

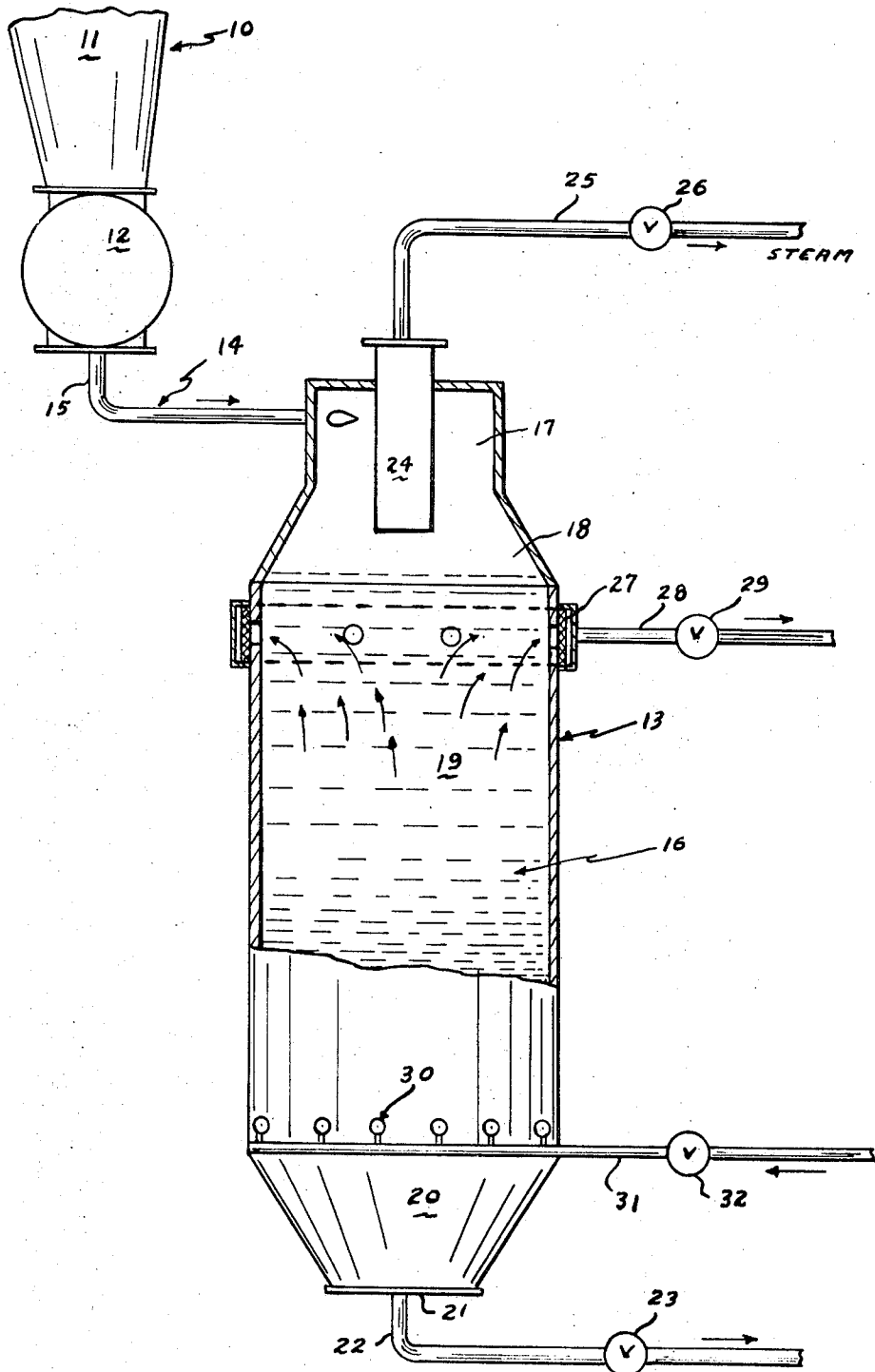
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P. D. CASE

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DIGESTER DISCHARGE SYSTEM

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3,567,573

DIGESTER DISCHARGE SYSTEM

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Continuation of application Ser. No. 674,012, Oct. 9,
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14 Claims

ABSTRACT OF THE DISCLOSURE

A process for simply refining fibrous materials such as wood chips characterized by a series related pair of vessels in the first of which the raw materials are fully saturated with conditioning fluids which substantially dissolve the bonding agents between their fibers without significantly affecting their shape and in the second of which the material is caused to automatically split to fiber form and be washed and cooled prior to exit to a blow tank or other holding or transition unit.

