Sept. 3, 1957 J. H. PAYNE ET AL 2,805,156

PROCESS FOR THE SEPARATION OF PITH AND FIBER COMPONENTS OF BAGASSE

Filed Jan. 21, 1953 2 Sheets-Sheet 1

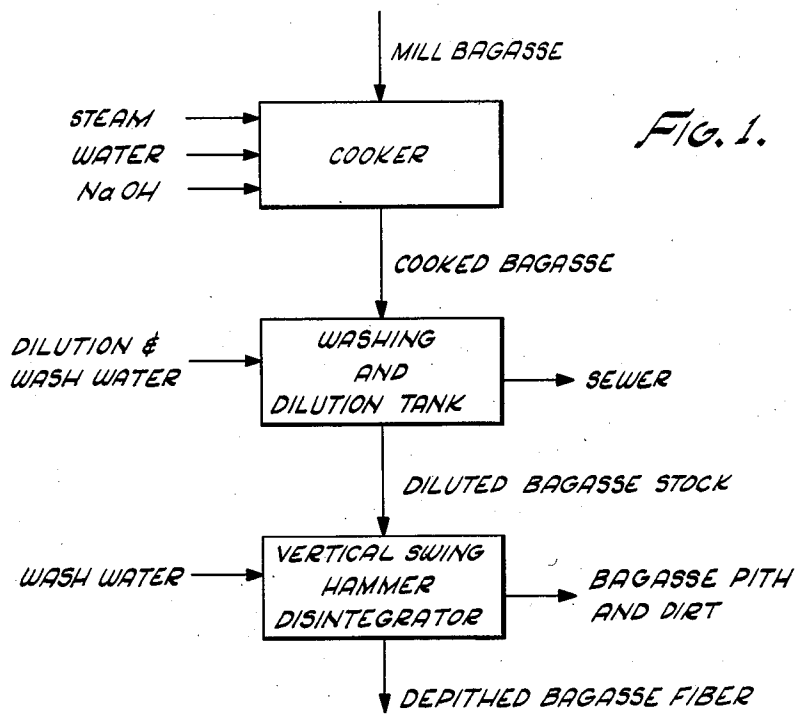


FIG. 1.

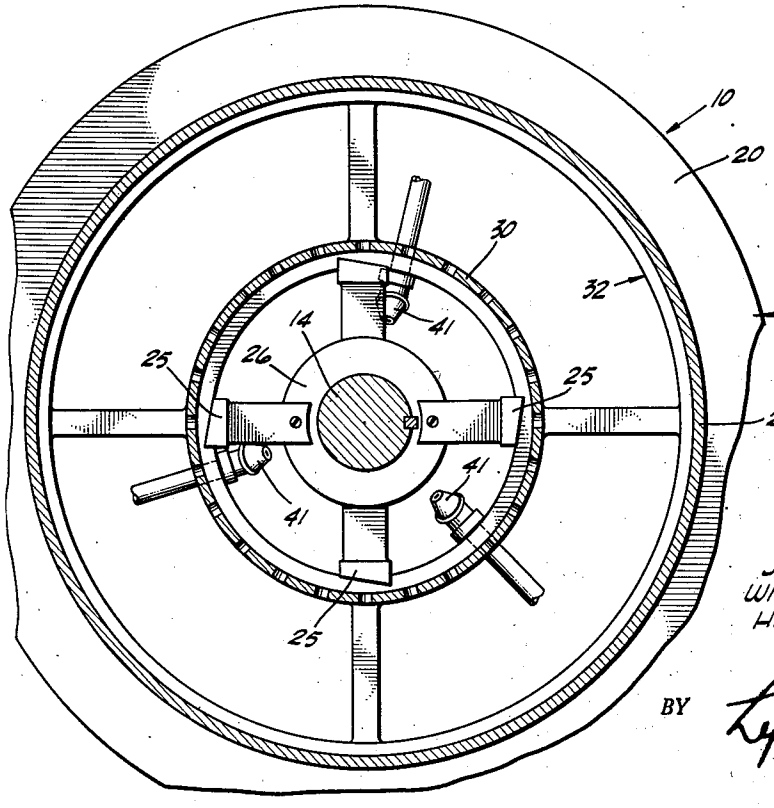


FIG. 3.

