United States Patent

[11] 3,622,091

[72] Inventor **Howard Bidwell**
56 Aldrich St., Granby, Mass. 01033

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Continuation-in-part of application Ser. No. 655,190, July 21, 1967, now Patent No. 3,539,315. This application June 18, 1969, Ser. No. 834,326

[54] **DRY FLUFFING PULP SHEET STOCK**
1 Claim, 5 Drawing Figs.

[52] **U.S. Cl.** **241/222,** 51/206.5, 241/295
[51] **Int. Cl.** **B02c 4/18,** B02c 4/30, B02c 4/44
[50] **Field of Search** 241/67, 277, 280–282, 294–295, 222, 41, 239–241; 51/206, 206.4, 206.5, 267

[56] **References Cited**

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Primary Examiner—Donald G. Kelly
Attorneys—Kenwood Ross and Chester E. Flavin

ABSTRACT: Apparatus for dry fibering pulp sheets fed by feed rollers from plural sheet stock rolls. The fibering apparatus includes a granular surfaced multisectioned roll having a multiplicity of thin disc-ring sections supported by a driving hollow core. The multisectioned roll cooperates with an adjustable anvil plate located at the point of sheet feed.

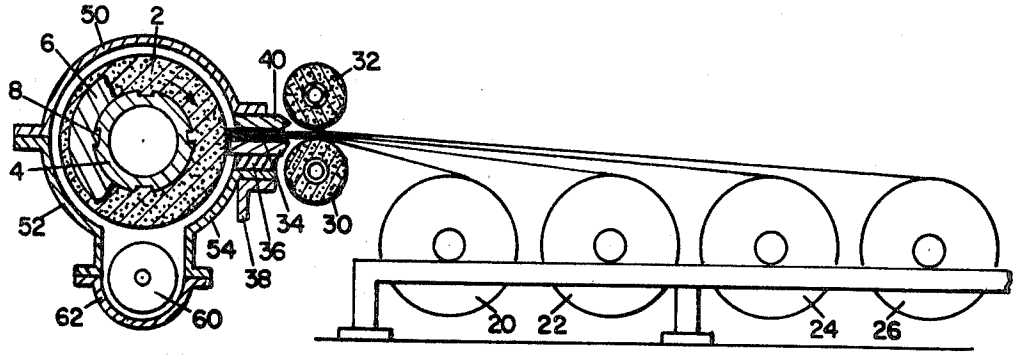


Fig 1

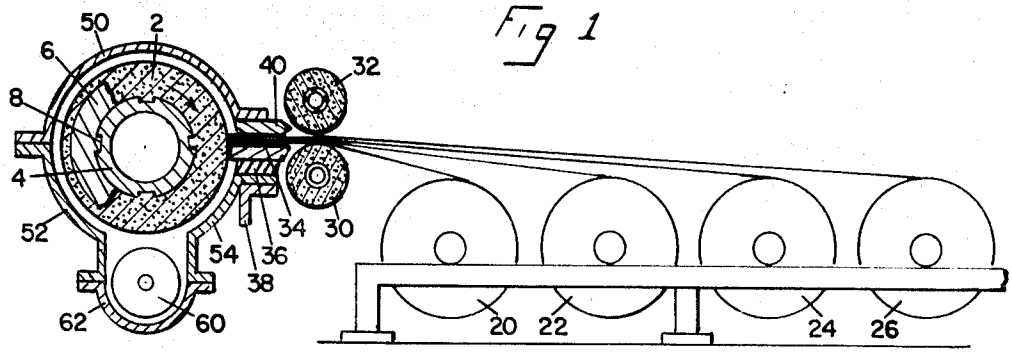


Fig 2

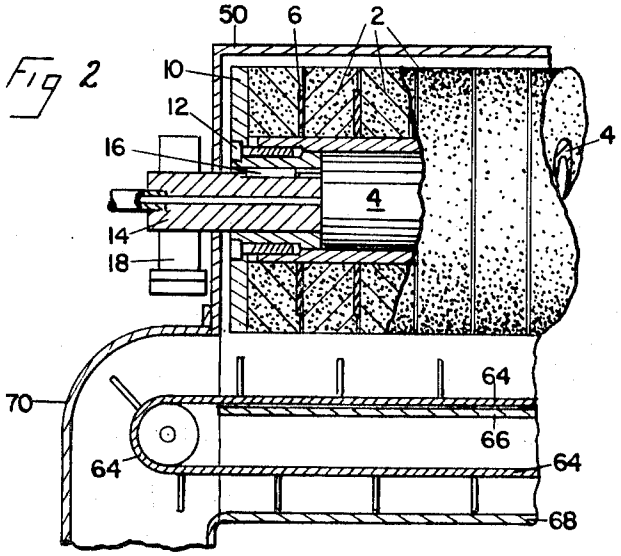


Fig 3

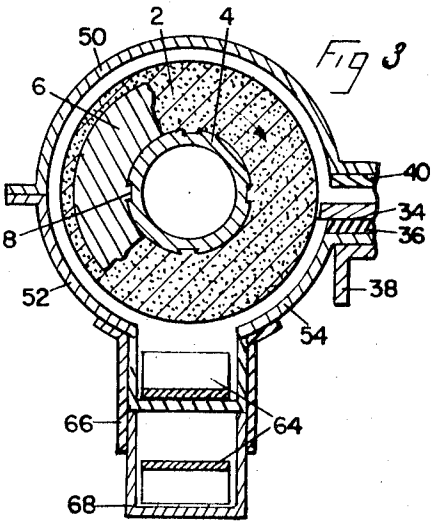


Fig 4

