Sept. 25, 1962 M. E. GINAVEN 3,055,598

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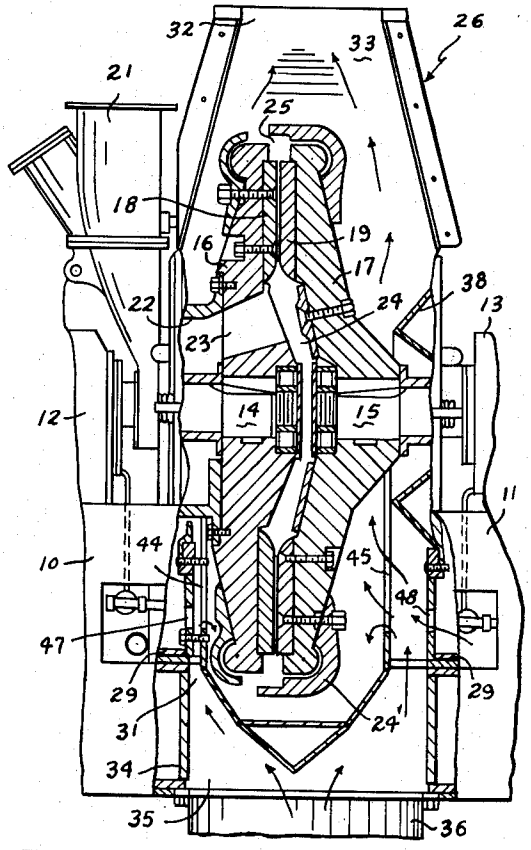


Fig-1

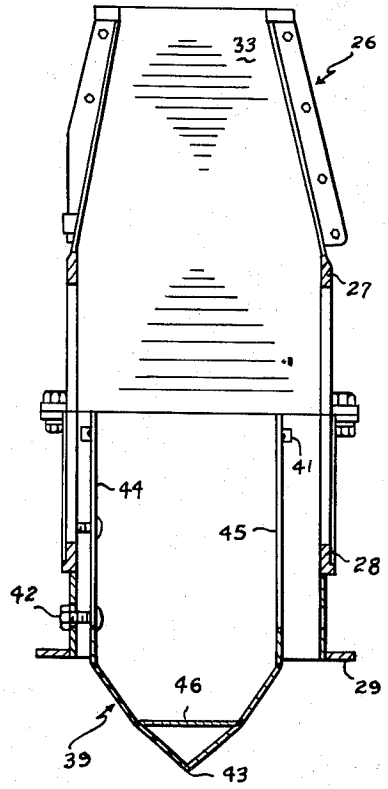


Fig-2

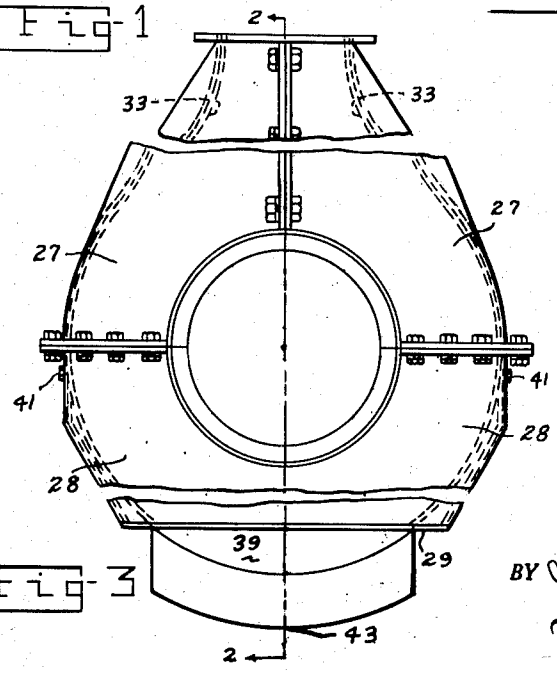


Fig-3

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This invention relates to refiners, particularly disc refiners as used in the manufacture of hardboard material to fiberize wood chips and the like.

The object of the invention is to simplify the construction as well as the means and mode of operation of refiners, whereby such refiners may not only be economically manufactured, but will be more efficient and satisfactory in use, adaptable to a wide variety of applications, and be unlikely to get out of order.

A further object of the invention is to obtain increased drying effect upon the fibrous material during fiberizing, and in transit from the refiner, to supply a semi-dry fiber to a secondary drying system whereby the temperature requirements of such system may be reduced.

Another object of the invention is to inhibit fiber accumulation in the discharge area of the refiner, it being a feature of the invention that the refiner is swept with a forced draft of air entraining and carrying off the expelled fiberized material.

