moving shredded pulp through the passageway. The screw (24) is foreshortened, having a length less than that of the passage way, and causes inlet-admitted pulp to form into a continuously moving pulp plug. The plug, albeit having some porosity, comprises a gas seal within the passageway, and inhibits any migration of downstream gas from escaping to the atmosphere via the passageway and the inlet (14) thereof. In addition, a source (32) of oxygen or such gas as is inert to any downstream process is controllingly admitted into the inlet (14) to maintain an upstream pressure equal to, or greater than any downstream process pressure to insure against release of downstream gas into the atmosphere.



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MEANS FOR GAS-SEALINGLY CONVEYING SHREDDED PULP

BACKGROUND OF THE INVENTION

This invention pertains to wood pulp bleaching processes, such as those which employ gaseous bleaching reagents contacted with high consistency (i.e. twenty percent or more) fluffed pulp, and in particular to means for gas-sealingly conveying shredded pulp, in a pulp-handling process, to a downstream vessel or device.

Wood pulp bleaching with gaseous reagents, such as ozone and other high reaction rate gases, promises significant reduction of objectionable pulp mill effluents to streams and other bodies of water, as well as reduction of objectionable gaseous emissions. Elimination of chlorine compounds from the bleaching sequence promises great economic and ecological benefits. However, incorporation of these bleaching reagents can impose significant capital costs on the pulp mill due to the use of pulp transport devices which are expensive and generally require frequent maintenance.

In the use of a bed type reactor, for example, such as described in U.S. Patent No. 3,814,664, issued to Carlsmith, et al., a thick stock pump is required to feed the pulp to the fluffer while sealing the vessel pressure from the thickening device which generally operates under atmospheric pressure. In another method, described in U.S. Patents Nos. 5,181,989; 5,164,043; and 5,164,044 issued to Griggs, et al., and 5,174,861; 5,211,811; and 5,188,708 issued to White, et al., a screw feeding device is used to transport the pulp to the fluffer, again while sealing the vessel pressure from the thickening device which operates under atmospheric pressure.

SUMMARY OF THE INVENTION

It is a purpose of this invention to disclose an efficient and inexpensive means for gas-sealingly conveying shredded pulp, from a thickening device to a downstream vessel, without having to employ a thick stock pump, a screw feeder, or such other expensive and high-maintenance equipment.

Particularly, it is a purpose of this disclosure to define means for gas-sealingly conveying shredded pulp, comprising a pulp conveyor having a pulp inlet and a pulp outlet; wherein said conveyor has openings only at said inlet and said outlet; and conduit means in communication with said inlet for admitting shredded pulp into said inlet; and said conveyor comprises means for transforming inlet-admitted, shredded pulp into a substantially effective, translating, gas seal between said inlet and said outlet.

The aforesaid, and further purposes and features of this invention, will become apparent by reference to the following description, taken in conjunction with the accompanying figures.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic diagram of a shredded pulp conveying means, according to an embodiment of the invention; and

Figure 2 is a diagram of an alternate embodiment of the pulp conveyor of Figure 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In gas phase bleaching of pulp, the pulp is first thickened to a high consistency, i.e., twenty percent or more, in a thickening device. By way of example, such a thickening device can be a twin roll press (not shown) which discharges the pulp to a breaker/shredder conveyor (not shown). Regardless of

from whence the shredded pulp is derived, the same is represented by the arrow 10, in Figure 1, as the source thereof. The sourced, shredded pulp is conducted to a conduit 12 which is in open communication with the inlet 14 of a pulp conveyor 16. The conveyor 16 has an outlet 18 at the end thereof which is opposite the inlet 14, and the inlet 14 and outlet 18 are the only openings in the conveyor 16. The conveyor is otherwise a walled passageway. Journalled in the conveyor 16, for rotation therein, by means of a motor 20, is a shaft 22 which carries thereon a screw 24. The screw 24 has a length which is less than that of the conveyor 16, one end of the screw 24 being in alignment with the inlet 14. The terminal end 26 of the screw 24, then, is distanced from the outlet 18. Shredded pulp is admitted into the inlet 14, from the conduit 12, for movement thereof along the conveyor 16 by the rotatable screw 24. As a consequence, the admitted pulp forms into a porous plug downstream of the screw 24. Typically, in a gas phase bleaching of pulp, downstream of the conveyor 16 would be a vessel having a gaseous reagent which may be toxic or otherwise objectionable. Consequently, it is important to insure that the relevant gas does not leak or insinuate itself through the conveyor 16 for release into the atmosphere. Under operating conditions, then, the screw 24 and conveyor 16-formed porous plug serves as the sealing medium. The continuously-admitted shredded pulp is caused to transform into a continuously moving plug, advancing toward the outlet 18, which inhibits a migration of the downstream gas in the opposite direction.