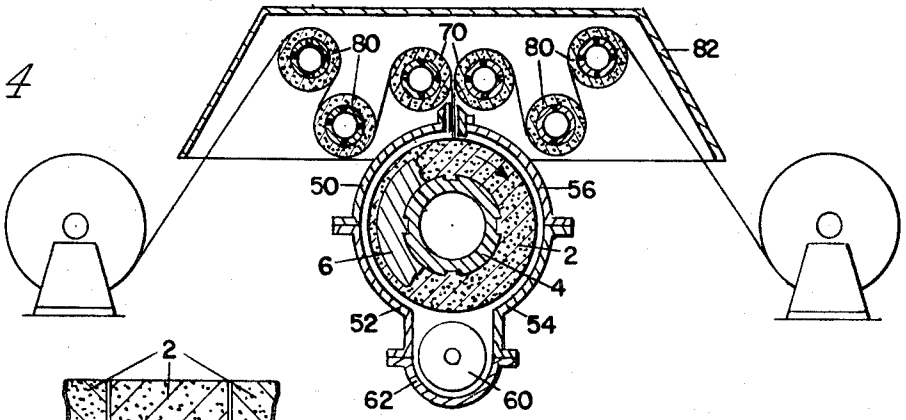
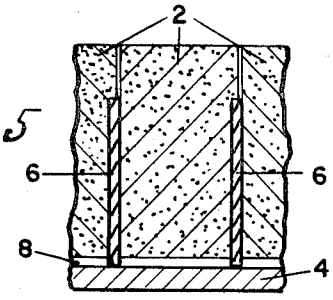


Fig 5



INVENTOR.
HOWARD BIDWELL
BY Kenwood Ross & Chester & Flavin
ATTORNEYS.

DRY FLUFFING PULP SHEET STOCK

CROSS-REFERENCES TO RELATED APPLICATIONS

This application is a continuation-in-part of copending application, Ser. No. 655,190, filed July 21, 1967, now Pat. No. 3,539,315, issued Nov. 10, 1970.

SUMMARY OF THE INVENTION

The invention provides a granular-surfaced roll type of fiberizing element which serves to reduce pulp sheets to a fluffed condition and is useful in the continuous fiberization of pulps of various sorts and from various sources. Such pulps have been heretofore processed from the raw state by a variety of means, such as by chemical and/or mechanical and/or grinding techniques, and inclusive of the usual subsequent web machine forming (e.g. lap stock forming) either pressed in a series of press-roll pressings or otherwise and the winding into shipping and storage-type pulp stock rolls preliminary to further refining and/or other processing, in the approximate range of 35 to 45 percent air-dry condition depending on whether leaving the last roll press or taken directly from the wet machine couch roll and dried without further pressing, by means of a drying oven or similar means.

