Oct. 7, 1969 R. B. REINHALL 3,471,366

APPARATUS FOR USE IN THE PRODUCTION OF PULP FROM LIGNOCELLULOSE CONTAINING MATERIAL

Original Filed Oct. 18, 1963 2 Sheets-Sheet 1

Fig.1

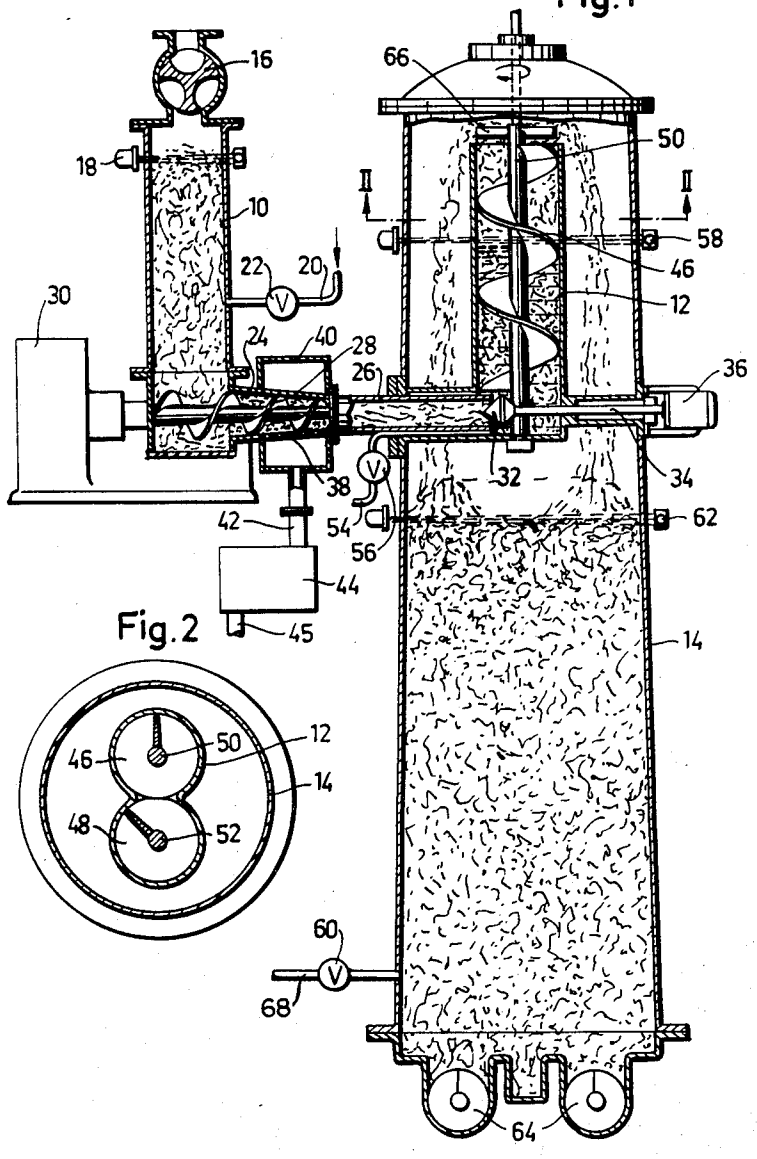


Fig.2

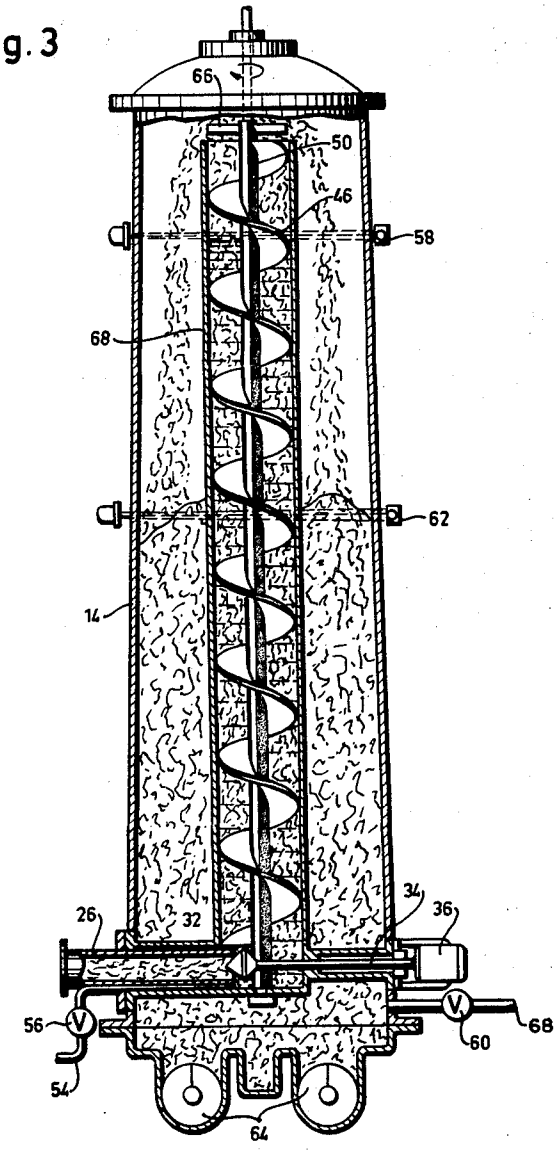
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Fig. 3



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APPARATUS FOR USE IN THE PRODUCTION OF PULP FROM LIGNOCELLULOSE CONTAINING MATERIAL

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Continuation of application Ser. No. 317,282, Oct. 18, 1963. This application Feb. 7, 1968, Ser. No. 703,792
Claims priority, application Sweden, Jan. 8, 1963, 191/63
Int. Cl. D21c 7/00
U.S. Cl. 162—237 6 Claims

ABSTRACT OF THE DISCLOSURE

An apparatus for use in the continuous production of pulp from lignocellulose-containing material. The apparatus includes three containers which are used for the treatment of the lignocellulose-containing material in steam. A particular type of conveying means is used between the first container and the second container to compress the water and air from the material after it has been treated in steam in the first container. The compressed material is then delivered to the bottom portion of the second container where it expands and is completely impregnated with liquid present in the second container. The second container is located within the third container. The third container includes means for producing a high pressure atmosphere of steam for treating the material after it has been allowed to expand and become impregnated in the second container.

BACKGROUND OF THE INVENTION

This application is a continuation of Ser. No. 317,282 filed Oct. 18, 1963, and now abandoned.