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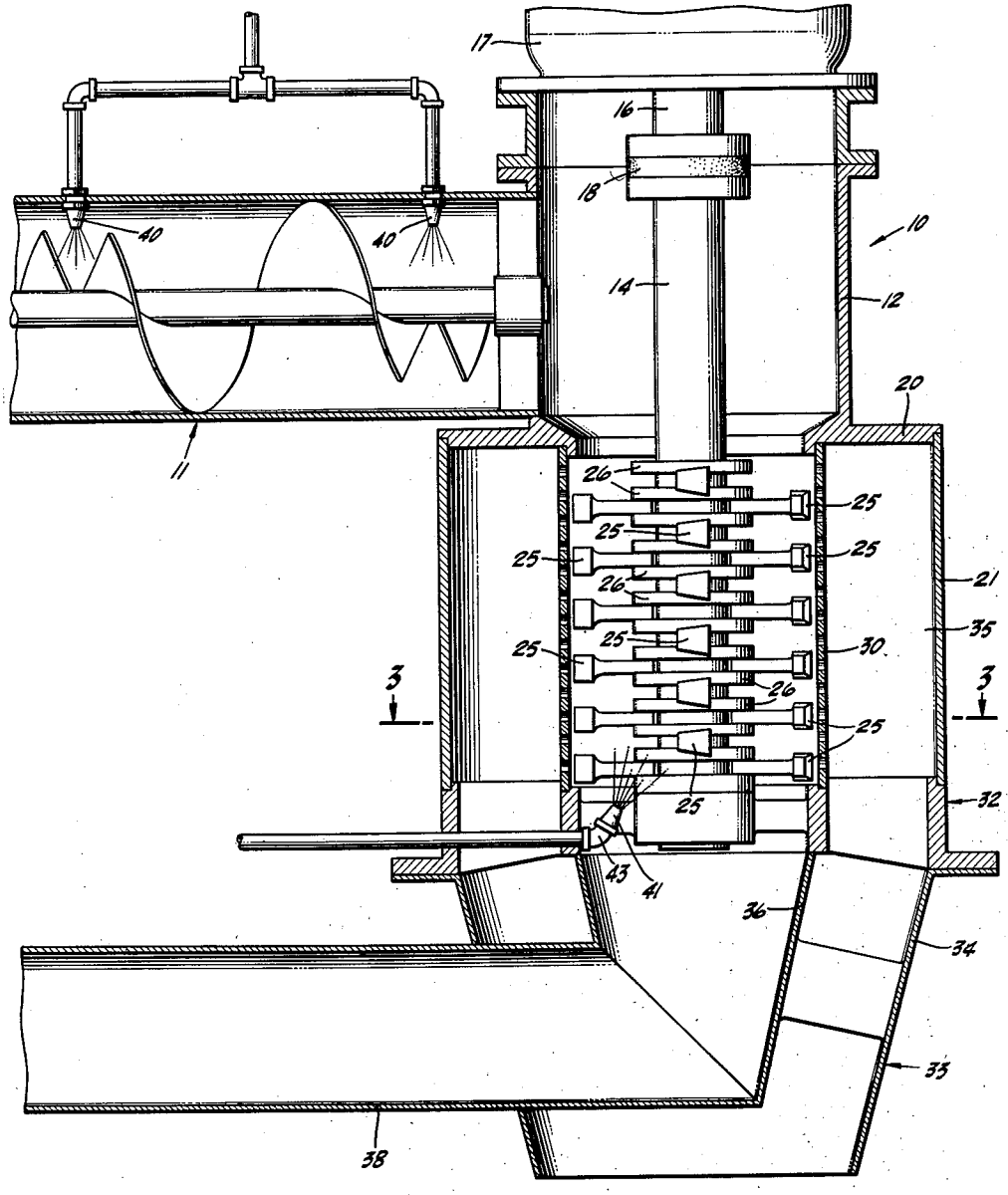


FIG. 2.

