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Anderson

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[54] **FIBER WASTE RECLAIM SYSTEM AND METHOD**

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[51] **Int. Cl.** **B07b 9/00**

[58] **Field of Search** ..... 209/3, 4, 28, 29, 36, 37, 209/45, 46, 250, 138, 139 R, 307, 308; 162/55, 189, 191, 100, 4; 131/146; 241/19, 24, 49, 78, 79, 79.1, 76, 190, 243, 79.3

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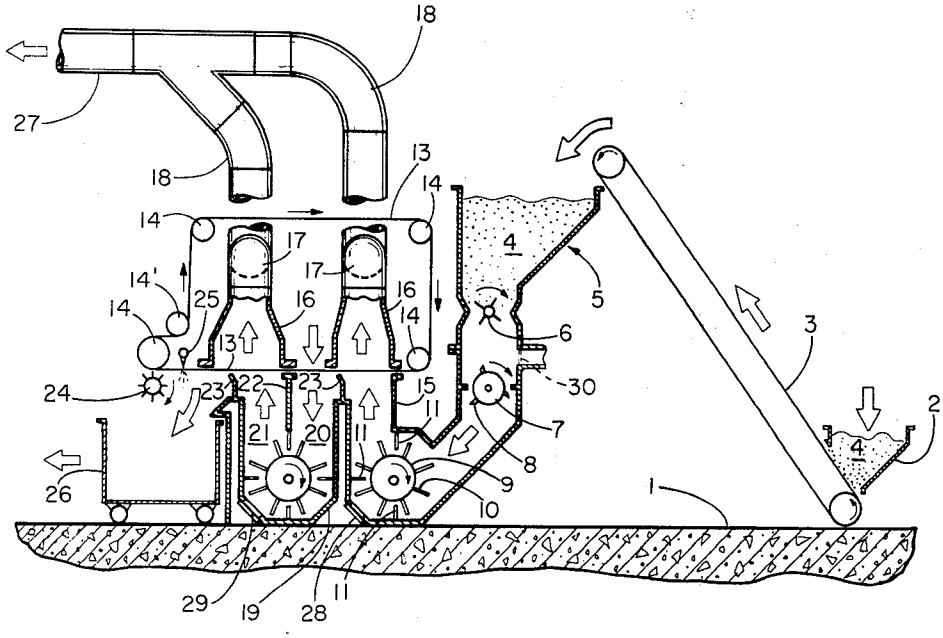
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[57] **ABSTRACT**

A method and apparatus for the recovery of wood pulp fibers from scrap products having the wood pulp fibers in fluff form. Such products include disposable diapers, sanitary napkins and the like wherein the fibers are commonly retained by sheet material. The sheet material may be a liquid impervious plastic or a liquid pervious nonwoven or both. The scrap products so called include production line rejects, trim and the like. The recovery apparatus particularly includes means to cut or chop the scrap into small pieces and a breaker operating in an upwardly directed air stream to separate from the sheet material the fibers as substantially individual fibers so that they are carried by the air stream from the breaker. The air stream is intercepted by a traveling screen which passes the upwardly moving air and fibers but prevents passage of larger pieces.

4 Claims, 2 Drawing Figures



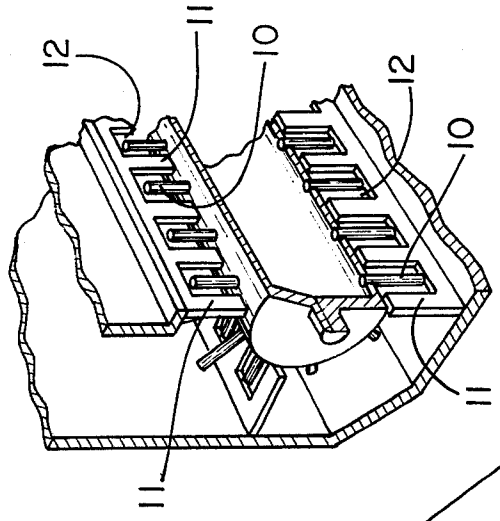

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FIG. 2

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FIG. 1

FIBER WASTE RECLAIM SYSTEM AND METHOD

BACKGROUND OF THE INVENTION

The present invention pertains to a new and novel method of fiber recovery and apparatus therefor whereby in a preferably continuous operation scrap from a manufacturing process having wood pulp fluff within an enclosing wrapper, such as disposable diapers and sanitary napkins, is subjected to size reduction and an opening operation followed by a separating action to obtain the wood pulp fluff for reuse.

It is common practice to employ wood pulp fluff in the articles mentioned as an absorbent body. The fluff is of such a nature that it must be recovered from the rejected unused products without detriment to the absorbency characteristics of the wood pulp fluff. For most purposes this requires not only maintaining the fluff dry but also freeing it of any pieces of material which are or may become hardened.

