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STRAINER MECHANISM FOR USE IN CONTINUOUS COOKING
OF CHIPS IN THE MANUFACTURE OF PULP
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3 Sheets-Sheet 1

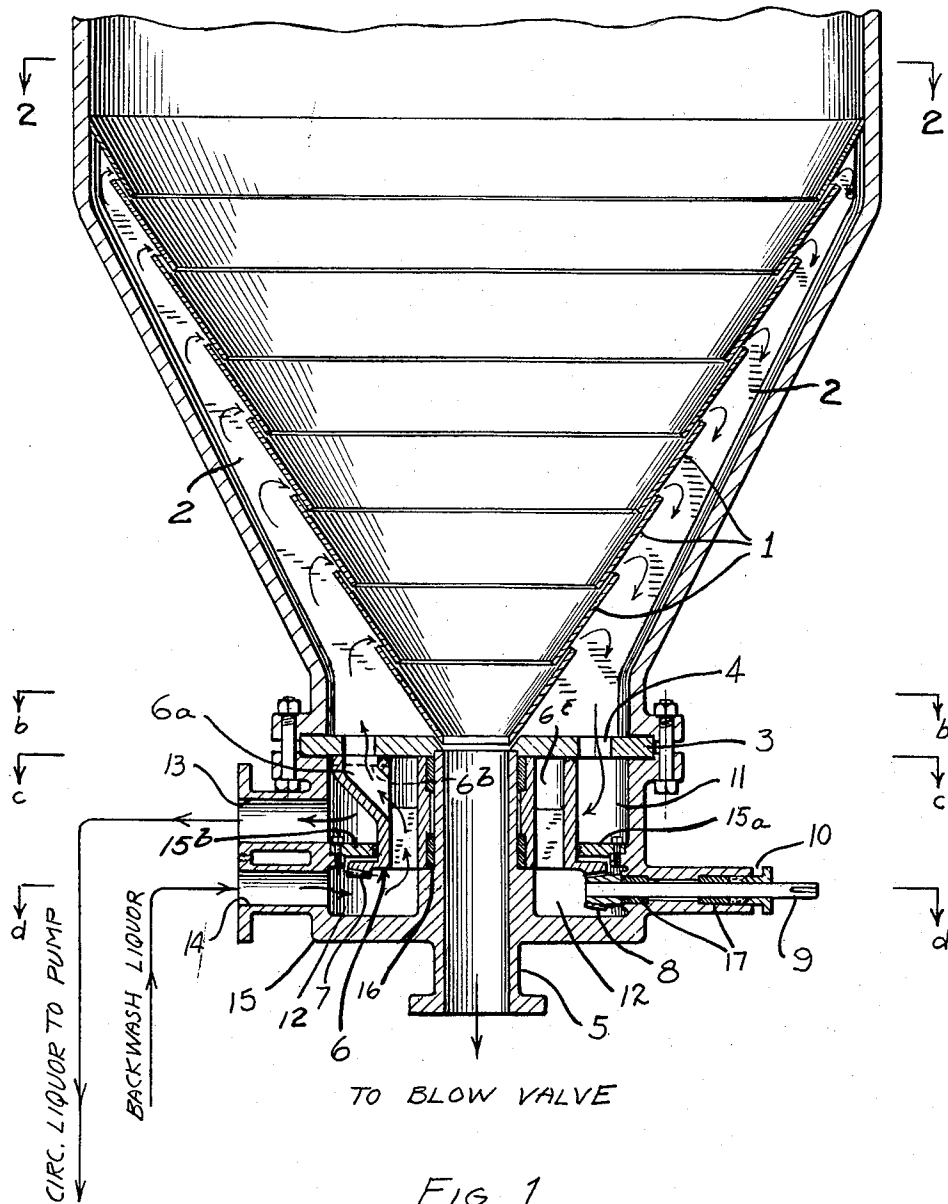


FIG 1

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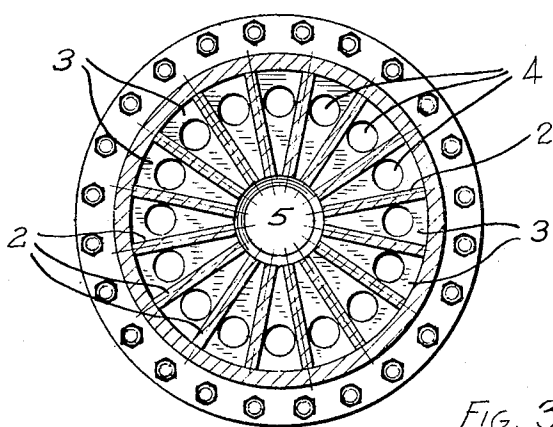
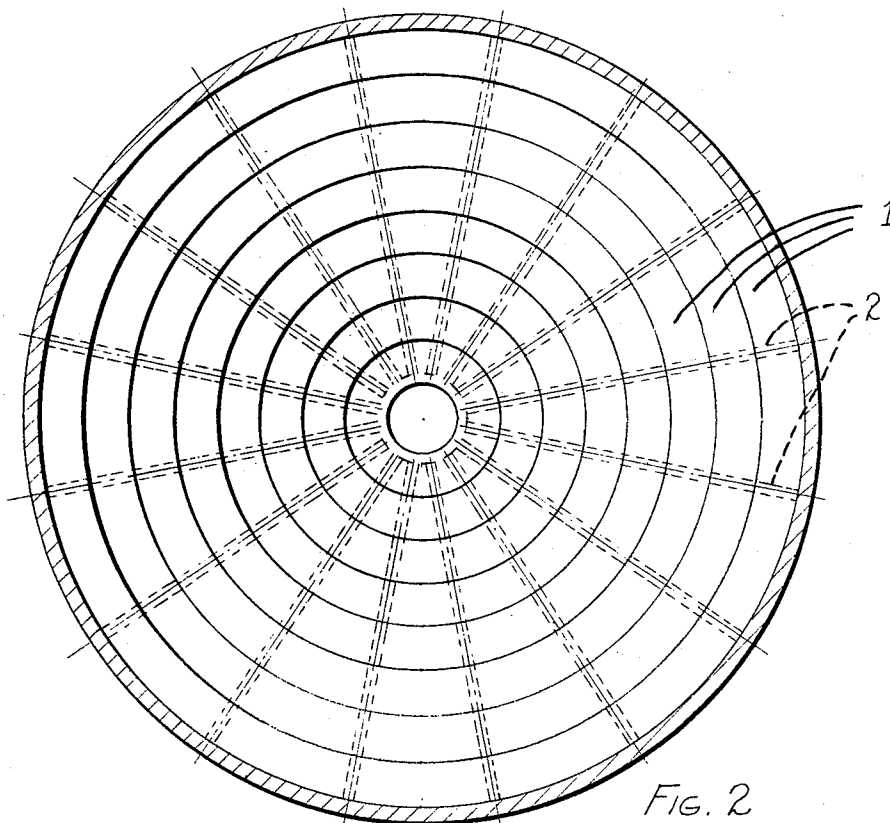
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

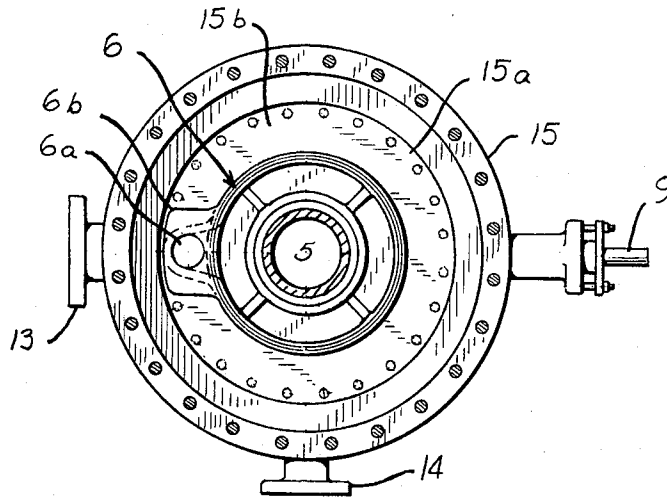


FIG. 4

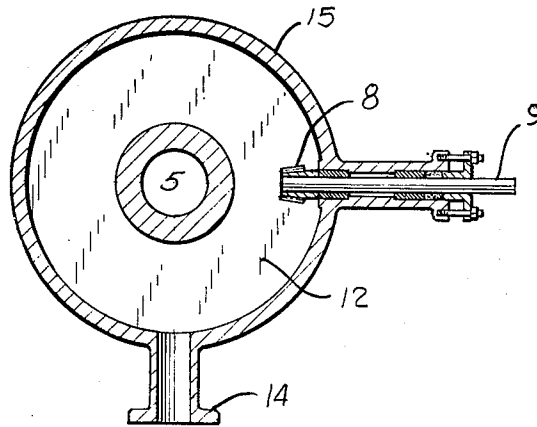


FIG. 5

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UNITED STATES PATENT OFFICE

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STRAINER MECHANISM FOR USE IN CONTINUOUS COOKING OF CHIPS IN THE MANUFACTURE OF PULP

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Application December 6, 1951, Serial No. 260,270

8 Claims. (Cl. 92-7)

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In my copending application, Serial No. 260,268, filed December 6, 1951, I describe novel processes for continuous digestion of wood chips in the manufacture of pulp.

