

March 31, 1953

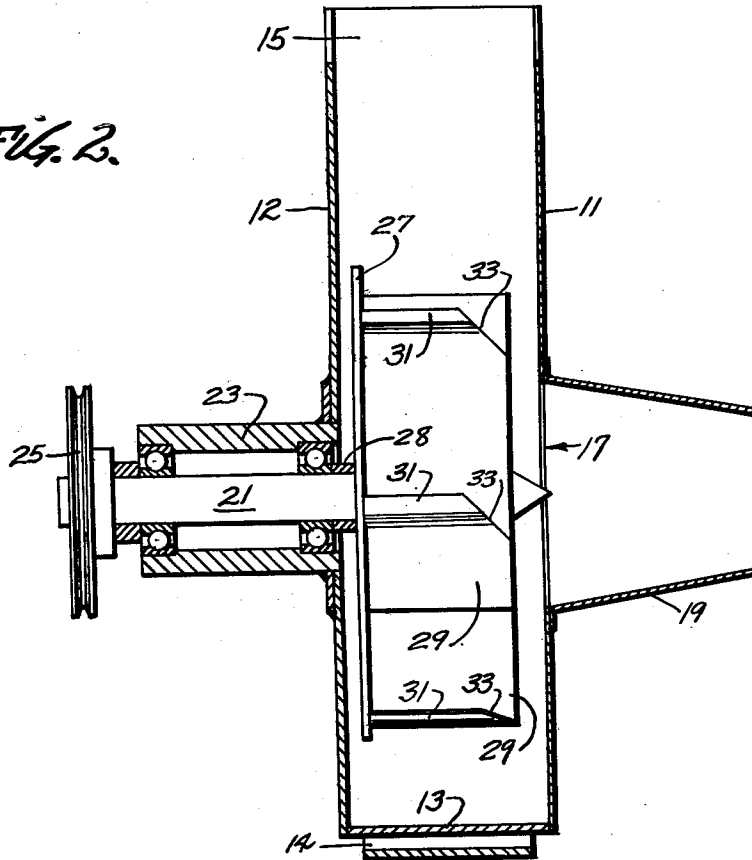
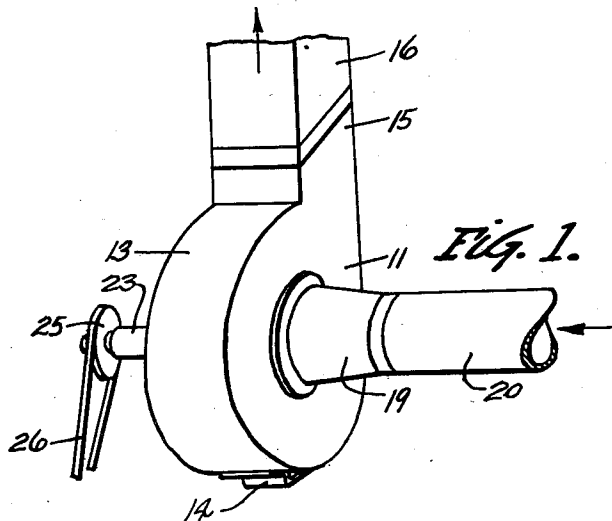
D. A. BUSH
MATERIAL HANDLING FAN

2,633,390

Filed Aug. 12, 1950

2 SHEETS—SHEET 1

Fig. 2.



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2 SHEETS—SHEET 2

Fig. 3.