The invention provides an improved granular-surfaced pulp stock fiberizing element of the nonstator-opposed built-up multicomponent sectionalized roll-type having structural characteristics which permit unlimited normal pulp roll lengths, which element is reenforced for relieving the working surface components of the workload stresses of full width multiple pulp sheet fiberization under power force feeding, is internally cooled for continuous operation, and is cooperant with means for driving and multipulp sheet feeding same being within a fluff collecting and discharging type of housing.

The salient features are that the element is constructed in sections for the elimination of stresses and dissipation of heat, all whereby large monolithic bodies in a stator and/or a rotor are eliminated, and further whereby manufacturing problems are simplified.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary sectional view of one type of granular-surfaced fiberizing roll within a housing and in association with a screw conveyor type of fluff collector and with a pulp sheet feeding arrangement for the simultaneous fiberizing of a multiplicity of air-dry sheets as drawn from a plurality of gang-arranged pulp rolls;

FIG. 2 is an enlarged fragmentary sectional view of the FIG. 1 fiberizing roll within a housing, in association with a conveyor belt type of fluff collector;

FIG. 3 is a fragmentary sectional view of the FIG. 2 fiberizing roll, housing and fluff collector;

FIG. 4 is a fragmentary end view of the FIG. 1 fiberizing roll in association with a modified arrangement for purposes of vapor tempering a plurality of pulp sheets; and

FIG. 5 is an enlarged fragmentary sectional view of a portion of the FIG. 2 fiberizing roll, showing in better detail sectional components thereof and the associated reenforcing-driving discs.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The fiberizing roll is composed of a multiplicity of uniformly sized coaxially arranged granular-bodied porous rings 2 of a ceramic type of material disclosed in and generally prepared according to the methods disclosed in my copending application, Ser. No. 93,272, now abandoned.

Rings 2 are relatively narrow in width so as to allow small peripheral working surfaces, as best seen in FIG. 2, are mounted on a heavy-walled large-bored tubular carrying member 4, with a reenforcing disc 6, preferably of stainless steel, being disposed on the carrying member between each pair of adjacently disposed rings. Each reenforcing disc 6 is provided with one or more key lugs fitting into complemental splined keyways 8 machined in the peripheral surface of the carrying member.

Carrying member 4 is fitted with suitable opposite mounting and driving end flanges 10 secured to the carrying member as by drawing up screws 12. The end flanges, in turn, are supported and driven by end shafts 14 to which they are secured as by keys 16, the entire assemblage being supported by suitable antifriction end bearings 18 mounted in appropriate supporting framework which is not shown for purposes of clarity.

The peripheral working surfaces of rings 2 may be identical in composition to the components used in related fibrous stock processing methods and apparatus such as are exemplified in my U.S. Pat. Nos. 2,912,174, 3,936,128, 3,058,678, 3,116,028, 3,191,876, 3,191,877, 3,193,206, 3,227,606, 3,261,741, 3,265,558, 3,387,795 and 3,415,456, and my copending application, Ser. No. 655,190 filed July 21, 1967.

For general fiberization purposes in obtaining a separation of the fiber constituents to individualized status with a minimum of fiber deterioration, the sections or components of the fibering roll and consisting of rings 2 may be generally composed of a No. 46 predominate size aluminum oxide or silica carbide grit such as normally employed in grinding wheel manufacture according to conventional vitrified bonding and kiln firing procedures, all so as to allow a medium hard body structure of a hardness shown in the art as "Q" grade.

With respect to composition, the specification for such sections or components may be by the basic symbols "A 46 Q V," with "A" representing regular aluminum oxide-type grit, "46" the predominate size grit, "Q" the body hardness, and "V" the ingredients for vitrified bonding by kiln firing.

Special grades of aluminum oxide, of which there are many, may be indicated by additional symbols preceding the "A," which grades may influence the required kilning temperatures.

Normal kilning temperatures may range from 2,000° to 2,400° F., depending on the employed types of grit, bonding agent and kilning.

Green pressure-molded blanks, oven-cured at approximately 350° to 400° F. for from 50 to 60 hours, and which are the same as those usually employed in grinding wheel manufacture, may be used as the basic form from which the sections or components may be fabricated, same being specified merely by the symbols "A 46 Q V," unless some other special preference is indicated to better serve a particular type of pulp fiber with respect to fiber length. For example, for a short fiber type of pulp, a closer grit structure in the blank may be preferable; for a long fiber type of pulp, a more open grit structure may be more desirable.