This application is a continuation of the copending applications of Philip D. Case, Ser. Nos. 674,012 and 295,687 (abandoned), which applications were respectively filed Oct. 9, 1967 and July 17, 1963 for "Digester Discharge System."

This invention relates to improvements in pulp refining systems and equipment therefor. More particularly, it provides a novel means and method for defiberizing fibrous pulp particles in a manner that on relative separation the individual fibers thereof retain their strength. An important feature of the invention is that it enables both defiberizing and fiber washing to be simply and simultaneously achieved in the same apparatus and in a manner to preclude adverse effects on either the strength or brightness of the resultant product.

The invention has particular advantage in reference to the production of bleachable grade pulps and will be so described. However, the application thereof is by no means so limited.

Prior systems of similar application have evidenced many basic problems. For example, agitation in course of fiber reduction, by mechanical action or otherwise, has in many instances been of such a nature to have a degrading effect on the resultant pulp. Further, extended treatment procedures have introduced complexity of equipment, resultant high cost of installation and operation, and greater opportunity for pulp degradation. The latter is due to the time and variety of exposure to variable conditions in the course of reducing material from a raw form to its fiber content.

The present invention provides a simple and economical answer to the above problems in that it achieves the desired end result in a system and process utilizing a minimum of equipment. It obviates the need for pretreatment of raw material. It also minimizes the digesting equipment and achieves optimal defiberizing, washing and cooling in a single vessel without risking degradation of the fibers.

The present invention is not to be confused with inventions such as shown in the U.S. Patents to Richter, 2,870,009; Schnyder, 3,081,820 and 2,035,963. The latter call for complex systems involving blow tanks for getting rid of steam in complex structures and/or procedures. Moreover, they involve physical agitating means and do not contemplate within a single vessel immediately following

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discharge, a washed and cooled pulp fiber product which has been achieved in a single vessel following a digester in a manner to avoid any detrimental effect on the strength properties of the end fiber product. Not only strength but brightness is protected in the practice of the present invention, to be hereinafter described in a manner and with structure not within the comprehension of the aforementioned patents of the prior art. It is by contrast to the prior art procedures and structures that the distinct advantages of the present invention should be recognized.

A primary object of the invention is to provide improvements in pulp refining systems rendering such systems more economical to fabricate, more efficient and satisfactory in use, adaptable to a wide variety of applications and unlikely to malfunction.

Another object of the invention is to provide improved means for defiberizing wood chips and similar fibrous particles.

A further object of the invention is to provide an improved system for defiberizing and washing cooked pulp while it is still hot.

An additional object of the invention is to provide an improved pulp refiner unit which functions both to defiberize fibrous particles and to wash the resultant fibers in a single continuing operation.

Another object of the invention is to provide a novel system for defiberizing cooked pulp enabling the reuse of heat produced in the cooking process.

A further object of the invention is to provide an improved means and method for producing bleachable grade pulp, the product of which has optimum strength and brightness.

Another object of the invention is to provide an improved system for washing pulp which preserves its strength and brightness.

An additional object of the invention is to provide improvements in available methods and apparatus for handling the discharge of a digester unit in a pulp refining system.

A further object of the invention is to provide an improved system for refining raw fibrous material to its individual fiber form comprising, basically, two vessels, the first providing means for full saturation of the raw material without significantly affecting its shape and the second providing means for effecting, in a continuous flow process, substantially complete defiberizing as an automatic response to established conditions.

Another object of the invention is to provide an improved system and process for refining raw fibrous material to its individual fiber form involving, basically, two vessels in the first of which the raw material is fully saturated and in passage through the second of which the saturated material is caused to achieve the form of individual washed fibers having optimal strength and brightness.

An additional object of the invention is to provide a system and process for refining raw fibrous material to its fiber form involving two basic vessels which minimize both the expense and time normally entailed in such procedures.

An additional object of the invention is to provide a pulp refining system and elements thereof possessing the advantageous structural features, the inherent meritorious characteristics and the means and mode of operation herein described.

