

Sept. 25, 1962

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3,055,795

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2 Sheets-Sheet 1

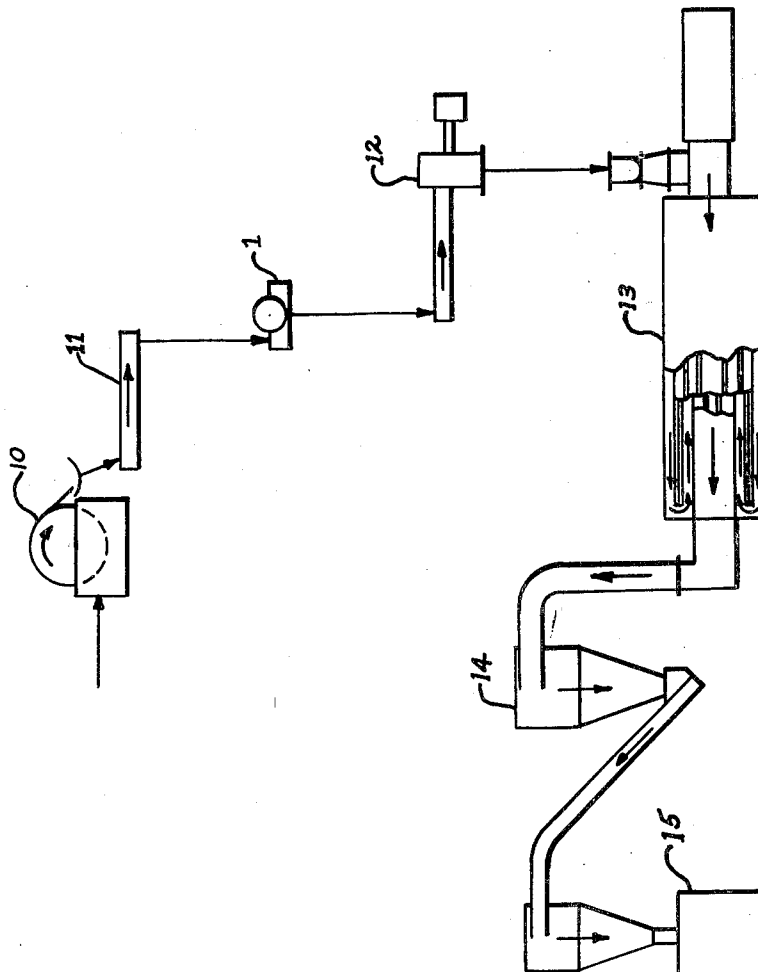


Fig.-1

INVENTOR.
LEE E. EBERHARDT
BY Tom Walker
ATTORNEY

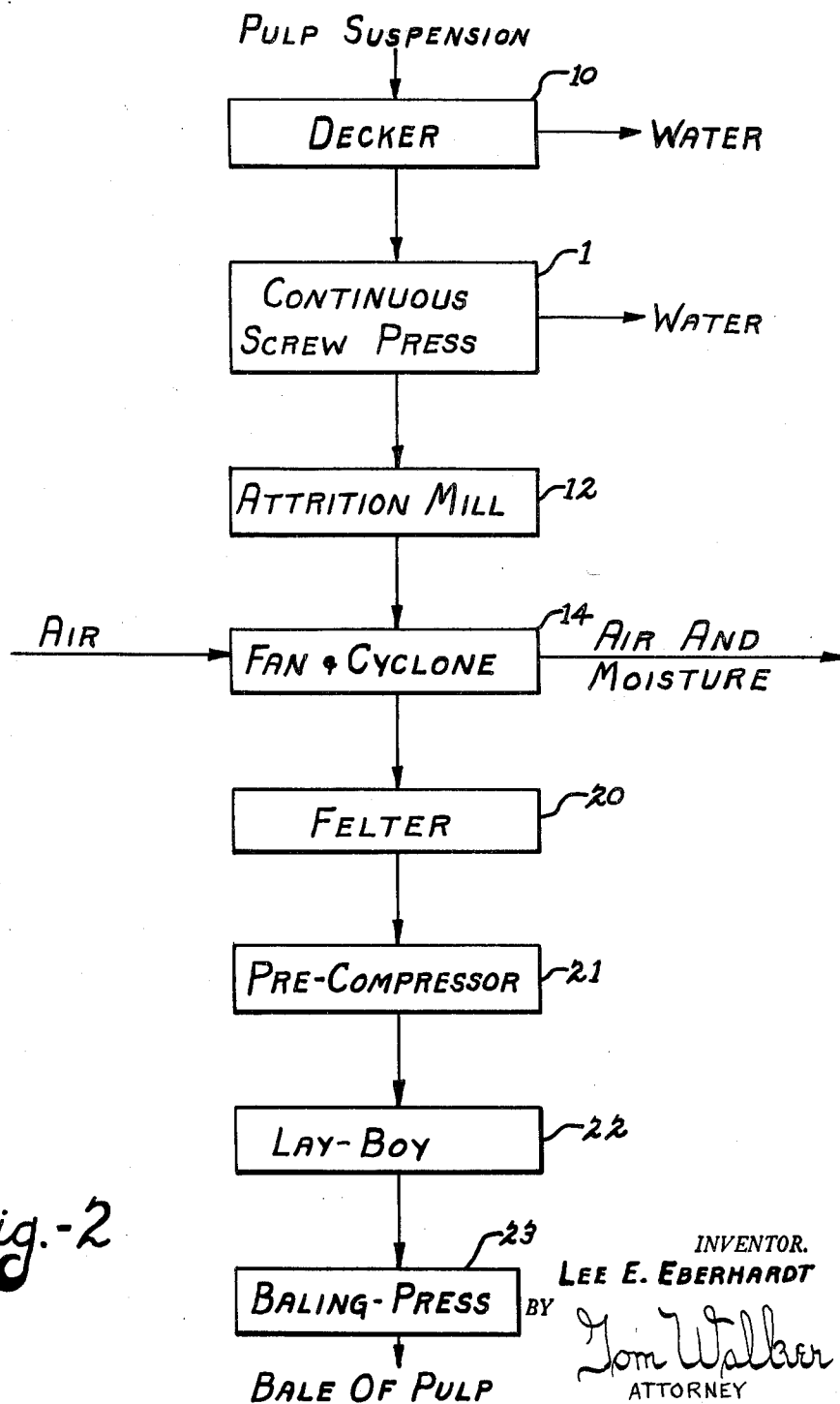
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1