A further object of the invention is to provide for a controlled and directed air flow over the refiner selectively achieving either or both ends of drying the fiberized material and of inhibiting accumulation in the refiner discharge area.

A further object of the invention is to provide a refiner possessing the advantageous structural features, the inherent meritorious characteristics and the mode of operation herein mentioned.

With the above and other incidental objects in view as 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.

Referring to the accompanying drawing wherein is shown the preferred but obviously not necessarily the only form of embodiment of the invention,

FIG. 1 is a fragmentary view in longitudinal section of a disc refiner in accordance with the illustrated embodiment of the invention;

FIG. 2 is a detail view in longitudinal section of a housing or shroud surrounding the discs of the refiner and defining an air flow passage therethrough; and

FIG. 3 is a view in front elevation of the housing of FIG. 2.

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

In the manufacture of hardboard material, in connection with which the instant invention has especial although not limited utility, the forming of the end product is a dry process making use of fiberized wood plant stock which has been reduced from chips or other fragments in a series of treatment steps wherein the fibrous material is at least a part of the time in a liquid saturated condition. Drying of the fibrous material before it reaches the forming stage accordingly is necessary. Also, the presence in the fibrous material of wax and phenolic resin promotes accumulation or build up adhering fibers to equipment surfaces. The instant invention, conceived as a modification or extension of the refining step, accomplishes a simplified and more facile drying of the product and in addition delivers the fiberized material from the refiner to a subsequent process step, as to cyclonic cleaning means, under conditions inhibiting

sticking or adhering of the fibers to equipment surfaces.

Referring to the drawings, a disc refiner of the kind to which the instant invention is applicable may, as shown in FIG. 1, comprise stationary supports **10** and **11** for motor units **12** and **13**. The latter are in generally opposed relation and serve to drive respective rotary shafts **14** and **15** which project into aligned, adjacent relation one to another. On the adjacent shafts **14** and **15** are respective discs **16** and **17**. These are the refiner discs, and, in response to a counter rotation thereof as induced by the motor units **12** and **13**, fibrous material introduced between the plates is reduced by an attrition like process to component fibers of desired physical or structural characteristics. Plates **18** and **19** on the respective opposing faces of the disc provide replaceable hardened work surfaces suitably formed to achieve the desired results. The material for milling or refining is fed into the machine through a stationary fitting **21** leading to a flanged element **22** on the back of disc **16**. The inlet space defined by flanged element **22** communicates through one or a plurality of openings **23** in the disc **16** with a space **24** between the discs and located centrally thereof. From space **24** the material has an enforced outward radial travel between the work plates **18** and **19** and is discharged peripherally of the disc assembly. Segmental ring means **24'** is fastened to the back of disc **17** and overlies what may be considered an annular discharge passage **25** at the periphery of the discs. The means **24'** has a wiping effect upon the material as it flows from between the refiner discs, and assists in maintaining a high velocity air flow through the surrounding housing due to its fanlike pumping action.

The discs **16** and **17** are closely surrounded by a shroud like housing **26** comprised, as shown in FIG. 3, of upper segments **27** and lower segments **28** bolted together to define a unitary case. The housing or case **26** is stationarily mounted on the machine frame, in part through flanges **29** at the lower ends of the sections **28** which rest upon respective supports **10** and **11**. End openings in the housing **26** provide for entry of the oppositely disposed shafts **14** and **15** and at one side thereof the flanged element **22** is accommodated for unrestricted in-put of the fibrous material from inlet fitting **21**. The end openings are suitably closed against any free movement of air or fibers therethrough.

The housing **26** is generally circular in configuration. The lower end thereof is truncated and defines an elongated opening **31** at the location of the flanges **29**. At the upper end of the housing the sections **27** have a sloping configuration to define at the top thereof a relatively restricted opening **32**. Sidewalls of the section **27** are, moreover, formed inwardly of the opening **32** with inwardly curved surfaces **33** forming a relatively constricted throat leading from the broad interior of the housing to the restricted opening **32**. Frame supported partition means **34** defines a chamber **35** beneath the opening **31** and a fitting **36** is attached to the frame in underlying communicating relation with the chamber **35**. Fitting **36** serves as an inlet for flowing air, being connected to a suitable source of air under pressure. Air supplied therethrough is forced through the chamber **35** into the bottom of housing **26** and flows upwardly therein over and around the discs **16** and **17** and discharges from the housing by way of opening **32**. The throat constriction defined by surfaces **33** and the relatively restricted outlet **32** serve, as will be understood, to obtain a directed and closely controlled flow of the moving air and a discharge thereof at relatively high velocity from the housing **26**. The arrangement of the housing **26** and inlet and outlet openings **31** and **32** therein is such as to cause the air to flow peripherally of the discs **16** and **17** or in a direction substantially transverse to the longitudinal