In designating the spacing of grains within a blank, as in the grinding wheel art, a structure number of not over "8" may be more suited to a short fiber type of pulp, while a structure number of not less than 8 may be more suited to a medium long fiber type of pulp.

For a body structure 8, the blank symbol would be A 46 Q 8V, for a regular aluminum oxide grit.

For fiberizing an extra long fiber type of pulp, a more open body structure is permitted by the use of graded volatile crystals of paradichlorobenzene, or one similar in volatility thereto, as is common in the grinding wheel art.

Of greatest importance is the removal by machine shaving or hand tooling of all mold-aligned grit from the peripheral portion of the green pressure-molded blank intended to serve the fiberizing function.

The usual techniques of grinding the finished surfaces or of wheel dressing are objectionable in that they can not produce the tooled-before-kiln-firing type of surface texture so essential in fiberizing pulp by either wet or dry methods.

The processing of the green pressure-molded blank into a fiber-processing component, preparatory to the kiln firing thereof, is the essential part of the component-forming process.

A variable degree of desired working surface texture, suitable for a wide range of pulp fiber lengths, may be tool sculp-

tured into the component in its green state by ranging methods ranging from a mere plain machine shaving of the surface to a desired degree of roughening of the working surface as with a saw-toothed tool of the appropriately sized and spaced tooth arrangement.

Too coarse grit sizes are not easily textured; too open structures and/or too coarse surface sculpturing may cause snags and knots in operational use.

The developing of a satisfactory ceramic component envisions the steps of: (1) procuring from a grinding wheel manufacturing source, a regular grinding wheel blank of the type conforming to the "A 46 Q 8V" classification, which blank has been pressure molded to a mold bore size adequate for the fitting thereof onto carrying member 4 and to a normal mold size outside diameter of sufficient oversize as to allow the removal of all mold aligned grit at the peripheral working surface, and to a molded thickness as to allow at least one side of the blank to be machine shaved so as to achieve a desired uniform component thickness, (2) machining or otherwise tool recessing one side of the blank to a desired depth for accommodating the nesting of reenforcing disc 6 and yet allowing approximately a one thirty-second inch gap between adjacently assembled components at the perimeters thereof (varied more or less subject to sized dimensions of the components), for stress relieving at said component purposes, (3) shaving the component working surface or perimeter to sufficiently oversize diametrical dimensions, (4) hand-tool sculpturing the working surface with a saw-toothed type of tool to a desired roughened surface texture according to the requirements for the fiberizing of the intended type of fiber to a desired degree of fiberization and beyond that working surface texture effect obtainable by normal machine shaving means.

All of these four additional nonconventional process steps are performed on the green blank to intended finished dimension, thereof prior to kiln firing to the symbol classification at temperatures best suited thereto ranging from 2,000° to 2,400° F., depending on the type of kiln-firing method employed therefor by the manufacturer of the green blanks all which may be otherwise varied compositionwise with respect to a green-state-before-kiln-firing handibility and toolability, and subsequent kiln-firing methods to a nongrinding pulp stock fiberizing ability with respect to pulp type, fiberization degree, rotational speeds, feeding type and rate therefor.

Under normal operation of the schematic arrangement of FIG. 1, a pulp sheet may be started from the nearest or first pulp roll and fed between power-driven feed rolls 30 and 32 which are held sufficiently close together under a spring tension, not shown.

Feed rolls 30 and 32 are normally driven at the same surface speeds and may be driven by a common variable speed drive, not shown.

Feed rolls 30 and 32 are normally driven at the same surface speeds and may be driven by a common variable speed drive, not shown.

Feed rolls 30 and 32 draw the pulp sheet from a first pulp roll 20 towards the fiberizing roll element assembly face over an adjustable anvil plate 34 which is adjustable to the fiberizing roll surface to a just-off-touching position by clamp screws, not shown, which hold the anvil plate and an associated compressible cushion pad 36 to a heavy frame bar 38.

A companion bar 40 opposes anvil plate 34 and may be fixed or spring-loaded, as desired.