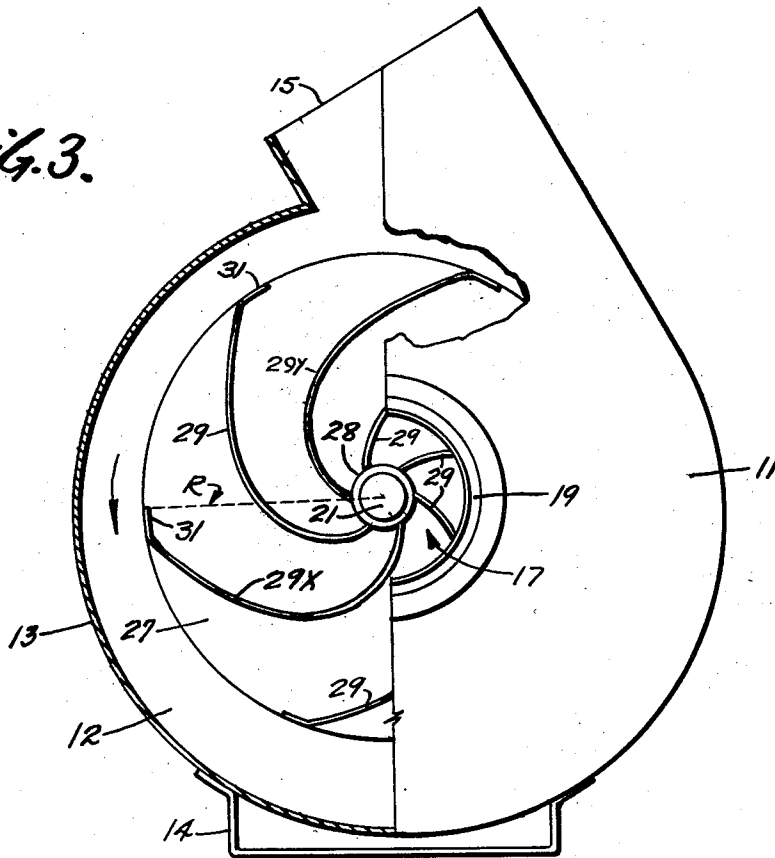
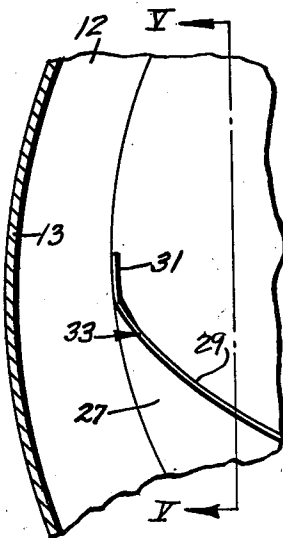
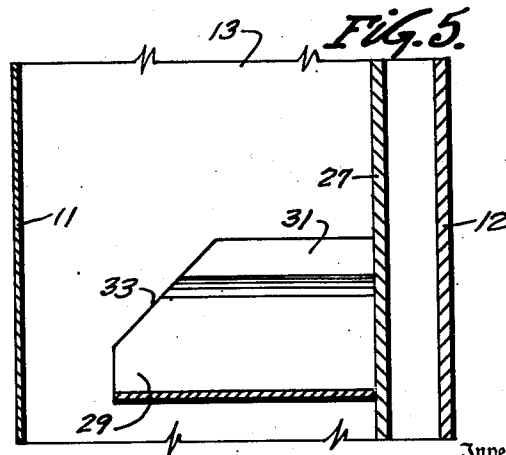


Fig. 4.



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UNITED STATES PATENT OFFICE

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MATERIAL HANDLING FAN

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3 Claims. (Cl. 302—37)

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This invention relates to certain new and useful improvements in fans for handling materials, particularly such material as cotton seed and also seed cotton as harvested and picked from the cotton plant by mechanical cotton pickers, and is adapted to serve as an exhaust fan for moving such material from the harvester and effecting delivery of same to a suitable receptacle.

The present invention is particularly related to such a fan or impeller in which material handling is satisfactorily and efficiently accomplished, eliminating the undesired cracking of the cotton seed, such as has resulted heretofore from the centrifugal force exerted upon cotton handled by fans of pre-existing types.

The principal object of this invention is to provide a fan for handling materials in which the blades or vanes of the fan are so arranged as to reduce the velocity of the cotton or other material as it passes along the surface of the said blades or vanes so as to eliminate cracking of seed in cotton and other damage to materials upon release of the material from contact with the fan blades.

A further object of the invention is to provide a material handling fan in which each of the blades or vanes consists of a segment of a spiral.

A further object of the invention is to provide, in a fan, blades having tip sections in which the tip sections are minor arcuately curved sections, the curvature of which is substantially concentric with the axis of rotation of the fan.

A further object of the invention is to provide a material handling fan blast wheel consisting of an imperforate backing plate, a plurality of spiral-segment vanes fixed in edge relation to the plate perpendicularly thereto, in which each blade remote from the fan hub is provided with tip section, angularly intersecting the body of the blade and arcuately curved concentrically with the fan hub and lying substantially equidistant from the fan hub with the periphery of the backing plate.

A further object of the invention is to improve the design, construction and efficiency of impeller means for handling materials.

The means by which the foregoing and other objects of the present invention are accomplished and the manner of their accomplishment will readily be seen from the following specification upon reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of an assembled fan unit in accordance with the present invention.

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Fig. 2 is a side elevational view on an enlarged scale with part of the housing removed for purposes of illustration.

Fig. 3 is a front view, partly in elevation, further illustrating the arrangement of the device.