axes thereof. The air current is, moreover, held and confined to an adjacent relation to the disc assembly by reason of the relatively closely fitting relationship of the housing thereto. As a result, fibers and fibrous material emerging from between the discs **16** and **17** encounters a current of rapidly moving air traveling transversely through the housing. The emerging solids accordingly are picked up by or entrained with the moving air and conducted thereby to and through the outlet opening **32**. The interior of housing **26** being thus swept with a draft of forced air, both its interior surfaces and the exterior surfaces of the discs **16** and **17** are kept clear of fibers which may tend to adhere thereto on account of their coating or impregnation with tacky or adhesive substances. The interior of the housing, near the outlet, provides, moreover, a gradually decreasing throat area in which an added velocity is imparted to the mixture of air and solids. The detention of individual fibers within the housing, which may form the nucleus of an accumulation of fibers, accordingly is inhibited and conditions of velocity flow maintained while the mixture of air and solids is being delivered to a subsequent process stage, as for example a cyclone collector.

Further in accordance with the instant invention, the air forced through the housing **26** is heated. The discs **16** and **17** carry out their treatment of the fibrous material by an attrition process productive of heat. This generated heat has a drying effect upon the material which is delivered thereto in a state retaining more or less absorbed moisture. The heated air flowing through housing **26** passes in contacting relation to the discs **16** and **17** and so raises the temperature of these discs with the result that the work of refining is carried out at a relatively elevated temperature with increased drying effect. Also, the material when discharged from the discs and entrained in the flowing air absorbs heat directly from the air with a consequent additional drying effect while the material is in transit from the refiner to the subsequent process stages. The final dryness of the material is controlled in a secondary system of indirect heat but the temperature of such system can be reduced appreciably, with consequent cost saving, by the preliminary drying during fiberizing and transit as contemplated by the instant invention.

The discs **16** and **17** are, as noted, relatively closely surrounded by the walls of housing **26**. The backs of the discs are disposed in generally parallel spaced relation to front and back walls of the housing in such manner that comparatively narrow spaces are provided for passage of the air in flowing through the housing. Contact of the air stream with the discs thus is assured. A more intimate and thorough contacting of the discs by the air may be obtained by an appropriate baffling of the air flow to force it against the refiner discs. Thus, circular deflector means **38** restricts by-passing flow of the air along the housing wall in back of disc **17**.

Also performing a deflecting function in respect of incoming air, and performing an intercepting function in respect of material discharged or expelled by the disc refiner, is an inner case or liner **39**. This is a hollow generally semi-circular element received in the housing **26** through the lower end thereof or through opening **31**. Its upper ends are secured by bolts **41** to sections **28** of the housing **26**. Further, intermediate portions of the deflector element **39** are secured to sections **28** of the housing by laterally disposed bolts **42**. These, along with the bolts **41**, locate the deflector element in an intermediate position, with respect to front and back walls of the housing, so that air may pass between the upstanding wall portions of the inner case and the front and back walls of the outer housing. The lower end of the inner case projects through and beyond the air inlet opening **31** and has an inwardly tapering configuration to terminate at its lower extremity in a ridge **43**. The lower part of the case accordingly serves as a flow divider. Air entering the refiner through fitting **36** and chamber **35** encounters the lower end of case **39** and is divided thereby into streams flowing upwardly within the housing **26** but on opposite sides of the disc assembly. The upstanding wall portions of the inner case are formed with lateral openings **44** and **45** which permits the entrance of air into the space embraced by the inner case and in particular to the peripheral section of the disc assembly enclosed by such inner case. The air accordingly has access to this space and picks up solid materials found therein and conducts them upwardly within the housing for discharge at the outlet **32**. The inner case underlies the disc assembly and is disposed intermediate such assembly and the air inlet **31**. It acts to intercept material discharging from the disc assembly, which may be expelled therefrom with considerable force, and acts also to prevent a gravity flow of solids into the air inlet duct. The lower level of the inner case may be raised below the ridge **43** by means of a transversely disposed bottom plate **46**. Solid materials expelled toward or dropping toward this air inlet opening **31** are intercepted and held for entrainment in the air flow in the manner described. The deflector **38** may serve the further function, in this connection, in constraining the air current in back of disc **17** to flow at increased velocity and in an upward direction immediately adjacent to the disc with the effect of drawing the solid materials from the lower portion of the case **43** with a more facile effect. The stationary supports **10** and **11** are constructed with open passageways terminating in openings **47** and **48** communicating with the interior of housing **26** on opposite sides of the inner case **39**. Additional air, for purposes of temperature modification or to assist in the removing of solid particles from the interior of the inner case, may be drawn through these openings in response to the suction effect generated by the main body of air in moving through the housing **26** between inlet opening **31** and outlet opening **32**.