With the above and other incidental objects in view as will more fully appear in the specification, the invention intended to be protected by Letters Patent consists of the features of construction, the parts and combinations thereof, and the mode of operation as hereinafter described or illustrated in the accompanying drawings, or their equivalents.

Referring to the accompanying drawings wherein is shown one but obviously not necessarily the only form of embodiment of the invention.

The figure is a generally diagrammatic showing of a portion of a pulp refiner system in accordance with the invention.

Like parts are indicated by similar characters of reference throughout the several views.

The refining system illustrated in the accompanying drawing is detailed only to the extent necessary for a complete disclosure of the present invention. As seen therein, it includes a digester 10 having an outlet defined by a vertically dependent tube 11, the discharge end of which is sealed by a rotary valve 12. The discharge side of the valve 12 is connected to the cylindrical head portion of a vertically oriented housing 13 through the medium of a right angled conduit member 14. The one end portion 15 of the conduit member 14 forms a seal about and vertically depends from the outlet of the valve 12.

The housing 13 is a shell-like structure which defines a vertically oriented chamber 16 successive zones of which, from top to bottom, have a different form and serve different functions. The uppermost zone 17 has a cylindrical configuration, being defined by the cylindrical head portion of the housing 13. The latter has a side opening adjacent the top thereof which sealingly accommodates the delivery end of the conduit member 14. The member 14 is so arranged to discharge in a sense tangential to the inner circumferential wall portion of the housing which defines the chamber portion 17. Immediately below the zone 17, the chamber 16 is formed to provide a conically expanded zone 18 followed by a cylindrically formed zone 19 therebelow. The zone 19 has a uniform diameter the dimension of which is substantially greater than that of the diameter of zone 17 and corresponds to that of the largest diameter of the zone 18. The zone 19 occupies a major portion of the chamber 16, extending from adjacent the top of the housing 13 to a position adjacent and spaced from its bottom. Immediately below the zone 19 the housing 13 is conically reduced in cross-section to provide the chamber 16 with a terminal or cooling zone 20 the bottom of which includes an outlet 21. The outlet 21 is defined by one end of a discharge line 22. The line 22 incorporates a blow valve 23 and is so arranged to discharge to a blow tank (not shown). Any conventional blow tank may be employed since the function thereof is merely to provide for discharge of residual gases as the end product is discharged to atmospheric conditions.

The top of the housing 13 is centrally apertured to accommodate a discharge pipe 24. The outer end of the pipe 24 communicates with a steam discharge line 25 incorporating a pressure control valve 26. The inner end of the pipe 24 depends in the chamber 16, concentric to the central vertical axis of the housing 13, extending through the zone 17 and terminating intermediate the vertical extremities of the zone 18.

Encircling the housing 13 and transversely abridging openings therein at the upper end of the zone 19 are girth screens 27. The screens 27 are interposed in the path of flow from the housing 13 to a discharge line 28 incorporating a flow control valve 29. Mounting peripherally of the housing 13 at the bottom of the zone 19 are a series of circumferentially spaced nozzles 30. The discharge ends of the nozzles 30 project interiorly of the housing 13 at the bottom of the zone 19 while the inlet ends thereof project exteriorly to communicate with a delivery line 31 incorporating a flow control valve 32.

The system and apparatus above described may be utilized for the production of bleachable grade pulp. In such instance, the digester 10, as illustrated, constitutes a cooking tube receiving a charge of wood chips which are cooked therein in a suitable liquor and under conditions of elevated pressure and temperature, for example, 150 p.s.i.g. and 365° F. Throughout this cooking procedure, during which they are saturated with the cooking fluid, the wood chips tend to retain their uncooked shape. How-

ever, during this process, the lignin, which serves as the bonding agent for the chip fibers, is dissolved to the point that very little additional energy would be required to reduce the chips to individual fibers.

At the end of a suitable cooking interval, the hot saturated chips are discharged along with their cooking liquor which serves as their fluid vehicle. The chips and the attendant liquor exit from the digester 10 through the tube 11 and rotary valve 12 to flow through the conduit member 14 and discharge therefrom in a sense tangential to the inner wall portion of the housing 13 which defines the zone 17 of chamber 16.

The chips which enter the chamber 16 are fully saturated with the fluid within which they were cooked. Moreover, both the chips and the liquor which constitutes their fluid vehicle are still hot.