SUMMARY OF THE INVENTION

A primary object of the invention is to provide a new and useful method for mechanically acting upon small pieces of disposable scrap products having as a component wood pulp fibers in fluff form to expose the fibers and free them from the usual retaining sheet wrapper or wrappers without significant damage to the fibers and without excessive shredding of the wrapper.

It is a particular object of the invention to provide an apparatus wherein means for freeing fibers from small pieces of enclosing sheet material are positionable in close proximity in a common air channel to means for recovering the freed fibers separately from the sheet material of the pieces.

These and other allied objects of the invention are attained in a preferred embodiment of the invention by providing small pieces of disposable product in an upwardly directed air stream and subjecting the pieces to a breaking action to loosen and free the fibers from sheet material of the product and to break up any clumps of the fibers. In this preferred embodiment the sheet material is substantially not torn or shredded. The upwardly moving air stream is intercepted by a traveling endless screen having openings of a size to pass the airborne freed fibers but small enough to inhibit passage of fiber clumps or pieces of sheet.

The invention will be more fully understood by reference to the following detailed description and accompanying drawings wherein:

FIG. 1 is a schematic view partially in section and having parts broken away illustrating an arrangement of equipment parts in a preferred embodiment of the invention; and

FIG. 2 is a fragmentary view of a breaker device useful in the separation of fibers from the sheet material of the scrap disposable products.

As shown in the drawing, a foundation **1** supports the apparatus. The numeral **2** identifies a hopper communicable with an upwardly inclined conveyor **3** for the feeding of scrap material **4.** This scrap material may be: complete diapers in the form of manufacturing rejects and having fiber fluff retained between a facing liquid-permeable nonwoven sheet and a backing liquid-impermeable polyethylene sheet; trim material from the diaper production operation; sanitary napkin production rejects having fiber fluff enclosed by a liquid-permeable nonwoven wrapper; and trim materials or the like from manufacturing operations on similar products.

The material **4** in the upper hopper **5** to which conveyor **3** empties is urged downwardly through a metering device **6** to a chopper **7.** This chopper has a plurality of knives **8** which act on the scrap material to cut it into relatively small pieces. The cutting action should result also in relatively uniformly sized pieces of scrap and about 2 to 4 inches on a side is a desirable dimension.

The feed from the chopper **7** may be in this preferred embodiment under the influence of gravity to a breaker **9** having projecting rods **10** which pass barrier **11** in slots **12** as best shown in FIG. **2.** The rods **10** have a good clearance in the slots and the pieces of cut scrap are mechanically worked in passing through the slots by the rods. The rods are suitably of rubber and in the form of resilient fingers which may yield when material is trapped between the fingers and the barrier.

The pieces presented to the breaker **9** will generally be open edged, that is, the sheet materials will have been cut through and the fiber fluff exposed to view. The fingers so work the pieces that the fibers, essentially as single fibers, are freed from the sheet material. The sheet material itself may be somewhat rolled or crumpled but generally will retain its integrity.

A traveling screen belt **13** supported by conventional pulleys **14** is positioned above breaker **9** to intercept in its rotation an air column moving upwardly in the conduit **15** from the breaker. The air column carries with it fiber freed from the sheet material as well as some of the small pieces of sheet. Screen **13** is provided with openings which permit passage of the fiber carrying air but prevent passage of larger pieces and unbroken material. Preferably, the openings are of a large size relative to the size of individual fibers. A mesh of about 1 inch by 1 inch is effective.

The conduit **15** and the upper conduit **16** with offset portion **17** and conduit **18** form the air flow system air column for the equipment illustrated in FIG. **1.** The breaker is, in effect, in communication with the exterior of the apparatus through the upwardly directed air column. Two such columns are provided in the embodiment described. Between the second upwardly directed air column and the first upwardly directed air column, a downwardly directed column is provided and the connector breaker housing **19** is common to both; the downwardly directed column is indicated at **20** and the second upwardly directed column at **21.** A partition **22** separates the column **20,21** and the numeral **23** designates partitions which separate the connector housing from the first air column on one side and the apparatus exterior on the other side. These partitions **22,23** are in close proximity to the lower reach of the traveling screen **13** and, together with rotatable brush **24** and air jet **25,** serve to remove material from the lower reach so that, as the screen travels upwardly on the exterior of the apparatus, it is well cleared of material being acted upon in the separation process by the screen and the screen is free of material prior to re-exposure to the upwardly moving air column at **15.** A movable truck **26** receives the particles of plastic film and sheet material and the like which fail to pass with the upwardly moving air columns and fibers to recovery through conduit portion **27.** Some fiber clumps may, of course, pass to the truck **26** with the screen belt

rejects and, if the scrap material has been of a difficult nature to process, as when it has been subjected to highly humid atmospheres, reworking of the screen rejects may be desirable. However, wet cellulosic pulp fiber material should not be subject to the process due to the tendency of such materials to adhere together in the wet state and to bond severely together when dried. Rather, the material should be dried before subjection to the process.