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HANDLING OF PAPER PULP

Lee E. Eberhardt, Springfield, Ohio, assignor to The
Bauer Brothers Company, Springfield, Ohio, a corpo-
ration of Ohio

Filed Sept. 9, 1957, Ser. No. 682,874
12 Claims. (Cl. 162-100)

This invention relates to pulp handling systems and more particularly to a new and improved method and system for drying and baling pulp for storage and ship-
ment.

The most serious problems facing non-integrated mills are due to the inadequacy of available pulp handling systems and the difficulties attendant preparation of pulp for world-wide shipment in accordance with prior art methods. Conventional methods employed to prepare pulp for shipment require high capital and involve high operational costs. Moreover, they have a relatively narrow range of application and may cause degradation in end product quality.

Ground wood, for example, is one of the most versatile market pulps, yet the marketing of this product has been severely handicapped because of the necessity of shipping it in a substantially liquified condition containing about fifty percent solids. Shipment of ground wood in this form may cause degradation due to microbiological deterioration over a relatively short period of time. The pulp resultingly loses most of its value in shipment and requires considerable processing by the consumer to effect products of any quality. As is obvious, the high water content of the pulp as conventionally prepared for shipment requires large volume and high tonnage shipping capacity.

Many methods have been investigated in an effort to obtain an effective system for drying and baling pulp to reduce shipping and handling problems but they have been handicapped by high initial capital costs, high operational costs, and loss of quality in the end product, the end product usually being difficult to re-pulp at the consuming mill.

The present invention affords a solution to the above indicated difficulties in the art. It provides a simple system for drying and baling pulp that involves a low capital cost, dries the pulp to a high solids content, reduces the unit volume required for shipping pulp, and works the pulp to a form that can be handled with simple loading and unloading equipment. The invention system also prevents pulp degradation and effects a pulp which the ultimate consumer can readily re-pulp without difficulty. Moreover, the product of the invention method, as delivered to the consumer, retains much of its original, inherent wet pulp strength.

A primary object of the invention is to provide a simplified and improved method of preparation of paper pulp for storage and shipment whereby such method will produce substantial economy, be more efficient and satisfactory in operation, be readily adaptable to a wide variety of applications and effect quality control of the pulp in the process.

A further object of the invention is to provide a simple, low capital cost system for drying and baling pulp.

A further object of the invention is to provide an improved method of drying and baling pulp for shipment which effects a drying of the pulp to a high solids content.

Another object of the invention is to provide an improved method for drying and baling pulp that reduces the pulp from considerable volume to a package or bale of a size that can be readily handled with simple loading and unloading equipment.

An additional object of the invention is to provide an

2

improved system for drying and baling pulp for shipment that prevents contamination of the pulp in handling.

A further object of the invention is to provide a new and improved method for drying and baling wood pulp for shipment that prevents pulp degradation in the process and provides a pulp which can be readily re-pulped by the ultimate consumer.

Another object of the invention is to provide an improved method of drying and baling pulp that causes the pulp to retain a maximum of its original, inherent wet pulp strength.