This invention relates to an apparatus for use in the continuous production of pulp from lignocellulose containing material, in the first instance wood, most suitably in the shape of chips, but also from grass of various kinds, straw, sugar-cane residues and like material. The fibre pulp is intended to be used in the paper making industry or for manufacture of fibre board and building elements or other objects containing such pulp.

It is known to introduce wood chips or the like material into a first container and to there subject them to a pretreatment by steam of low pressure and corresponding relatively low temperature. Between this container and a second container having an intake conduit for an impregnating liquid there is provided at the base portion of said containers a channel or tube containing a screw-conveyer which in collaboration with a counterpressure member produces a powerful mechanical pressure acting on the pretreated chips for removal of air and free water from the pores thereof. The material is relieved from said very high mechanical pressure in the second container where it is allowed to expand towards its original volume. The material is introduced below the liquid level in the container. A large quantity of impregnating liquid is sucked into the pores of the material. The second container communicates in turn with a third container in which the impregnated chips are subjected to cooking in a steam

and/or liquid phase under high pressure. The pretreatment temperatures ranges between 60 and 100° C. and more and the vapour pressure during the cooking step may amount to about 8 to 10 kilograms per square centimeter. An apparatus of this type is described in the copending patent application Ser. No. 237,911, filed Nov. 15, 1962, and now abandoned, by Arne Johan Arthur Asplund.

