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[54] **CENTRIFUGAL FAN FOR HANDLING MATERIAL**

[75] Inventors: **Donald W. Van Doorn; William C. Pease, III,** both of Columbus, Ga.

[73] Assignee: **Lummus ndustries, Inc.,** Columbus, Ohio

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[52] **U.S. Cl.** **415/206,** 415/213, 416/177

[51] **Int. Cl.** **F04d 7/02,** F04d 29/24

[58] **Field of Search** ..... 416/177, 178, 179, 416/181, 182, 183, 184, 185, 186, 237; 415/157 A, 213, 206, 204

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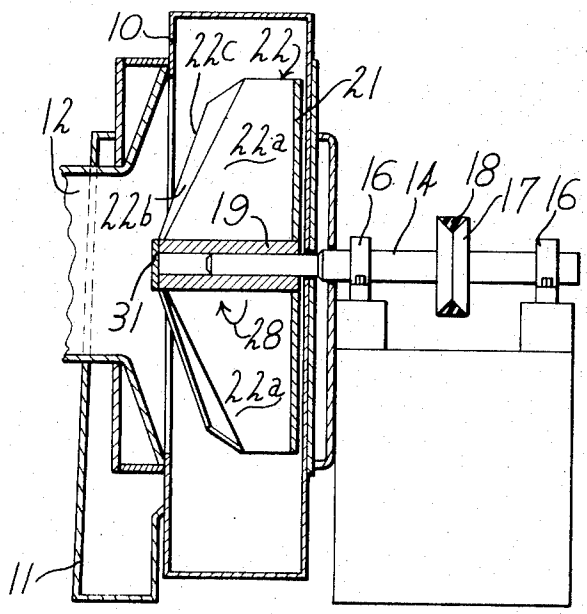
Primary Examiner—Henry F. Raduazo

Attorney—Jennings, Carter & Thompson

[57] **ABSTRACT**

A fan of the centrifugal type especially adapted to handle material without undue working of the same. The invention is directed to a new form of impeller in which there are a plurality of blades, mounted at their inner ends on a shaft, hub or the like, the blades having generally flat sections, the blades being so disposed that when in rotation material which engages the same strikes the flat surfaces thereof and moves outwardly, that is, radially, without overworking, damaging or changing the physical characteristics of the material to any significant extent.

3 Claims, 4 Drawing Figures



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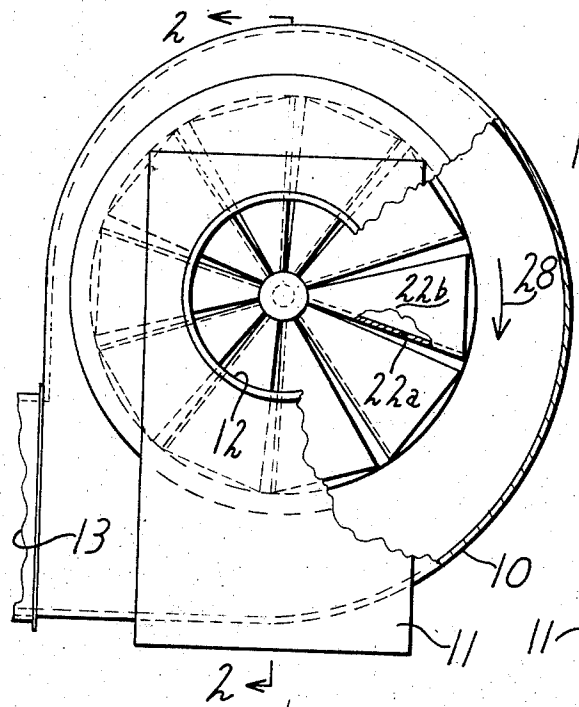