The outlet 18, optionally, can communicate with an immediate discharge conduit 27, shown only in phantom, for conduct therefrom to an ozone contactor. Too, depending upon the process requirements, the outlet can be in communication with a shredding or fluffing device 28 (shown only in phantom), if further shredding or fluffing of the pulp is required. Then, the pulp can be conducted, via a conduit 30 (shown only in phantom) to a

downstream reaction vessel.

As noted, under dynamic conditions of continuous plug transport through the conveyor 16, the continuously forming and moving plug will serve as the only required gas sealing between ends of the conveyor, and the inlet 14 and outlet 18. During system shutdown, however, when the advance of the plug is halted, it is possible that gas will weep through the halted plug and get released to the atmosphere. The invention comprehends means for addressing this matter. In order to maintain reliability of the gas sealing, the invention is enhanced by incorporating a control means whereby oxygen, or other suitable gas which is inert in the downstream process, is added in relatively small quantities to maintain a pressure somewhat higher in the feed to the sealing conveyor 16, as compared to the pressure downstream. As shown in Figure 1, a source 32 of oxygen, for instance, is communicated to the conduit 12, via a control valve 34. In this manner, a small quantity of gas passes through the porous plug to the downstream processing, it being arranged that the quantity and type of gas (oxygen or other) does not have a negative impact on the downstream ministrations. The functionality is provided by automatically controlling the pressure in the inlet 14 at or above the pressure under which the downstream process is operating. For example, the invention sets forth maintaining an upstream pressure of from one-tenth to five psig above the downstream process pressure. In the disclosed embodiment, this control is effected by bridging across the inlet 14 and outlet 18 with a pressure-sensing line 36 which has incorporated therein a differential pressure control 38, the latter being linked to the valve 34 for supervisory operation thereof.

Figure 2 shows an alternate embodiment of the pulp conveyor 16' in which the journalled shaft 22', which carries the screw 24 thereon, is journalled in the outlet end of the conveyor (as well as in the inlet end

thereof). In adjacency to the far or downstream end of the shaft 22' is provided a plurality of perpendicularly-disposed breaker bars 40. Bars 40 further break up the pulp, particularly the pulp plug, to accommodate the passage of the pulp through the outlet 18.

5 The invention advances the art, in that it allows for the replacement of a high cost, high maintenance, positive displacement feeder with a simple, inexpensive, conveyor-type screw 24. Further, it reduces the compaction forces to which the pulp is subjected in conventional feeding devices to a minimal amount of compaction in the porous plug. Those skilled in the art
10 will recognize that the reduction or elimination of compacting forces will substantially improve the fluff quality obtained in downstream devices, and will thereby reduce the quantity of reactant gas required for the receiving process.

 It is a teaching of this invention that it is possible to eliminate a high maintenance, high cost device in such system while providing for enhanced
15 performance of the downstream fluffing and reaction system, thereby reducing the cost, and improving the system performance.

 While I have described my invention in connection with specific embodiments thereof, it is to be clearly understood that this is done only by way of example, and not as a limitation of the invention as set forth in the
20 purposes thereof and in the appended claims. Benefiting from my disclosure herein, others will find a plurality of procedures for conveying shredded pulp without unduly compacting the same before discharging the pulp to a downstream vessel or device, and conveyance of the pulp without permitting downstream gaseous reagents, or the like, from passing through the conveyor
25 16 and venting upstream. In the first procedure, it is only required to design the conveyor 16 and the cooperating screw 24 to insure that the plug, which is

formed ahead of the screw 24, is of sufficient length that it adequately accomplishes the necessary gas sealing through the conveyor 16.

Alternatively, the employment of the source 32 of pressurizing gas (oxygen, or such), and the line 36, control valve 34 and control 38 is deemed a useful

5 expedient should it become necessary to prevent gas leakage through the conveyor 16 toward the inlet 14 at shut-down. If it is deemed warranted to use a shorter length conveyor 16 which will not provide for a pulp plug having a sufficient length to prevent gas leakage through the conveyor 16, the differential pressure can be employed as an integral part of the system. In
10 this, of course the source 32 can provide a continuous, slightly elevated pressure at the inlet 14 all during system operation. Then, with shut-down, if it is necessary to raise the pressure at the inlet 14, the differential pressure arrangement is in place to accommodate for this. All of these operational methods are comprehended by this invention, and within the ambit of the appended claims.