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 construction 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 the preferred mode 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 refiner, including a pair of relatively rotatable opposed discs, means for admitting a fibrous material centrally of and between said discs for outward radial movement and peripheral discharge, means for directing air at high velocity in surrounding generally transverse relation to said discs, deflector means in partly surrounding relation to said discs and located in advance thereof in respect of the direction of air flow, said deflector means having lateral openings for air flow therethrough, and a housing surrounding said discs and said deflector means and having openings defining an air flow path therethrough, said deflector having side portions in generally parallel spaced relation to side walls of said housing.

2. A refiner, including a pair of relatively rotatable opposed fiberizing discs, a housing surrounding said discs and having generally oppositely disposed inlet and outlet openings for a current of heated air, said discs being disposed intermediate said openings, the air flow being in

enveloping contacting relation to said discs, and means for introducing a fibrous material between said discs for radial outward movement, the fiberized material discharging peripherally of said discs in the presence of said heated air and being dried thereby and conducted from said housing by way of said outlet, said discs being mounted in said housing to present the peripheries thereof to said air current, the current which is directed radially inward from said inlet toward said peripheries dividing and flowing over the backs of said discs to the said oppositely disposed outlet.

3. A refiner, including a housing having opposed sidewalls and further having inlet and outlet openings for a transverse flow of air therethrough, a pair of relatively rotatable fiberizing discs in said housing, said discs being arranged to present their peripheries to the air flow through said housing and to present their respective faces in adjacent opposing relation to one another, the backs of said discs being in generally parallel spaced relation to respective sidewalls of said housing, and means for introducing a fibrous material between said discs for discharge peripherally thereof into the air current flowing over said discs, the discharged material being carried from the housing by the air flow by way of said outlet opening.

4. A refiner according to claim 3, characterized by deflector means located at the said inlet opening of said housing and acting to direct the air flow over the backs of said discs.

5. A refiner according to claim 3, characterized by deflector means located at the said inlet opening and directing the air flow over the backs of said discs, said deflector means including upstanding portions in overlapping embracing relation to said discs, said portions having openings admitting air to said discs.

6. A refiner, including a housing having opposing side walls and further having inlet and outlet openings for a transverse flow of air therethrough, a pair of relatively rotatable fiberizing discs in said housing, said discs being arranged to present their peripheries to the air flow through said housing and to present their respective faces in adjacent opposing relation to one another, the backs of said discs being in generally spaced relation to respective side walls of said housing, means for introducing a fibrous material between said discs for discharge peripherally thereof into the air current flowing over said discs, the discharged material being carried from the housing by the air flow by way of said outlet, deflector means

extending across said inlet opening in position to intercept fibrous material expelled by said discs toward said inlet opening and acting further to direct the air flow over the backs of said discs, said deflector means including upstanding portions in overlapping embracing relation to said discs, said portions having openings admitting air to said discs to entrain the said fibrous material expelled toward said deflector means.

7. A refiner, including a pair of relatively rotatable opposed fiberizing discs, a housing surrounding said discs and having generally oppositely disposed inlet and outlet openings for a flow of heated air, the air flow being in surrounding contacting relation to said discs, means for introducing a fibrous material between said discs, the fiberized material discharging peripherally of said discs in the presence of said heated air and being dried thereby and conducted from said housing by way of said outlet opening, and means forming a throat constriction in said housing in advance of said outlet opening imparting a smoothness of flow and added velocity effect in the mixture of air and fibrous material reaching said outlet opening.

8. A refiner, including a pair of relatively rotatable opposed fiberizing discs, a housing surrounding said discs and having generally oppositely disposed inlet and outlet openings for a flow of heated air, deflector means located at the inlet opening of said housing and acting to direct the airflow over the backs of said discs, the airflow being in surrounding contacting relation to said discs, means for introducing a fibrous material between said discs, the fiberized material discharging peripherally of said disc in the presence of said heated air and conducted from said housing by way of said outlet opening, means forming a throat constriction in said housing in advance of said outlet opening imparting a smoothness of flow and added velocity effect in the mixture of air and fibrous material reaching said outlet opening, and means operative within said deflector means for increasing the velocity of airflow from within said deflector means to said outlet opening.

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