This application deals with an improved strainer mechanism for use in wood pulp digesters, particularly digesters used in the continuous repulping processes.

It is therefore a principal object of my invention to devise a digester especially of the continuous type having a strainer for continuously straining pulp passing therethrough. It is a further object to provide an improved means for continuously backwashing portions of the strainer in succession without interfering with the operation of the remaining portions thereof. It is also an object to devise a strainer having use apart from the digester as shown.

Further objects and advantages thereof will be apparent as the description proceeds and the features of novelty will be pointed out in the claims.

The usual strainers employed in digesters consist of plates or pipes with a plurality of round holes small enough to prevent passage of chips about through which the liquor may drain. In batch cooking operations these holes gradually become plugged with chips and chip fragments as the cooking proceeds, sometimes seriously interfering with the flow of the circulating liquor. However, each time the batch digester blows, the holes are cleaned by the rapid movement of the mass of chips and the reverse flow of liquor and expanding steam through the strainers.

In continuous pulping the chip movement is relatively slow and there is no blowing operation to clean the strainer plates, consequently the strainers tend to become plugged tighter and tighter until the flow of liquor is seriously hindered.

The improved strainer which I have invented is designed to overcome these difficulties. Instead of using flat plates or pipes with holes, I use a series of overlapping plates, the plates overlapping in the direction of flow like shingles on a house roof. The overlapping plates have a small clearance between their lapping surfaces through which the liquor drains. The motion of the chips tends to keep these openings clean and to supplement this, I have provided a means for backwashing the strainer, a portion at a time, for further cleaning. This backwashing action, in addition to cleaning the strainer, assists the chip movement toward the discharge opening of the digester.

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For the best understanding of my invention, reference may now be had to the following detailed description taken in connection with the annexed drawings, in which

5 Figure 1 is a vertical section view of the lower portion of a digester equipped with my improved strainer;

Figure 2 is a top view of the strainer taken on line 2-2 of Fig. 1;

10 Figures 3, 4 and 5 are horizontal sectional views taken respectively on lines b-b, c-c, and d-d of Fig. 1.

In Fig. 1, I have shown a vertical sectional view of the conically shaped bottom of a typical digester equipped with my improved strainer. The strainer proper consists of a number of overlapping, preferably conical rings or funnel-like elements 1 of progressively decreasing size as shown. These are supported and maintained in place by a number of radially disposed bridge plates or partitions 2 as shown in Figs. 1 and 2. The rings 1 may be attached to the bridge plates by means of screws or welding or other known means. The bridge plates may likewise, if desired, be attached to the digester wall. Desirably the topmost ring makes a substantially tight fit with the digester wall in order to keep the backwashing water from escaping into the digester. For the usual purpose of cooking wood chips of standard size, the edges of the conical rings may overlap a distance of from approximately one-half to approximately two inches and be separated at such region of overlap between approximately one-sixteenth and approximately one-half inch and satisfactory results obtained.

It will be apparent that the bridge plates 2 divide the space under the strainer rings into a number of separate compartments. At the bottom of these compartments is provided a port plate 3 which has ports 4 opening into each compartment. At the center of the digester the hollow journal 5 serves as the chip discharge outlet for the digester and around its outside carries a rotary valve mechanism 6 comprising a valve chamber 6c for performing the backwashing operation. This valve 6 may be rotated at 1 R. P. M. more or less by means of bevel gear 7, bevel pinion 8, and shaft 9 extending to the outside through stuffing box 10. The two-piece disk-like element 15a and 15b in casing 15 divides the valve housing into separate top and bottom compartments 11 and 12. Rotary valve 6 has conduit 6a extending from the lower compartment 12 up to the port plate 3 so sized as to register with one port at a time in said port plate as the valve rotates. Chip

6b, as shown in Fig. 4, extends slightly to each side of conduit 6a to prevent by-passing of the liquor flow when the conduit is rotating from one port to the other. It will be noted that as shown the valve 6 is substantially hydraulically balanced as far as thrust is concerned by reason of the annular shape of the valve chamber 6c communicating with the passage 6b.

In operation, the circulating liquor in the digester system travels down through the mass of chips, on through the slots formed by the conical rings 1 through the ports 4 into upper valve compartment 11 and out through liquor outlet 13 and on to the liquor circulating pump for return back to the top of the digester. Part of the circulating liquor after leaving the pump, however, is by-passed back to backwash liquor inlet 14 and into lower valve compartment 12. From here it flows up through conduit 6a into one strainer compartment at a time backwashing the strainer slots, and progressing from one strainer compartment to another as the valve 6 rotates. Where preferred a separate pump can be used to supply the backwash liquor instead of by-passing a portion of the circulating liquor flow for this service.