FIG 1

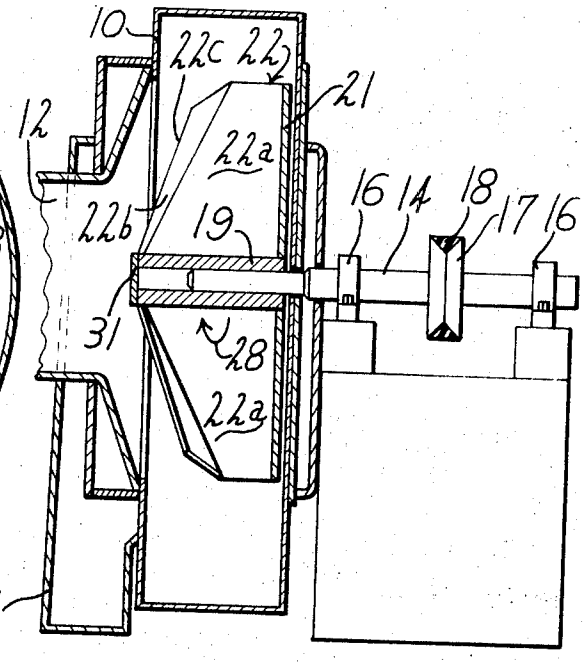
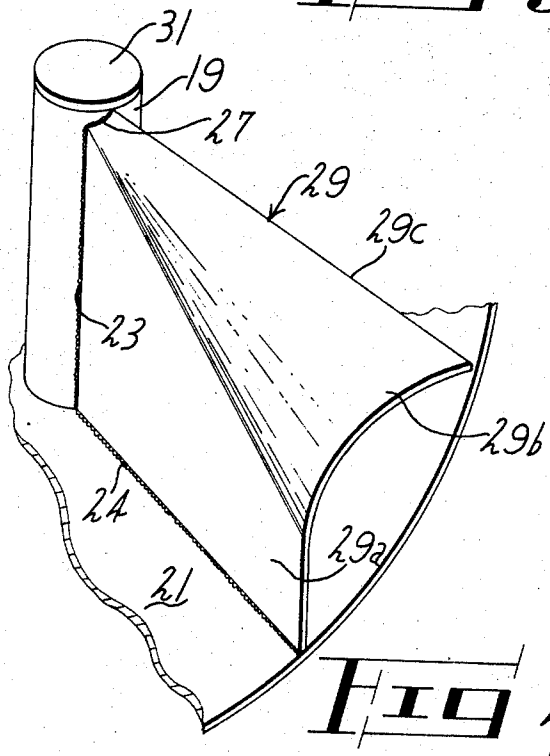


FIG 2

FIG 3



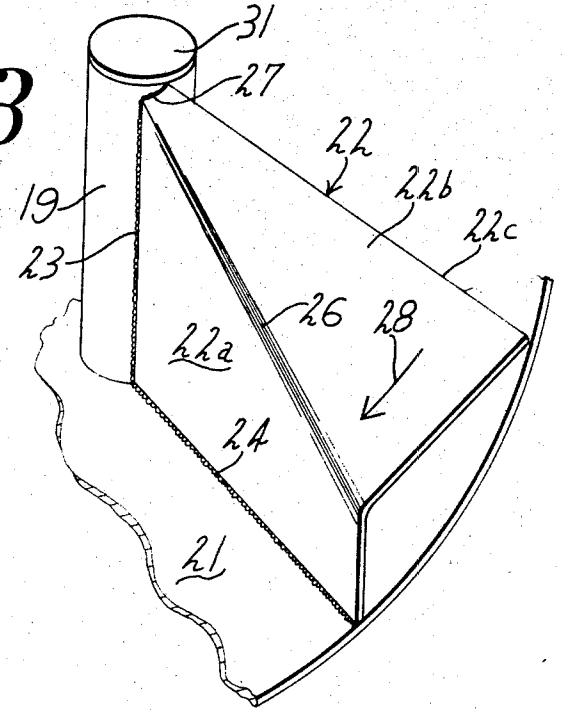


FIG 4

INVENTOR
Donald W. VanDoorn
William C. Pease III

BY Jennings Carter & Thompson
Attorneys

CENTRIFUGAL FAN FOR HANDLING MATERIAL

Our invention relates to centrifugal fans for handling material such as fiber and other material wherein it is desired to reduce the damage to the fiber, to reduce working of the fiber and otherwise to provide a fan through which various forms of material may be moved, without materially changing the physical condition, shape, particle size or the like during passage through the fan.