AFter the pulp sheet from firs pulp roll 20 has been placed in feeding position between feed rolls 30 and 32 by inching the feed rolls, the pulp sheets from other pulp rolls 22, 24 and 26 may then also be fed in between feed rolls 30 and 32 by inching same until all of the sheets are held in feeding position by the feed rolls, which are not put in normal operation until after the fiberizing roll has been rendered operative.

The fiberizing roll housing members 50, 52, and 54 and 56 may be secured to suitable frame members, not shown.

The fluff from the fiberizing operation may be discharged at one side of the fiberizing apparatus by either a screw-type conveyor 60 and its associated tray housing 62, as shown in FIG. 1, or by a belt-type conveyor 64 enclosed in associated trays 66 and 68, as shown in FIGS. 2 and 3, and discharged through a suitable outlet 70.

Roll pulp stock sheets, pressed to the usual 45 percent dryness for shipping and storage purposes, are generally of a relatively hard texture and do not give up the fibers with as low loss in fiber fines as the usual lap stocks that have been formed on the same type of wet machines, but have not passed through a series of roll presses.

For that reason, lap stocks in the lapped form may be more advantageously fiberized in the same manner as lump drainer half-stuff as dug out of the drainers by apparatus of the type exemplified in my U.S. Pat. No. 3,261,741, modified for dry operation.

The pulp sheets may be tempered with low steam vapor by causing the sheets to pass over a number of hollow core porous bodied rolls 80, as shown in the schematic arrangement of FIG. 4, the pulp sheet being dampened sufficiently thereby to allow the fibers to be drawn out of the sheet more readily by the fiberizing roll with less disintegrating effect and loss in fiber fines.

In this case, feeding rolls 70 may also be of the porous bodied vapor-moistening type, similar to rolls 80, all of which may be of the type exemplified in my U.S. Pat. No. 3,261,741, modified dimensionwise to suit the application.

Hood 82 may be sectionalized or retractably suspended for access during threading, nd when in lowered position will serve to aid in the moisture tempering.

Rolls 70 and 80 may be basically similar in construction to the fiberizing roll. That is, all rolls, particularly those of the porous granular type, are preferably assembled in sections on a tubular core of sufficient rigidity to avoid any damaging workload or flexing stresses.

The advantage of the sectionalized working-surface components 2 of the fibering, sheet feeding and vapor-moistening rolls, is that the components are relieved of all thermal expansion and flexing and workload stresses, as will be apparent by reference to FIG. 5 where the assemblage of ceramic components 2 is shown on rigid core 4 with an easy-sliding fit with a reenforcing disc 6 laminated in between each adjacent pair and having lugs which fit into keyways 8 of the tubular core.

Components 2 are precision shaped dimensionally while in the green unfired state so as to be interchangeable and are recessed on the side faces to receive reenforcing discs 6 upon assembly with a slight space gap between the components at the perimetral faces.

When the end flanges of the rolls are drawn up tight on assembly, sufficient compression tension is caused to bear between components 2 and reenforcing discs 6, to cause the workload stresses at the perimeter faces to be absorbed by the reenforcing discs from very close to the point or origin. In other words, reenforcing discs 6 actually propel components 2 in a manner to relieve the components of all tension stresses regardless of any flexing action by the roll core.

Further, discs 6 fit upon core tube 4 tightly so as to provide a thermal outlet in draining away any tendency of heat buildup under continuous-workload conditions, particularly when the core member is cooled by circulating fluid via hollow shaft 14 and rotary joint (not shown) or other arrangement.

I claim:

1. Apparatus for dry fluffing pulp sheet stock as the sheets are drawn from pulp stock rolls within a collecting and discharging chamber enclosure comprising: a granular surfaced multisectioned roll within the enclosure and composed of a multiplicity of demountable relatively thin disc-ringlike fluff-causing sections, each section being frictionally propelled by an adjacent thinner demountable metallic ring-type disc of less diameter having internal keylike lug projections for assembling into matching splines provided therefore on the exterior surface of a supporting and driving hollow

core, the core having demountable end flanges fitted with hollow supporting and driving shaft stubs, the demountable sectionalized roll being structurally of relatively small diameter with respect to length, which by reason of its demountable sectionalized assembly characteristic, eliminates stresses within the sections, caused by roll flexing underload.

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