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PROCESS FOR THE SEPARATION OF PITH AND FIBER COMPONENTS OF BAGASSE

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4 Claims. (Cl. 92—14)

This invention relates to the treatment of bagasse and similar cellulose-containing materials, and has particular reference to a process for the treatment of bagasse, and the like, to prepare therefrom a clean fiber suitable for the production of paper pulp and dissolving pulp.

Many attempts have heretofore been made, with varying degrees of success, to separate from bagasse a fiber which will meet the requirements of the paper industry. To accomplish this, it is desirable to remove from the bagasse a major portion of the undesirable pithy component and to eliminate the large quantity of occluded dirt and insoluble matter which always accompanies bagasse, due to the conditions under which the sugar cane is harvested. One of the principal objects of this invention is, then, to provide a process for the separation from bagasse of clean fiber suitable for paper pulp production.

Another object of this invention is to provide a process for the separation of pith and fiber components of bagasse, in which process a minimum amount of fine bagasse fiber is produced, and which process provides substantially complete removal of objectionable ash impurities from the bagasse fiber.

Still another object of this invention is to provide an efficient and relatively inexpensive process for the separation from bagasse of a fiber suitable for the production of paper pulp and dissolving pulp.

Other objects and advantages of this invention, it is believed, will be readily apparent from the following detailed description of a preferred embodiment thereof when read in connection with the accompanying drawings.

In the drawings:

Figure 1 is a flow sheet illustrating a process which comprises a preferred embodiment of this invention.

Figure 2 is a diagrammatic vertical section of a swing hammer disintegrator utilized in carrying out the preferred process of this invention.

Figure 3 is a sectional view, taken substantially on the line 3—3 of Figure 2.

Referring now to the drawings, and particularly to Figure 1, it will be seen that bagasse, which is in the moist condition in which it is usually delivered from the sugar mill, is charged into a cooker which may comprise a conventional pulp mill digester, pulper or vegetable blancher. The bagasse is immersed in water, and the mixture is heated by means of steam and maintained at the desired temperature for a given period of time. It has been found that the addition of from about 0.5 to about 6 percent caustic soda, based on the dry weight of bagasse, will reduce the necessary cooking time, and will also improve the separation of pith from the fiber and the removal of waxes from the surface cane fibers.

The primary purpose of the cooking operation is to soften the fiber to prevent disintegration, or partial disintegration, of the fiber particles during subsequent separation operations, and the resultant production of excessive amounts of fine fiber particles; and to loosen adhering dirt particles. The cooking conditions are, therefore, more or less dependent upon the physical state of

the bagasse at the time of its introduction into the cooking equipment. In operation, we have found optimum results are obtained when the bagasse is cooked for about one hour at a temperature of from 190–200° F. with a caustic soda concentration of 3–6 percent, based on the dry weight of bagasse. Under some conditions, a cooking period of about thirty minutes is sufficiently long. The temperature should be maintained in excess of 150° F., but at, or near, such temperature, a longer cooking period is desirable. The consistency of the bagasse during cooking may be varied over a wide range preferably from about 2 to about 7.5 percent.

After cooking, the cooked bagasse stock is diluted with water in a washing and dilution tank, as shown in Figure 1. Preferably, sufficient water is added to bring the consistency down to about 2 percent or less. The extent to which dilution is carried out depends upon the amount of dirt the original bagasse contains. Where excessive amounts of dirt are present, it is desirable to dilute the stock to a consistency of 1 percent or less, washing out the large dirt particles to the sewer through a screen (not shown) in the dilution tank prior to further processing.

The cooked and diluted bagasse stock is then pumped to a vertical swing hammer disintegrator generally indicated **10**, where the simultaneous disintegration of the bagasse i. e., loosening of the pith and dirt components from the fiber and separation of the fiber from the pith and dirt particles is carried out.