The tangentially directed inflow produces a cyclone type swirling movement of the incoming hot saturated chips and the accompanying cooking liquor. The vortex so produced has the pipe 24 as its center.

In the process of entering the chamber 16, the hot saturated wood chips, though remaining in a sealed portion of the refining system, are exposed to a pressure significantly lower than that to which they were subjected in the digester. Therefore, on entrance to the zone 17, the chips are subjected to a pressure differential which results in an expansion of the liquid embodied therein during the cooking process. The conditions are such that this liquid is automatically flashed to steam. By the process of this expansion, the liquid in the cooked chips induces an automatic split or defiberizing thereof and causes them to assume the form of individual fibers and fiber aggregates.

The conically expanded form of the chamber portion 18 which lies immediately below the zone 17 and the entrance thereto provides for expansion and flow of the steam created in the zone 17. Due to the cyclone type movement of the liquor, chips, resultant fibers and steam through the zone 17 to the zone 18, the steam moves to the center of the vortex produced thereby and a predetermined portion of the steam is induced to escape through the pipe 24 and discharge line 25, the amount thereof being limited by the setting of the flow control valve 26. As will be evident, by a proper setting of the control valve 26, one may control the pressure in the chamber 16 and thereby the amount of steam flashed from the incoming wood chips and, correspondingly, the average size of the aggregates which result from the defiberizing action achieved in this process.

Of course some steam will be leaked from the digester 10 to flow through the valve 12 and enter the housing 13 with the incoming chips. This steam will intermingle with that flashed from the liquid saturated wood chips and escape therewith to the extent permitted and governed by the setting of the control valve 26.

The fiber aggregates so produced, along with the hot cooking liquors which accompany the wood chips in entering the housing 13, drop downwardly in the chamber 16 toward the outlet 21. As will be further described, the flow from the digester 10 to the housing 13 and from the housing 13 through the blow valve 23 is so controlled to maintain a volume of hot pulp and liquor in the chamber 16 to achieve a level thereof which is slightly above that of the drainage screens 27 and the outlet to the discharge line 28.

The zone 19 constitutes the washing section of the chamber 16. A weak and relatively cool black wash liquor is continuously flowed through the line 31 to pass to the interior of the housing 13 through the medium of the jet nozzles 30. The nozzles 30 are so oriented that a portion of this wash liquor is induced to flow upwardly of the zone 19 and counter to the flow of the hot pulp-liquor mass as provided by the incoming cooking liquor and the fiber aggregates which accrue in the upper zones 17 and 18. During the upward movement thereof through the zone 19, the wash liquor diffuses through the pulp-liquor mass,

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picking up undesirable elements from the fibrous aggregates, including undissolved solids which adhere thereto, and drawing heat from both the pulp and the accompanying cooking fluid. By the time the wash liquor reaches the level of the screens 27 and the outlet to the line 28, it has increased in strength and temperature. Thus, a resultantly stronger and relatively hot black wash liquor flows outwardly through the screens 27 to the delivery line 28, to an extent governed by the setting of the control valve 29. This liquor which is discharged through the line 28 may be so treated as to recover both the heat and chemicals taken on thereby in movement through the zone 19 which constitutes the washing section of the housing 13.

The effect of maintaining a pulp and liquor level in the housing 13 at a level above that of the drainage screens 27 and the outlet 28 is significant. The portion of this pulp and liquor above the screens 27 is isolated from the influence of the relatively cool counterflow of wash liquor that moves through the major extent of the washing zone 19 and therefore remains hot. Thus, the invention provides for a layer of hot liquor and pulp to exist in the housing 13 in contact with the steam atmosphere which occurs in the upper zones 17 and 18 of the chamber 16. This prevents the steam from being quenched and thereby affecting the system's efficiency.

While a portion of the wash liquor is arranged to serve as a counter-flow to cool and wash the fibers and fiber aggregates as they move downwardly through the zone 19 of the housing 13, the remainder thereof which is not discharged through line 28 is used to dilute and cool as well as assist in movement of the pulp mass of fiber aggregates and attendant fluids from the zone 19. The pulp and accompanying liquor is thereby induced to move through the cooling zone 20 and the outlet 21 and to the discharge line 22. The movement of the pulp and liquor mixture through the washing zone 19 and cooling zone 20 under the conditions specified causes the temperature thereof to drop to approximately 200° F. Then as the pulp slurry, consisting of the liquor, the fibers and fiber aggregates, passes from the outlet 21 to the delivery line 22 and through the blow valve 23, a turbulence is induced therein in passing through the blow valve which causes the separation of remaining fiber aggregates into individual fibers without reducing their strength. This is due to the reduced temperature level at which this takes place. At this level the turbulence will not be detrimental as it would be at higher temperatures. It should be recognized that the discharge consistency is controlled by the setting of blow valve 23 for any given pressure which exists at a given time in the chamber 16.