What is claimed is:

1. A pulp conveyor comprising:

a housing having an inlet and an outlet, the housing being divided into at least two regions including a conveyor region and a gas seal region;

a screw type conveyor rotatably mounted within the conveyor region of the housing, the screw type conveyor forming a pulp plug at a discharge of the conveyor and discharging the pulp plug into the gas seal region of the housing; and

a moving pulp plug having a predetermined length such that the length of the pulp plug in the gas seal region forms a gas seal plug to prevent the flow of gas from the outlet to the inlet, the gas seal region of the housing being characterized by the absence of means for disrupting the pulp plug.

2. The pulp conveyor according to claim 1, wherein the gas seal region of the housing is in fluid communication with the outlet.

3. The pulp conveyor according to claim 1, wherein the housing is divided into three regions, the third region being a pulp plug breaking region, the pulp plug breaking region being in fluid communication with the gas seal region and the outlet; and further comprising:

a pulp breaker rotatably mounted within the pulp plug breaking region of the housing.

4. The pulp conveyor according to claim 1, wherein the housing has a first end and a second end, the screw type conveyor having a shaft journaled in the first and second end of the housing, the shaft extending through the gas seal region of the housing.

5. The pulp conveyor according to claim 1, further comprising:
a means for establishing a pressure between the housing inlet and the housing outlet.

1 6. A pulp conveyor comprising:
2 a housing having an inlet and an outlet, the housing being divided into
3 at least two regions including a conveyor region and a gas seal region;
4 a formation means for forming a moving pulp plug, the formation
5 means being in the conveyor region of the housing, the formation means
6 including a screw type conveyor rotatably mounted within the conveyor region
7 of the housing, the screw type conveyor forming a pulp plug at a discharge of
8 the conveyor and discharging the pulp plug into the gas seal region of the
9 housing; and
10 a conveyor means for conveying the moving pulp plug without disrupt-
11 ing the moving pulp plug a predetermined distance from the formation means
12 towards the outlet, the moving pulp plug being located within the gas seal
13 region, the conveyor means including the gas seal region of the housing being
14 characterized by the absence of means for disrupting the pulp plug, the gas seal
15 region having a predetermined length such that the length of the pulp plug in
16 the gas seal region forms a gas seal plug to prevent the flow of gas from the
17 outlet to the inlet.

7. The pulp conveyor according to claim 6, further comprising:
a means for establishing a pressure between the housing inlet and the housing outlet.

1 8. A method for conveying pulp in a housing having an inlet and an outlet,
2 the housing being divided into at least two regions including a conveyor region
3 and a gas seal region, a screw type conveyor being rotatably mounted in the

4 conveyor region of the housing, comprising the steps of:
5 supplying pulp to the conveyor;
6 rotating the conveyor forming a pulp plug at the discharge of the
7 conveyor;
8 sealing the housing to prevent the flow of gas from the outlet to the
9 inlet by moving the pulp plug without disrupting the pulp plug through the gas
10 seal region of the housing a predetermined distance from the conveyor towards
11 the outlet.

9. The method according to claim 8, further comprising the step of:
establishing a pressure between the housing inlet and the housing outlet.