Referring in particular to Figures 2 and 3, the disintegrator **10** is provided with a screw-type feeder conveyor **11**, the outlet of which leads into the casing **12** of the disintegrator proper. A vertical shaft **14** is suitably journaled in the casing, and is connected in driven relation with the drive shaft **16** of a motor **17** by means of a coupling **18**. The casing **12** is provided with an annular outwardly-extending shoulder **20**, depending from which is a cylindrical housing **21**, downwardly through which extends the shaft **14**. A plurality of swing hammers **25** are pivotally connected to flanges **26** secured to the shaft. Surrounding the swing hammers **25**, and closely adjacent the outer ends thereof, is a cylindrical screen **30**.

Connected to the bottom of the housing **21**, and to the bottom of the screen **30**, is a double-walled body portion **32**, and depending therefrom is a separating discharge device **33** which includes an outer frusto-conical section **34** communicating with the annular space **35** between the screen **30** and housing **21**. Centrally of the section **34**, and communicating with the central chamber defined by the screen **30**, is a product discharge section **36** which is connected to an outlet conduit **38**.

Wash water is introduced into the conveyor **11** by means of the pair of spray heads **40**. Additional wash water is applied to the operating section of the disintegrator by means of three spaced spray heads **41** which are directed upwardly as shown through the agency of the elbow fittings **43**. The use of wash water at these points improves the separation of the pith and fiber and also facilitates the removal of dirt particles.

Preferably, the screen is provided with perforations of about $\frac{1}{16}$ inch diameter, although perforations of $\frac{1}{32}$ inch and $\frac{3}{32}$ inch have been used successfully. A shaft speed of 3,600 R. P. M. appears to produce the most desirable fiber product, although satisfactory results have been obtained at a speed of 1,800 R. P. M.

The cooked and diluted bagasse stock is pre-broken by means of the screw conveyor **11**, from which it is discharged downwardly onto the swing hammer **25**. The finely divided dirt particles and pith are first separated from the fiber by the centrifugal attrition action of the hammers against the screen, and are then forced out-

wardly through the screen perforations by continued centrifugal force. These dirt and pith particulars are discharged downwardly through the section 34 and there discarded. The fiber is retained on the interior of the screen, and then falls downwardly through the discharge section 36, from where it is conveyed through the conduit 38 to be stored for further processing in accordance with conventional paper mill practice.

By the use of the above-described process, a high recovery of clean, acceptable fiber is obtained. The cooking step produces sufficient softening of the fibre bundles so that the action of the disintegrator does not reduce the fiber length to an undesirable extent, yet enables efficient separation of the undesirable pith and other foreign matter.

It will be readily apparent to those skilled in the art that ash and dirt particles are undesirable components of pulp for paper and viscose products. In the utilization of dissolving pulp for viscose production, the presence of substantial amounts of manganese, copper, and iron in the pulp has a deleterious effect on the viscosity of the resulting viscose. We have found that the process herein described removes a substantial portion of the soil ash which contains these offending impurities. The ash removal obtained with the present process is much greater than that achieved by normal digestion and pulping methods heretofore recommended for bagasse pith and fiber separation.

Tables I and II below provide specific examples of the efficacy of the process of this invention in removing ash impurities, as compared to other processes.

Table I

Material (Dry Basis)	Ash, percent	Fe_2O_3, percent	Copper, percent	Manganese, percent
1. Mill bagasse	2.26	.216	.0010	.0029
2. Dry Screened fiber	1.72	.250	.0048	.0022
3. Pulped (3% NaOH, 190° F.) and wet screened fiber	0.86	.044	.0007	.0008
4. Our process	0.48	.030	.0003	.0003

Table II

Material (Dry Basis)	Ash, percent	Fe_2O_3, percent	Copper, percent	Manganese, percent
1. Pulped (6% NaOH, 200° F.) and wet screened fiber	2.13	.328	.0060	.0028
2. Our process	0.68	.020	.0002	.0008

Material No. 1 in Table I was obtained from the discharge roll of the last mill in a cane sugar factory. Material No. 2 was obtained by passing mill bagasse containing 45 percent moisture over a 12-mesh Rotex screen. Material No. 3 was produced by pulping mill bagasse in a standard pulp mill pulper for one hour in a solution containing 3 percent caustic soda based on the dry weight of the bagasse at 190° F., and then wet screening the pulped stock in a rotary screen to produce the fiber. Material No. 4 was produced by the process of this invention, the cooking stage being carried out in a pulper for one hour in 3 percent caustic soda at 190° F.