The valve 32 which controls the delivery of the wash liquor is arranged to function in correspondence with the desired level of the pulp and liquor in the housing 13 in a manner believed obvious.

Thus, the invention provides a completely sealed segment of a refining system wherein hot cooked chips may be defiberized without the need for any mechanical action thereon and immediately washed, in a manner to preserve the pulp strength. Further, the pulp fibers are so handled that the defiberizing and washing action takes place in immediately following relation to a cooking procedure and in a manner to avoid the exposure of unwashed pulp to air. By this means, the invention achieved an optimum brightness in the end product on discharge thereof from the housing 13 at which point the fibers are not only washed but at reduced temperature.

On considering the invention process, it may be seen that the almost immediate conversion to steam of a major portion of the heat present in the chip-liquor mass which exits from the digester 10 facilitates the separation of this heat in a useable form. By this means one also moderates the amount of fluid necessary for the cooling process. Further, in the housing 13, and before contact with air, the pulp is washed, cooled and diluted as well as defiberized without any mechanical medium and in a manner to avoid

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any detrimental effect on the strength properties of the resultant product.

The invention system and process are important in that the chips are defiberized at elevated temperatures and immediately washed prior to exposure thereof to air at which time the temperature of the fibers are reduced, thereby preventing deterioration in discharge procedures. This is particularly advantageous when pulp is cooked in a high sulphidity. It protects the unbleached brightness of the pulp which would otherwise be adversely affected by premature exposure to the atmosphere. A further feature of the invention system and process is that by enabling a washing procedure which requires minimal amounts of cooling fluid, the need for subsequent evaporating thereof is minimized. Moreover, the minimal turbulence produced in the defiberizing action achieved in accordance with the invention results in a preservation of fiber strength and thereby enables high quality products. In summary, the discharge system of the invention offers the following advantages:

(1) Through the controlled reduction in pressure in the top expanding portion of the housing 13, which reduction is under sealed conditions and not reduced to atmospheric conditions, the majority of the heat present in the chip and liquor mass which passes thereto from the digester will be converted to steam which is easy to separate and is in a usable form. While the temperature of the separated fibers is still elevated at this point under the pressurized conditions existing, the conversion of the substantial majority of heat present reduces the amount of liquor needed for the cooling procedures which follow.

(2) Noting paragraph (1) immediately above, the pressure reduction is partial as contrasted to a reduction to atmospheric conditions and is performed in such a way that the chips are defibered without subjecting them to mechanical action at the existing high temperatures and thus preserves the fiber strength.

(3) The fibers and fiber aggregates achieved through the pressure reduction as above described have minimal resistance to the liquid flow of the washing fluid in the invention system and are thereby washed very simply and very efficiently in the process of their discharge through the housing 13.

(4) The counter-current flow of wash liquid as provided by the invention not only removes attached dissolved solids which cling to the fibers but some of the remaining heat. An ancillary advantage is that the stronger black liquor withdrawn which includes this heat can be made to give up the heat to further improve the economy of the system as here contemplated.

(5) The portion of the weak liquor or fluid used to assist the flow of the pulp fibers from the bottom of the housing 13 functions to cool the pulp to the final discharge temperature which as expressed is at a level where the subsequent turbulence does not in any way affect its quality character.

(6) Remaining aggregates are reduced to individual fibers by turbulence encountered immediately on discharge from the housing 13.

(7) All the preceding is effected in a single vessel immediately in connection with a digester tube and resultant washed fibers are brought into existence before any contact thereof with air.

From the above description it will be apparent that there is thus provided a device of the character described possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail construction and arrangement of parts without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute the invention has been described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific features shown, but that the means and construction herein disclosed comprise but

one of several modes of putting the invention into effect, and the invention is therefore claimed in any of its forms or modifications within the legitimate and valid scope of the appended claims.