An object of our invention is to provide a centrifugal fan of the character designated in which there are a plurality of blades, generally L-shaped as viewed in transverse section, each blade having a leading section and a trailing section, all sections of the blades presenting to the incoming material generally flat surfaces whereby material which strikes the impeller is not damaged, or worked and due to the rotation of the impeller moves generally radially outward, to be discharged from the scroll case.

Another object of our invention is to provide an impeller for a centrifugal fan in which the blades comprise leading sections which are generally normally disposed relative to the axis of the scroll case and trailing sections which are generally in planes at right angles to the axis of the case, the first named sections providing conveying air and the second named sections providing cushioning surfaces for the material being conveyed thereby to prevent overworking of the material as it passes through the fan.

In this art various forms of centrifugal fans for conveying various kinds of materials have been proposed. In prior fans for conveying materials such as fiber the construction and arrangement of the blades of the impeller have been such as to damage fiber passing through the fan. Prior impellers have blades which present sharp, unprotected edges to the stock, oftentimes cutting the fiber or causing formation of undesirable neps or wads. Such fans rely on blades having single surfaces for producing movement of material through the fan and due to the disposition of these surfaces it inherently follows that some of the material entering the fan casing is contacted by sharp edges thereon, causing damage to the stock. One type of prior art fan attempts to decrease blade damage to the stock by providing a perforated plate against which the material impinges and from which the material is supposed to sling off for discharge with the stream of air generated by the fan. This is not entirely satisfactory because the perforations become clogged and are difficult to clean.

Our invention overcomes the foregoing difficulties and provides a fan in which damage to the material being conveyed is greatly reduced, one which is self cleaning and a fan which is simple and inexpensive to construct and troublefree in operation.

Apparatus illustrating features of our invention is shown in the accompanying drawing forming a part of this application in which:

FIG. 1 is an end elevational view of our improved fan, a part of the scroll case being broken away and in section;

FIG. 2 is a detail fragmental view taken generally along line 2—2 of FIG. 1;

FIG. 3 is a detail, isometric view of a single one of our improved blades, a portion of the back plate being shown and in section; and,

FIG. 4 is a view corresponding to FIG. 3 and showing a slightly modified form of blade configuration.

Referring now to the drawings for a better understanding of our invention we illustrate the same in association with a scroll case **10.** As is known, the scroll case may be supported on a base or frame section **11** and there is an inlet **12** for the material to be conveyed and an outlet **13** from which it is discharged. The fan thus receives material through the eye **12** of the fan and discharges it through the discharge opening **13,** as is well known in connection with centrifugal fans in general.

Our invention comprises the new form of impeller which may be associated with the scroll case **10.** The impeller is mounted for rotation on a shaft **14** mounted in bearing **16** and driven from a pulley or the like **17** through a belt or the like **18** from a source of power, not shown.

Our improved impeller preferably comprises a central hub portion **19** which is hollow and keyed or otherwise affixed to the shaft **14** for rotation therewith.

More in detail, we preferably provide our improved propeller with a back plate **21,** which back plate is secured by welding or otherwise to the hub **19,** adjacent its rear end, that is, adjacent the wall of the scroll case opposite the eye or inlet **12.**

Our improved impeller is further characterized by the provision of a plurality of generally radially extending blades each of which is indicated generally by the numeral **22.** As shown, each blade comprises essentially two sections. First, there is the leading section **22*a*** which lies in a plane generally parallel to the axis of the hub **19.** Conveniently, the blade section **22*a*** may be secured by welding to the hub **19** along line **23** and may be secured to the back plate **21** by welding along line **24.**