Materials Nos. 1 and 2 of Table II correspond to Nos. 3 and 4, respectively, of Table I, with the exception that, in both of the former cases, the cooking conditions were 200° F., the solution containing 6 percent caustic soda based on the dry weight of the bagasse.

The above description and examples are intended to be illustrative only. Any modification of or variation therefrom which conforms to the spirit of the invention is intended to be included within the scope of the claims.

We claim:

1. In a process for the treatment of bagasse wherein the bagasse is cooked in an aqueous medium for a sufficient length of time to produce a material containing softened bagasse fibers, bagasse pith and foreign matter, the steps of continuously advancing said material while in a wet condition downwardly through a zone of disintegration surrounded by a substantially vertical screen while directing sprays of water into said zone, subjecting the material in said zone simultaneously to impact disintegration, centrifugal attrition and continuous washing action so that the pith and foreign matter are loosened from the fibers without substantial disintegration of such fibers and are forced outwardly through the perforations of said vertical screen, the fibers being retained within said zone by said screen and passing generally downwardly through said zone, discharging the pith and foreign matter passing outwardly through said screen, and separately discharging the downwardly moving fiber relatively free of pith and foreign matter from the lower end of said zone.

2. In a process for the treatment of bagasse wherein the bagasse is cooked in an aqueous medium for a sufficient length of time to produce a material containing softened bagasse fibers, bagasse pith and foreign matter, the steps of continuously advancing said material while in a wet condition downwardly through a zone of disintegration surrounded by a vertical screen against upwardly directed sprays of water, subjecting the material in said zone simultaneously to impact disintegration, centrifugal attrition and continuous washing action so that the pith and foreign matter are loosened from the fibers without substantial disintegration of such fibers and are forced outwardly through the perforations of said vertical screen, the fibers being retained within said zone by said screen and passing generally downwardly, discharging the pith and foreign matter passing outwardly through said screen, and separately discharging the downwardly moving fiber relatively free of pith and foreign matter from the lower end of said zone.

3. In a process for the treatment of bagasse wherein the bagasse is cooked in an aqueous medium for a sufficient length of time to produce a material containing softened bagasse fibers, bagasse pith and foreign matter, the steps of diluting said material with water to a consistency of less than 2 percent, continuously advancing said material while in a wet condition downwardly through a zone of disintegration surrounded by a vertical screen against upwardly directed sprays of water, subjecting the material in said zone simultaneously to impact disintegration, centrifugal attrition and continuous washing action so that the pith and foreign matter are loosened from the fibers without substantial disintegration of such fibers and are forced outwardly through the perforations of said vertical screen, the fibers being retained within said zone by said screen and passing generally downwardly, discharging the pith and foreign matter passing outwardly through said screen, and separately discharging the downwardly moving fiber relatively free of pith and foreign matter from the lower end of said zone.

4. In a process for the treatment of bagasse wherein the bagasse is cooked in an aqueous medium for a sufficient length of time to produce a material containing softened bagasse fibers, bagasse pith and foreign matter, the steps of continuously advancing said material while in a wet condition downwardly through a zone of disintegration while directing sprays of water into said zone, subjecting the material in said zone simultaneously to impact disintegration, centrifugal attrition and continuous washing action so that the pith and foreign matter are loosened from the fibers without substantial disintegration of such fibers and are forced outwardly from said zone, the fibers being retained within said zone and passing generally downwardly through said zone, discharging the pith and foreign matter passing outwardly from said zone, and separately discharging the down-

wardly moving fiber relatively free of pith and foreign matter from the lower end of said zone.

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