A further object of the invention is to provide a new and novel method for drying and baling pulp.

A further object of the invention is to provide a method and apparatus for handling paper pulp possessing the advantageous structural features, the inherent meritorious characteristics and the mode of operation herein mentioned.

With the above primary and other incidental objects in view, which 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 drawings wherein are found some, but obviously not the only forms of embodiment of the invention;

FIG. 1 of the drawings schematically illustrates a flow diagram of the invention system for drying and baling pulps; and

FIG. 2 illustrates a modification of the system of FIG. 1.

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

The invention method and system can be best described with reference to the flow diagram illustrated. In the practice of the invention a pulp suspension consisting of wood fragments in a liquid carrier is initially delivered to a vacuum decker 10. Here a portion of the water or other liquid carrier is separated from the pulp and drained off, leaving a pulp of 15-20 percent solids. Some initial shredding of the pulp may be accomplished at the decker depending on the type of removal device employed.

From the decker, the pulp is carried through conveyor 11 which further disintegrates the partially dewatered pulp so that it readily enters a continuous press 1 wherein sufficient water is drained to increase the solid content to 40-50 percent.

The de-watered pulp from the continuous screw press is then delivered to an attrition mill 12, either a single or double disc, or modified hammer mill, wherein the pulp is fluffed and separated into individual fibers. The fluffing action is accompanied by a flashing of moisture due to the emission of water vapor or steam in proportion to the attrition power applied in fluffing. Accordingly, the percentage of bone dry solids in the suspension delivered from the mill is thereby slightly increased.

From the fluffing stage the pulp is dropped into a pneumatic conveyor and discharged into a heated air stream provided by a "flash" drier 13. This drier preferably consists of a direct fired multiple pass rotating drum drier as indicated in the schematic drawing. The heated air stream carries the pulp suspension from the fluffing stage through the multiple passes of the rotating drum. This process causes additional moisture to be flashed in the air stream, dependent on the temperature and the relative dryness of the conveying air. By control of these two factors, which may be readily effected in a manner believed obvious, an accurate determination and effecting of the desired moisture content of the final processed pulp product may be had.

From the flash drier, the pulp, accompanied by the

now hot moist carrier air, is discharged into a cooling cyclone 14 where the hot moist air is separated from the pulp. It must be noted that the interval of exposure of the pulp to the hot dry air stream in the flash drier is less than one minute and at no time does the temperature of the pulp at the cyclone discharge exceed 130° F. As a matter of fact, since the water flashes to steam at 212° F. and at this point that the heat of evaporation will cool the pulp fibers, it is doubtful that the pulp temperature in the air stream within the flash drier ever exceeds 212° F. This flash-drying process is effective to dry the pulp to an optimum solids level of 75-95 percent dry.

The pulp, in fiber form on separation from the hot moist air and water vapor in the cyclone, is discharged to an air handling system which delivers the fiber to a two-station high density baler 15. At the first or tamping station of the baler, the pulp is continuously delivered to a baler box until enough pulp is accumulated to form a bale, at which time the flow of pulp is momentarily stopped. The baler box is then indexed under a high compression ram system where the pulp is compressed to a high density by hydraulic rams to obtain a bale density in the range of 45-65 pounds per cubic foot. Bales so compressed have been found to have little spring back and to retain their compression without strapping. The bale is then wrapped and/or boxed for handling to warehouses or to cars for shipping. Strapping may be utilized but is not generally required.

The resulting pulp bales as prepared for shipment are in the area of 90 percent bone dry and are considerably reduced in volume from the conventional shipping form. Shipping economy is readily apparent and handling difficulties are reduced to an absolute minimum in the employment of the subject invention. There is substantially no degradation of the pulp in storage or shipment.

The pulp so processed can be re-pulped with ease. It can be broken down readily in conventional slush pulpers and while there is some slight strength lost in the drying and baling of the pulp, this can be readily restored by a slight beating or refining by the consumer.

The direct cost per ton of end product is substantially reduced in the employment of the invention while its quality is increased. The system is completely automatic and controlled and the only labor required is for handling the baling and shipping operation. Two operators are sufficient for the entire system.

As a modification of the above described system, noting FIG. 2 of the drawings, from the cyclone the fibers may be discharged into a felt 20. The felt is a rectangular box, the bottom of which is provided by a continuously moving wire belt. The fibers fall to the felt in a "snow-storm" which settles as a thick mat on the moving wire belt. This belt moves out of the felt between two rubber belts 21 to gradually effect a decrease of the mat thickness from about three to six inches to about one-half to one inch. This provides a pre-compression of the pulp prior to baling. The pre-compressed mat is then delivered onto a lay-boy 22 in continuous form so as to hairpin or fold back and forth on itself to build up in layers. The lay-boy is gradually lowered as the layers are deposited until a predetermined amount is stacked, at which point the mat is cut. The stack is then moved from the lay-boy to a baling or indexing press 23 where the pulp is compressed to a bale of better than 35 pounds per cubic foot density and then wrapped and/or boxed for removal to storage and shipping.