One main object of the invention is to provide an apparatus of the kind set forth above which is simpler in construction and therefore cheaper in manufacture and maintenance while at the same time the treatment of the raw material is improved. According to one main feature of the invention the second container is disposed within the third container and communicates with this latter at its top portion.

Even if the starting material is preheated in the first container it has a lower temperature than that which prevails in the third container. Due to the communication between the second and the third containers thus the law of the cold wall is applicable until the freshly introduced starting material has been heated to the high temperature. A further object of the invention is to provide an apparatus of the type under consideration under which the heating time is shortened and as a consequence the condensation of steam in the impregnating liquid with subsequent diluting thereof is reduced considerably.

BRIEF DESCRIPTION OF THE DRAWINGS

Further objects and advantages of the invention will become apparent from the following description, considered in connection with the accompanying drawings which form part of the specification and of which:

FIG. 1 is a vertical longitudinal section through an apparatus constructed according to the invention for impregnation and cooking of wood chips.

FIG. 2 is a section following lines 2—2 of FIG. 1.

FIG. 3 is a vertical longitudinal section of a slightly modified embodiment.

DESCRIPTION OF SPECIFIC EMBODIMENT

Referring to FIGS. 1 and 2 of the drawings reference numeral **10** denotes the first container, numeral **12** the second container and numeral **14** the third container of the apparatus. The container **10** is suitably closed, the starting material, primarily wood chips being fed from the top through a so-called cell-feeder **16** which suitably is of the type which is described in my Patent No. 3,077,272, granted Feb. 12, 1963, to which reference is made for a more detailed disclosure. The level until which the container is filled with chips is determined by a level control device **18** of known type. Steam of low pressure is introduced into the container **10** through a conduit **20** provided with a valve **22**. In the container **10** the material undergoes a preheating treatment and simultaneously part of the air present between the chips or in the pores of the wood, respectively is expelled. The cell-feeder **16** permits the air expelled in this manner to pass out of the container **10** into the surrounding atmosphere. Atmospheric or higher pressure may prevail in the container.

Connected to the base portion of the container **10** is a conical tube **24** which through a cylindrical tube **26** communicates with the base portion of the container **12**. A

screw-feeder **28** driven by a motor **30** extends into, and is adapted to, the conical shape of the tube **24**. Adjacent the inner end of the tube **26** a valve body **32** is disposed which valve body by means of a piston-rod **34** and a hydraulic servomotor **36** is adjustable relatively to the mouth of the tube. Co-operation of the screw-feeder **28** and the valve body **32** result in a mechanical compression the chips under high pressure which may amount to 20 to 30 kilograms per square centimeter and more whereby the chips are compressed and air as well as free water present in their pores are expelled to a substantial degree. The air and the water escape through the perforated wall **38** of the tube **28** to a suitably closed chamber **40** which through a conduit **42**, a pressure control member **44**, and a drain **45** is in connection with the free atmosphere.

The second container **12** is open at its top and contains suitably two mutually parallel screw conveyers **46**, **48** the vertical wall of the container suitably having the form of an **8** adapted to the screws as is evident from FIG. 2. The valve body **32** and the piston-rod **34** are located exactly between the screws which for this purpose have a portion cut away in correspondence to the diameter of the valve body. The screws are secured to shafts **50** and **52**, respectively, and are rotated by a motor not shown.

Chemicals containing liquid of known kind is supplied to the container **12** through a pipe **54** controlled by a valve **56**. These chemicals containing solution or impregnating liquid are filled to a level which is controlled by a level controlling device **58** which is at a distance above the mouth of the tube **26** opening into the container **12**. Thus when the strongly compressed chips mass arrives in the container **12** and are there relieved from the mechanical pressure, the chips will expand like a sponge and therefore will suck chemicals containing into their pores during their transportation in an upward direction by the screws **46** and **48**.

The container **12** is located in the upper portion of the container **14** and has in the illustrated embodiment a considerably less vertical extension than the container **14**. Steam under high pressure such as, for example, of 8 to 10 kilograms per square centimeter is supplied to the container **14** through a conduit **68** controlled by a valve **60** arranged in the base portion of the container. The level of the chips is determined by a control device **62** which groverns the number of revolutions of two horizontal screw conveyors **64** located at the base of the container. Said control device **62** is located in spaced relation to, and below, the base of the inner container **12**.