Having thus described my invention, I claim:

1. A process for converting fibrous materials such as wood chips to an individual fiber form comprising the steps of introducing the raw material to a first vessel and there saturating and heating the material with a conditioning fluid in an environment of above atmospheric pressure and a correspondingly elevated temperature to the point of substantially dissolving the agents which bond their fibers to provide that said material is retained in substantially its original uncooked shape, in a condition that little additional energy is required to reduce the raw material to individual fibers, immediately thereafter transferring the so heated and saturated material with attendant hot conditioning fluid to the upper end of a substantially vertically oriented chamber defined interiorly of a second vessel, immediately on entry to said second vessel subjecting the hot saturated material to a pressure reduced relative to the pressure in said first vessel while maintaining the material sealed from the atmosphere to cause an expansion of the fluid in said saturated material in a manner to induce an automatic split of said material into individual fibers and some fiber aggregates, providing thereafter that said fibers and fiber aggregates move downwardly within said second vessel influenced by gravity, and discharging the fibers and fiber aggregates from said second vessel in a continuing flow and impressing on said flow, immediately on discharge and prior to exposure thereof to atmospheric conditions, a turbulence which causes split of remaining fiber aggregates into individual fibers.

2. The process as set forth in claim 1 characterized by effecting a continuous movement of the split material through said second vessel following its automatic split in the upper end thereof and limiting the flow of the split material with attendant hot conditioning fluid from said second vessel in a manner to maintain a controlled level thereof in said second vessel to provide above said level an open space within which the saturated material is first introduced and split.

3. A process as in claim 1 characterized by movement of said saturated material to said second vessel, with attendant hot conditioning fluid, in substantially original form, effecting first a substantially cylindrical flow thereof in said second vessel and then expanding said flow in the process of which the inherent and automatic split of said material is first induced to take place.

4. A process as in claim 3 characterized by maintaining a desired level of said split material and hot attendant fluid in said second vessel by controlling the discharge from said second vessel to provide above said level a space within which said expansion and split takes place and flowing a washing fluid through said split material and attendant hot fluids in a limited area of said second vessel spaced vertically below the said level to pick up undesirable elements including those which adhere to the downwardly moving fibers and fiber aggregates and discharging the washing fluid from said limited area at a level spaced below the first mentioned level, the flow and discharge of the washing fluid being restricted to maintain in said second vessel above said second mentioned level a hot layer of the freshly split material and attendant hot fluids as a buffer zone to separate the washing process from the splitting process.

5. A process as in claim 4 characterized by the washing fluid being maintained cool relative to the said hot fluids to reduce the temperature of fiber materials and attendant fluids in the course of their flow from said second vessel.

6. A process as set forth in claim 2 characterized by flowing a conditioning fluid through the split fiber materials and their attendant hot fluids to both act thereon

and influence discharge thereof from said second vessel in an area thereof to its bottom.

7. Apparatus for converting fibrous materials such as wood chips to individual fiber form comprising a pair of vessels having means in connection therewith for establishing therein above atmospheric pressure, means interconnecting said vessels including valve means relatively sealing a first of said vessels from the second of said vessels while providing for transfer of materials from the first to the second vessel, the first of said vessels providing means for saturating the chips therein with a conditioning fluid under conditions of elevated temperature and pressure to substantially dissolve the bonding agents which interconnect the chip fibers without materially affecting the original shape of the wood chips to place the chips in a condition that but little additional energy is required to reduce the chips to individual fibers, said valve means providing a series relation between said vessels and means for a direct and continuous transfer of the saturated chips and attendant hot fluid to said second vessel, means including said valve means sealing said second vessel whereby the pressure in said second vessel may rise as a function of introduction of saturated chips and hot fluid, pressure relief means for limiting pressure rise in said second vessel to maintain therein an above atmospheric pressure which is substantially reduced from the pressure in the first of said vessels to cause thereby that the saturated hot chips will automatically split to individual fibers and some fiber aggregates in the course of their entry into the second of said vessels, the second of said vessels providing means for a gravity influenced movement of the split materials including the individual fibers and fiber aggregates to drop therethrough, means defining an outlet for discharge of the fiber and fiber aggregates and attendant fluid from the second of said vessels in a continuing flow and means for impressing on said flow, on discharge and prior to exposure thereof to atmospheric conditions, a turbulence which induces split of remaining fiber aggregates into individual fibers.