The alternate modifications proposed may be selectively used depending on the application intended. The staged drying process insures maximum quality products in either case.

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 con-

struction 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 method of preparing pulp for shipment including the steps of introducing wood particles in a liquid carrier, agitating such suspension and draining to provide a suspension having a 15-20 percent solids range, pressing said particles to reduce the water content and effect a suspension having a 40-50 percent solids level, fluffing the pulp to separate it into fibers, flashing moisture in the process, and flash drying the pulp at moderate temperatures to a 75-95 percent dry condition.

2. A method of preparing pulp for shipment including, agitating and draining a pulp suspension, subjecting the suspension so obtaining to a continuous press operation to fiberize the pulp, grinding the pulp to reduce it to individual fibers and transmitting the pulp fibers in suspension in a pre-heated dry air stream to provide pulp which is 75-95 percent dry.

3. A process of preparing pulp for shipment including the steps of successively agitating and pressing pulp in suspension, fluffing the pulp in suspension to separate the pulp fibers, and introducing the fiberized pulp in suspension to a heated air stream to flash-dry the pulp to a substantially dry condition enabling compression of the fibers into bale form.

4. A method of processing pulp for storage and shipment comprising the steps of introducing pulp in a liquid carrier to provide a suspension of pumpable consistency, subjecting the pulp in suspension to staged shredding action and draining to reduce the suspension to a 40-50 percent solids level, further treating the pulp to reduce it to an individual fiber condition and introducing the pulp fiber to a dry heated air stream for an interval of one minute or less to separate the hot moist air from the pulp fiber to convert the pulp to an optimum solids level facilitating baling of the pulp for shipment.

5. A method of processing pulp for shipment including the steps of subjecting a pulp suspension to staged dewatering and fiberizing action, fluffing the pulp to separate the pulp fibers and flash moisture therefrom, transmitting the fluffed pulp and subjecting it to a heated air stream for less than one minute, the heated air stream relieving the pulp of moisture and maintaining it at a relatively low temperature, and separating the pulp from the hot moist air stream to provide a relatively dry pulp capable of being baled and shipped without the danger of pulp degradation in transit.

6. The method as set forth in claim 5 and further introducing the flash-dried pulp to a two stage baling press and pre-compressing and compressing the pulp fibers to provide a bale having a density in the range of 45-65 pounds per cubic foot.

7. A method of preparing pulp for shipment including the steps of subjecting a pulp suspension to a fiberizing and de-watering action, fluffing and separating the pulp into fibers and, flash drying the pulp fiber for a period of less than one minute at relatively low temperature ranges.

8. A method as set forth in claim 7, and transmitting the flash dried pulp in fiber condition to a felt and compressing the fibers into a continuous mat, further compressing the mat so formed, hairpinning the mat onto a layboy, separating the hairpinned mat portion on the layboy and compressing it to bale form to provide a pulp

5

highly resistant to micro-biological deterioration and readily handled and shipped.

9. A method of preparing pulp for shipment including the steps of passing a pulp suspension successively through a decker, a continuous screw press and an attrition mill to fiberize the pulp in staged fashion, fluff it and reduce it to a 40 to 50% dry condition, transmitting the pulp from the mill to a cyclone by means of a pre-heated air stream flashing moisture from the fiberized pulp to dry it to an optimum solids level, separating the hot moisture from the pulp in the cyclone and dropping the pulp fibers to a felt, pre-compressing the fiber delivered from the felt and stacking and baling the pulp so provided.

10. A method of preparing pulp as set forth in claim 9 wherein the pulp temperature in the transmitting air stream is maintained at 212° or less and the interval of time for transmission from the mill to the cyclone is substantially one minute.

11. A pulp handling system for conditioning pulp for storage or shipment including, a series of fiberizing means connected to successively fiberize pulp in suspension and increase the solids content of the suspension in stepped fashion, means in connected relation to said fiberizing means for entraining the fiberized pulp in a pre-heated air stream, means for receiving the pulp and the air

6

stream which has absorbed moisture from the pulp for separating the pulp for baling, a press, and means interposed between said separating means and said press for matting and pre-compressing the pulp fiber obtaining to facilitate stacking and forming the pulp into fibrous bales.

12. Pulp conditioning apparatus including, means for successively subjecting a pulp in suspension to successively increasing fiberizing action and incremental draining to increase the solids level of the suspension, a felt, means for transmitting the fiberized pulp to the felt and flash drying the pulp fiber in transmission, means for transmitting the fiber in mat form from the felt and means for stacking the mat for compression and baling for shipment.

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