When the impregnated chips in the container **12** have reached the upper edge of the container **12** they are fed out through a distributor **66** and fall down in the container **14**. The same high vapour pressure as in the container **14** also prevails in the container **12** which has an advantageous effect on the efficiency of the impregnation. The container **12** is surrounded by a steam atmosphere for which reason the chips entering from the channel **24**, **26** are heated quickly to a temperature corresponding to that of the high pressure steam. For this reason, the steam will only be condensed to only a minor degree in the impregnating liquid in the container **12** and thus retain its most suitable concentration. Due to the features of the invention, the apparatus is given a relatively compact structure and the inner container **12** need not be provided with sealing end packings which would be relatively expensive because they should be made to withstand higher interior pressures.

The pressure control device **44** serves to adjust the pressure inside the jacket **40** to the value equal to or slightly higher than the steam pressure prevailing in the container **10** when the last-mentioned pressure is higher than the atmospheric pressure. Steam from the container **10** is prevented from escaping particularly before any plug of chips has been formed by the action of the screw conveyor **28**.

The embodiment illustrated in FIG. 3 is which the same reference numerals are used as in FIGS. 1 and 2 to denote equal or equivalent parts, differs from the embodiment shown in the FIGS. 1 and 2 mainly by the feature that the inner container **68** has been elongated so as to occupy substantially the whole inner length of the container **14**. The conduit **26** through which the chips are fed from the container **10** into the container **68** is thus located in the lower portion of the container **14**. The embodiment shown in FIG. 3 permits prolongnation of the heating time for the chips. Further, it is rendered easier to vary the length of the heating time by having the screws **46**, **48** to rotate with varying speeds.

While the apparatus for use in the production of pulp from lignocellulose containing material has been shown and described in detail, it is obvious that this invention is not to be considered as being limited to the exact form disclosed, and that changes in detail and construction may be made therein within the scope of the invention, without departing from the spirit thereof.

What is claimed is:

1. An apparatus for use in the continuous production of pulp from lignocellulose-containing material comprising:

(a) a first container having a first intake opening for the material and a second intake opening for the admission of steam under low pressure,

(b) a second container for an impregnating liquid having an inlet opening to introduce the material below the level of the impregnating liquid and an outlet opening at the top thereof,

(c) a first conveying means extending between the lower portions of the first and second containers, said conveying means including a compressing means providing a high pressure to the material being conveyed to compress said material before introduction into said container and a means to exhaust water and air pressed out of the material by said compressing means,

(d) injection means located at the bottom of said second container to introduce said impregnating liquid,

(e) means regulating the level of the impregnating liquid within the second container,

(f) a third container in which the second container is disposed, the top edge of the second container being in communication with the top portion of the third container,

(g) means providing a high pressure atmosphere of steam in the third container, and

(h) a second conveying means located in the second container to move the material from the lower portion thereof, through the impregnating liquid and over the edge of the second container into the third container.

2. An apparatus as defined in claim **1** including means regulating the level of the liquid in the third container and wherein the top edge of the second container located in the third container is above the level of the liquid in the third container.

3. An apparatus as defined in claim **1** wherein the regulating means of the third container maintains the level of the liquid in the third container below the bottom of the second container so that the latter container is entirely surrounded by an atmosphere of steam.

4. An apparatus as defined in claim **1** wherein said first conveying means includes a channel extending between the lower portions of the first and second containers and a screw conveyor operably mounted within said chan-

nel moves the material from the first container through the channel into the second container.

5. An apparatus as defined in claim 4 wherein said compressing means includes a counter-pressure member cooperating with the screw conveyor for mechanically compressing the material before introduction into the second container.

6. An apparatus as defined in claim 4 wherein said exhaust means includes a perforated wall for the channel adjacent to the screw conveyor for the escape of water and air pressed out of the material.

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U.S. Cl. X.R.

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