8. Apparatus as in claim 7 characterized by means for controlling the discharge from the second of said vessels to provide for maintaining a level of the split material and attendant hot fluids in said second vessel to produce above said level a space within which the entering hot saturated chips are induced to automatically split, and there being means for delivering to the second of said vessels a flow of washing liquor to move through and act on the split materials and attendant fluids in an area of said second vessel spaced below said aforementioned level, there being further means providing for discharge from the second vessel of the said washing liquor at a level spaced below the first mentioned level and to inhibit movement of the washing liquor thereby above said second mentioned level whereby to leave a buffer zone in said second vessel of hot split material and attendant hot fluid which protects the space above said first mentioned level from being influenced as to its temperature by the washing liquor.

9. A system as in claim 7 characterized by said second vessel having a first cylindrical section within which there is an inlet for the incoming chips with attendant fluids followed by a second conically expanded section providing for expansion of the incoming flow to accommodate the physical reaction producing the automatic split of the chips.

10. A system as in claim 9 characterized by said conically expanded section being followed by a uniformly cylindrical section constituting a washing or treatment chamber for the split material terminating in a conically reduced section constituting a cooling chamber for said material the apex portion of which includes the outlet from said second vessel for discharge of the split material in a washed and cooled fiber state, there being means

adjacent the juncture of said washing and cooling chambers for introducing a relatively cool wash liquor.

11. A system as in claim 10 characterized by means defining screened discharge openings in said second vessel adjacent the end of said washing or treating chamber remote from said cooling chamber to provide for discharge from said second vessel of at least a portion of the washing or treating fluids and there being further means for controlling the discharge from the second of said vessels of the split materials together with attendant fluid to maintain in said second vessel a layer of the hot split material and attendant hot fluid which defines and seals a space thereabove within which the saturated hot material is split.

12. A system as in claim 9 characterized by a discharge tube defining an outlet from said cylindrical section for gases released from said incoming chips and attendant fluids, said tube extending through said cylindrical section to terminate at its inner end within said conically expanded section.

13. A system as in claim 12 and means in connection with said last mentioned outlet to variably control the exit therefrom of said gases whereby to control the level of the reduction of the above atmospheric pressure in the second of said vessels in respect to the pressure in the first of said vessels and thereby control the extent of the automatic and inherent split of the fibrous material in said second vessel.

14. Apparatus for converting fibrous materials to individual fibers consisting of two series related vessels, means interconnecting said vessels including an outlet valve which relatively seals the first vessel from the second vessel while providing for transfer of materials from the first to the second vessel, the first said vessel including means for impregnating, saturating and heating wood chips or the like with a conditioning fluid in an environment of above atmospheric pressure and correspondingly elevated temperature to the point of substantially dissolving the agents which bond their fibers, said transfer valve providing means for delivery from the first said vessel to the top of the second said vessel of the hot saturated chips together with hot conditioning fluid, said second vessel having at the bottom thereof means defining an outlet and in connection therewith means for controlling the discharge from said second vessel to pro-

vide thereby that a desired level of the incoming materials including the attendant hot conditioning fluid is maintained adjacent and spaced from the top of said second vessel, the space defined thereby having in communication therewith an inlet communicating said second vessel with said transfer valve, means in connection with said second vessel and communicating with said space to provide for escape of gases therefrom and to thereby establish within said second vessel an above atmospheric pressure which is substantially lower than the pressure in the first said vessel, the second said vessel providing means thereby to produce an environment in said space causing the hot saturated chips entering said space to automatically split within said space into individual fibers and some fiber aggregates, the degree of split corresponding to the established differential pressure as between that in the first said vessel and that in the second said vessel, said second vessel providing means for a drop therethrough of the split materials and the attendant hot fluids, means defining washing and cooling sections in said second vessel spaced below the upper level of the hot fiber materials and attendant hot fluid, said second vessel having in connection therewith, at the limits of said washing section, means for introduction of washing fluid and means for discharge of at least a portion of the fluid to separate the washing fluid from the aforementioned level so as to inhibit the temperature thereof from affecting the aforementioned automatic split, there being further means in immediately following relation to the outlet from said second vessel to impose on the flow therefrom of the fibers and fiber aggregates and attendant fluids a turbulence the degree of which induces an automatic split of remaining fiber aggregates.

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