Each blade **22** also comprises the trailing plate portion **22*b***. The blade portion **22*b*** lies in a plane generally normal to the axis of the hub **19** and conveniently the entire blade may be formed of simple plates, bent along line **26** to provide a generally L-shaped blade. The inner end of the blade portion **22*b*** may be welded to the hub as indicated at **27.**

It will be noted that the trailing edge **22*c*** of each of the blades **22** is spaced farther from the back plate **21** than along the line **26** where it joins the section **22*a***. That is to say, relative to the direction of rotation indicated by arrow **28,** the blade sections **22*b*** slope upwardly from the line **26** so that the trailing edge **22*c*** thereof is at a greater elevation relative to the front surface of the back plate **21** than is the leading edge of such section **22*c*** as shown by the line **26.**

From the foregoing it will be seen that with material such as fiber entering in an airborne stream through the eye **12,** any of the material which strikes the impeller engages only flat surfaces. In view of the fact that the blade sections **22*a*** in effect provide the conveying air within the fan by far the majority of any material which does strike any part of the impeller engages the flat portions **22*b***. This is for the reason that the material is moving generally axially through the eye of the fan while the blade sections **22*a*** are generating a flow of air around the scroll case. Therefore, substantially all of the material entering the eye of the fan strikes the flat, plane, moving blade sections **22*b*** and moves radially outward therefrom, into contact with the curved inner wall of the scroll case, for discharge through outlet **13.**

Our fan thus presents to the incoming material flat, non-broken surfaces characterized by the absence of sharp cutting edges, or any other edges of the surfaces which would damage the material.

It will further be seen that by making the blade **22** of a simple plate, bent along line **26,** we have provided a construction which is extremely economical to manufacture and further which is extremely economical to weld both to the hub **19** and to the back plate **21.**

In FIG. **4** we show a slightly modified form of blade. In this instance instead of forming along line **26** the entire blade **29,** while still being generally L-shaped and secured to the hub **19** and back plate **21** as already mentioned, nevertheless it is provided with a generally flat forward section **29***a* and a trailing section **29***b* which joins the outer edge of the blade **29***a* on a curve, and which throughout its extent also continues to be somewhat curved. This curvature presents convex surfaces to the oncoming material. This type of blade is slightly more gentle on the material being conveyed. The trailing edge **29***c* of the blade portion **29***b* also lies farther away from the back plate **21** than where it joins the outer edge of blade **29,** just as explained with respect to FIGS. **1** to **3.**

It might be mentioned, also, that in order to prevent material from entering the bore of the hub we close the same by means of a cap or the like **31.**

In view of the foregoing it will be seen that we have provided an improved impeller and a fan incorporating the same in which relatively delicate material such as fibers and the like may be conveyed without damage. Our invention is particularly characterized by the fact that it is self cleaning and this is of importance when it is realized that in many instances it is desired to convey first one color of fiber and then another, without in any way mixing one color. When changing from color to color it is oftentimes absolutely necessary that all of the previously run color be removed from all of the machinery which is to handle the new color, to prevent color contamination.

While we have shown our invention in but two forms, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other changes and modifications without departing from the spirit thereof.

What we claimed is:

1. For use in a centrifugal fan of the kind having a scroll case with inlet and outlet openings, an impeller comprising:

a. a rotatable hub adapted to be mounted in the case generally in axial alignment relative to the inlet opening,

b. a back plate secured to and rotatable with the hub,

c. a plurality of generally radially disposed blades each of which is generally L-shaped as viewed in cross section thereby providing blades having leading plate portions extending generally radially from the hub in planes parallel to the axis of the hub and trailing plate sections lying in planes generally normal to the axis of the hub,

d. the trailing edges of the trailing plate portions of the blades being spaced farther from the back plate than are the leading edges of the same, whereby material which contacts the impeller strikes the rotating generally flat surfaces of said blades, reducing working of the material.

2. An impeller as defined in claim **1** in which the trailing plates are convex on the surfaces thereof which are engaged by the material being conveyed.

3. An impeller as defined in claim **1** in which the leading plates of the blades are flat and in which the trailing plates thereof are convex on the surfaces thereof which are engaged by the material being conveyed.

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