For the rotary parts I find self-lubricating materials like those composed of or containing graphite to be very satisfactory for bearing sleeves or liners 16 and 17.

In Fig. 1 the liquor inlet and outlet connections are for sake of clearness shown in vertical alignment. Actually they would preferably be radially located as Figs. 3, 4 and 5 show.

The assembly which I have illustrated shows the strainer located in the conical bottom of a digester. However such overlapping plate strainer elements could be employed at other places in the digester, with or without the backwashing feature, without departing from the scope of my invention. The single rotary backwashing valve could obviously be replaced with individual valves for each compartment or with multiple valves for controlling several compartments at a time, said valves being manually or automatically operated, also without departing from the scope of my invention.

I claim:

1. In a digester for continuously cooking wood chips to form pulp, said digester having means for continuously discharging cooked chips therefrom, a strainer in the path of movement of the chips comprising a series of spaced substantially concentric partially nested truncated funnel-like elements with the narrow ends of said elements pointed in the direction of travel of the chips and into the tops of the succeeding elements, the surfaces between said elements in the region of nesting being such as to permit the passage of liquid therefrom to the substantial exclusion of the chips, and means for withdrawing the separated liquid from the digester.

2. The digester according to claim 1 having means for backwashing said strainer, comprising partitions extending substantially in the direction of travel of the chips and dividing the spaces between the strainer and the digester into a plurality of compartments, means for directing a stream of backwashing liquid through a small fraction of said compartments in a direction reverse to that of the normal flow and into the main flow of said chips, together with means for moving said stream-directing means so as to backwash all of said compartments in succession

without interrupting the straining operation of the remaining compartments.

3. In a digester for continuously cooking wood chips to form pulp, said digester having means for continuously discharging cooked chips therefrom, a strainer in the path of movement of the chips comprising a series of spaced substantially concentric partially nested truncated funnel-like elements with the narrow ends of said elements pointed in the direction of travel of the chips and into the tops of the succeeding elements, the surfaces between said elements in the region of nesting being such as to permit the passage of liquid therefrom to the substantial exclusion of the chips, and means for withdrawing the separated liquid from the digester, said elements progressively decreasing in size in the direction of travel of the chips.

4. The digester according to claim 3 having means for backwashing said strainer, comprising partitions extending substantially in the direction of travel of the chips and dividing the spaces between the strainer and the digester into a plurality of compartments, means for directing a stream of backwashing liquid through a small fraction of said compartments in a direction reverse to that of the normal flow and into the main flow of said chips, together with means for moving said stream-directing means so as to backwash all of said compartments in succession without interrupting the straining operation of the remaining compartments.

5. The digester according to claim 3, in which said elements overlap each other a distance of approximately one-half inch to approximately two inches and are separated in the region of overlap from approximately $\frac{1}{8}$ of an inch to approximately one-half inch.

6. In a digester for cooking chips to form pulp, said digester having a conical bottom portion together with means for discharging cooked chips therefrom, a strainer in said bottom portion comprising a series of substantially concentric partially nested truncated funnel-like elements pointed in the direction of travel of the chips and decreasing in size in the direction of travel of the chips, the spacing between said elements in the region of nesting being such as to permit the passage of the liquid therethrough to the substantial exclusion of the chips, the topmost of said elements making a substantially water-tight fit with the digester wall whereby the space between said strainer and the conical bottom portion constitutes a filtrate-receiving chamber, together with means for withdrawing such filtrate from said chamber.

7. A strainer for separating a liquid from solid material, comprising a casing, a series of substantially concentric partially nested truncated funnel-like elements with the narrow ends of said elements pointed in the direction of travel of said material and into the tops of the succeeding elements, the spaces between said elements in the region of nesting being such as to permit the passage of liquid therethrough to the substantial exclusion of the solid material, means for withdrawing the separated liquid from the casing, and means for withdrawing the solid material from the last of said elements.

8. The strainer according to claim 7 having means for backwashing the same, comprising partitions extending substantially in the direction of the material to be strained and dividing the space between the strainer and the casing in a plurality of compartments, and means for

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directing a stream of backwashing liquid through a small fraction of said compartments in a direction reverse to that of the normal flow and into the stream of the material to be strained together with means for moving said stream-directing means so as to backwash all of said compartments in succession without interrupting the straining operation of the remaining components.

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