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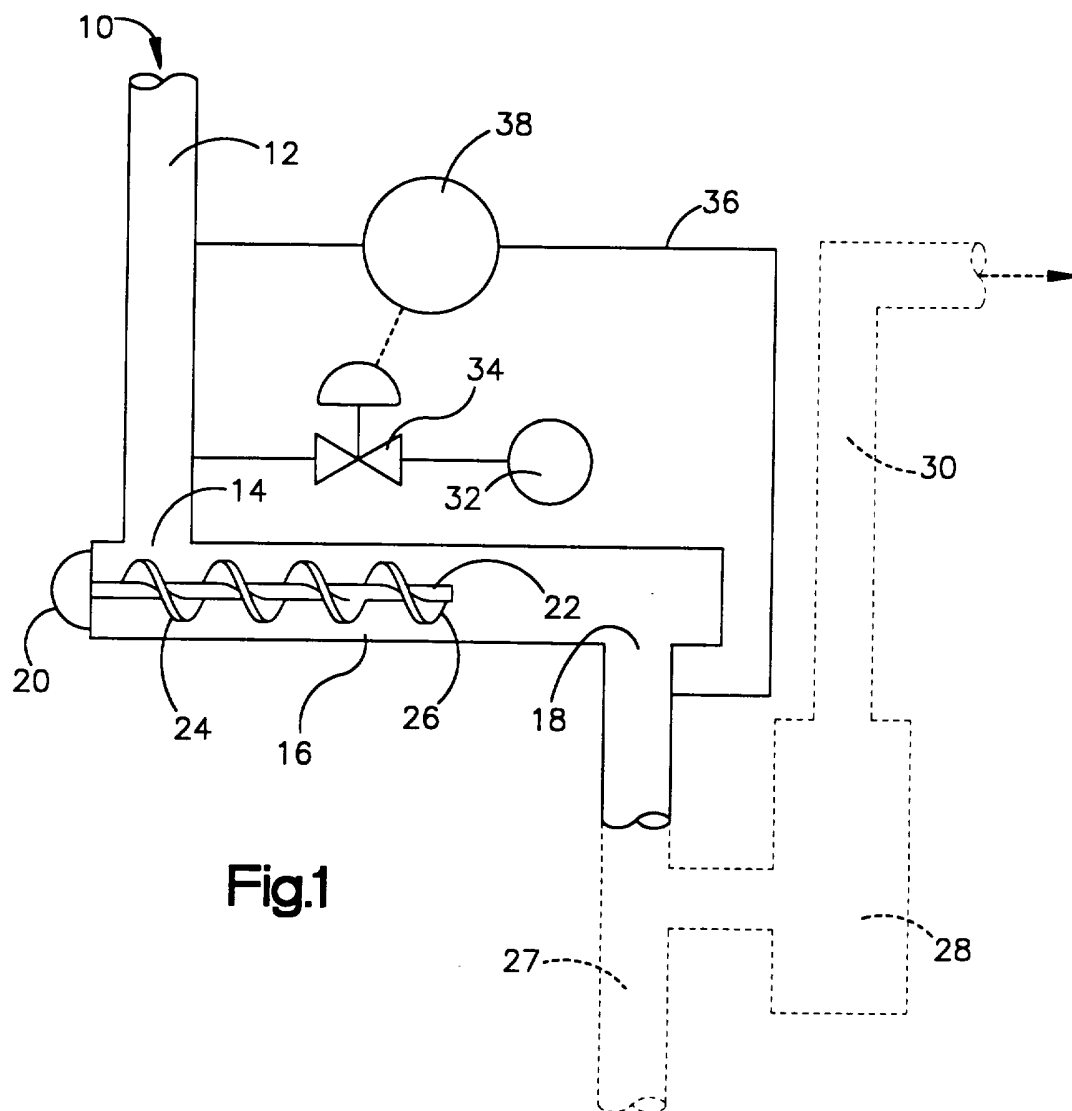


Fig.1

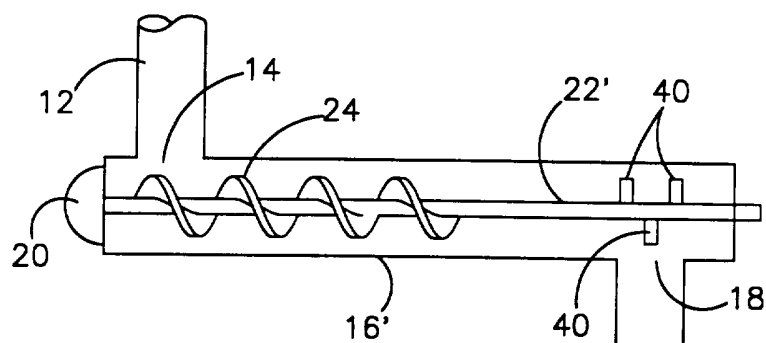


Fig.2

INTERNATIONAL SEARCH REPORT

International application No

PCT/US 95/10391

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 D21C9/10 B01J3/02 D21C7/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 D21C B01J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR,A,2 378 125 (STAKE TECHNOLOGY LTD) 18 August 1978 see page 2, line 23 - page 3, line 2	1,2,6,8
Y	---	3,4
Y	FR,A,2 672 314 (INGERSOLL RAND CO) 7 August 1992 see page 8, line 1 - line 5; figure 1 -----	3,4

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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11 January 1996

Date of mailing of the international search report

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Information on patent family members

International Application No
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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