The numeral **28** designates an opening in the lower poriton of the conduit **15** for removal of materials which may fall downwardly backwardly toward the breaker **9** and which are of a character such that they will not be carried satisfactorily upwardly in the air screen to removal on the belt. A similar opening is provided at **29** in the connector housing **19.**

In the practice of the invention the air column need only be a gentle movement induced by a vacuum application through the conduit **27** and the conduit **18,** etc. For the purpose of insuring the passage of air through the conduits, a screen opening is suitably provided at **30.** This is not a necessary requirement in the instances where air may be drawn through the material **4** in the hopper **5** but, since such materials may tend to impede air flow, a screen or the like at **30** is desirable.

As many apparently widely different embodiments of this invention may be made without departing from the spirit and scope thereof, it is to be understood that I do not limit myself to the specific embodiments thereof except as defined in the appended claims.

I claim:

1. The method of separating fibers from a wrapping sheet for the fibers which comprises subjecting pieces of the fiber-sheet composite to a breaking action to break up the wrapping sheet and remove the fibers therefrom, passing an air stream through the pieces of the fiber-sheet composite as they are subjected to the breaking action, and intercepting the air stream containing the fibers and sheet material as the air stream moves upwardly from the zone of the breaking action by passing across the air stream a foraminous screen having openings of a size sufficient to permit airborne fibers to pass therethrough and also sufficient to retain other larger pieces.

2. A fiber recovery apparatus for recovering fibers from composite waste products of fiber and plastic wherein the fiber is in a fluff form retained at least in part by the plastic, the said apparatus comprising means for feeding the waste products, chopper means positioned to receive the feeding waste products and as they feed to chop the waste products into relatively large pieces but sufficient to expose the fiber fluff, breaker means positioned for receiving the chopped pieces to reduce the size of the chopped pieces and to free fibers from the pieces, a vertical air column communicating the breaker means with the exterior of the apparatus, a perforated traveling belt interrupting the said air column and having openings of a size to pass fluff fibers loosened from the chopped pieces in the breaker means and air column but insufficient to pass the chopped pieces including pieces of plastic film, such that some fibers and film are retained by the perforated belt and others fall under the influence of gravity against the rising air column back to the breaker means for reworking, removal means in the course of belt travel to remove from the belt any pieces of waste product material clinging thereto prior to belt reexposure to the same air column, and between the air column and removal means a second breaker means provided below the perforated belt, and a downwardly directed air column and then a second and upwardly directed air column also traversing the belt, the downwardly directed air column being disposed to purge material from the belt to the second breaker means and the second upwardly directed air column arranged to direct broken material to the traveling belt.

3. Fiber recovery apparatus for material comprising plastic and fibers in fluff form comprising means defining a pair of upwardly directed air columns and a downwardly directed air column between the said pair serving to communicate the columns of the pair, a traveling foraminous belt interrupting in one reach thereof each of the said air columns, breaking means for loosening fibers from a retaining plastic film, one breaking means being well down in each upwardly directed air column and operable to urge loosened fiber material to the traveling belt, the downwardly directed air column also communicating with breaking means well down in the column and to which partially loosened material is fed by the downwardly directed air column, said foraminous belt being generally pervious to dispersed airborne fibers but of sufficient size to retain plastic pieces and clots of fibers, said upwardly directed air columns being each communicable with the exterior of the apparatus through the pervious belt whereby fibers in an upwardly moving column are carried to the apparatus exterior, and removal means engageable with material carried on the foraminous belt beyond the air columns in the direction of belt travel to remove the material from the traveling belt.

4. The method of separating wood pulp fibers from sheet material retaining the fibers which comprises chopping a body of the sheet-material-fibers to reduce the sheet material to small size pieces, supporting the chopped sheet-material-fibers in a stream of downwardly moving air while effecting the chopping, subjecting the pieces to a breaking action to break up the pieces and remove fibers therefrom, directing the stream upwardly and intercepting the stream of air with a pervious screen which passes the air and fibers but prevents passage of other pieces, collecting from the screen the pieces which fail to pass the screen, subjecting the pieces which failed to pass the screen to a second downwardly directed air stream to impel the latter mentioned pieces and to further break the pieces, and again subjecting the pieces to an upwardly moving air stream to separate with a pervious screen the fibers and air from large pieces.

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