Fig. 4 is a fragmentary front view on an enlarged scale illustrating the details of the blade tip section; and

Fig. 5 is a fragmentary sectional view taken as on the line V—V of Fig. 4.

Referring now to the drawings in which the various parts are indicated by numerals, a housing is provided for the fan of the present invention, which housing consists of a front plate 11, a rear plate 12 and a curved scroll plate 13. Preferably a foot or pedestal 14 is provided to support the unit for use. Front and rear plates 11, 12, are flat plates formed with appropriately curving edges and are joined along their edges by scroll plate 13, completing a housing having a substantially cylindrical body and provided with a tangential discharge 15, to which a discharge conduit 16 may be fixed to lead to a suitable receptacle, not shown.

Front plate 11 is provided with an aperture 17 disposed slightly above and laterally offset from the center of the cylindrical housing, to which aperture is attached a forwardly projecting intake spout 19, the spout being preferably substantially frusto-conical in shape and being adapted to receive and have fitted thereon a suitable piping 20 from a source of material such as a cotton harvester, not shown. Rear plate 12 is apertured in concentric alignment with intake opening 17 to receive a shaft 21, a suitable bearing sleeve 23 being fixed to the exterior of rear plate 12 in alignment with the aperture therein to provide journalling and support for shaft 21. Suitable drive means may be provided for the exterior shaft 21 in the form of a pulley 25 mounted thereon which is coupled as by a belt 26 to a drive mechanism, not shown.

The fan blast wheel of the present invention consists of a substantially vertically disposed circular and imperforate impeller plate 27, having a hollow hub 28 which is mounted upon and fixed in suitable fashion, as by a key to shaft 21, for rotation with the shaft.

The fan wheel is completed by a plurality of blades or vanes 29 which are secured in edge relation to the forward face of impeller plate 27 and projecting perpendicularly from that face. The blades 29 are preferably identical and are spaced equidistant about the axis of rotation of the fan wheel, the roots of each blade being abutted against and fixed to hub 28. Each blade 29 is

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preferably formed with its main body portion consisting of a segment of a geometrical spiral, the shape of each blade following a path as formed by a point rotated about the fan axis and constantly receding therefrom. The blades are so disposed upon the impeller plate that the blade root adjacent hub 28 is the leading portion of the blade in the direction of wheel rotation which is indicated by the arrow shown on Fig. 3, the path of the curve of the spiral segment body portion extending away from the hub in a counter-rotational direction. The spiral segment body portion of each blade preferably extends substantially to the periphery of impeller plate 27 and a tip section 31 is formed integrally with the spiral segment body portions and angularly joining the body portions along the line of junction, which line is substantially perpendicular to the impeller plate. Each of the tip sections 31 preferably comprises a segment of a cylinder, and is arcuately curved substantially concentrically with the axis of rotation of the fan and preferably having a radius substantially equal to the radius of impeller plate 27.

It will be seen that in the preferred embodiment of the fan the root and a substantial portion of each blade is embraced within the space bounded by the blade next preceding in the direction of fan rotation and that the terminal end of each tip section preferably lies substantially on that radius of the impeller plate extending through the root of the second following blade. Thus as indicated by the dotted line R on Fig. 3, the tip 31 of blade 29X lies substantially on the plate radius passing through the root of blade 23Y.

In addition it is preferred that a minor end portion of each blade body and its integral tip section 31 should be cut off as at 33 along a diagonal line, providing a relief space at the outer and forward corner of each blade and its tip section, for the purpose of facilitating elimination of possible overload or packing of material in the housing. Preferably hub 28 extends rearwardly beyond the impeller plate so as to space the impeller plate a minor distance forwardly of rear plate 12 when the fan has been mounted in the housing. It is further preferred that the forward tip of shaft 21 should be tapered or formed conically in order to provide a divider for the stream of material flowing into the casing through intake spout 19.

In the use of the device after it has been assembled in the manner described, the fan wheel, as stated, is rotated in the direction of the arrow in Fig. 3, establishing a flow of air inwardly through intake spout 19, thence outwardly closely along the surface of the respective blades 29 discharging peripherally about the fan and upwardly and outwardly through the tangential discharge 15. The movement of air thus created is adequate to withdraw cotton or other material through pipe 20 into spout 19 and the interior of the housing and to tangentially discharge the material for travel to a suitable receptacle through tangential discharge 15 and discharge pipe 16. It is found that when material such as cotton is delivered by the fan it impinges against the forwardly projecting conical end of shaft 21 and is separated outwardly from the hub of the fan. It is engaged by the blades, the leading root portions of the blade face first effecting such engagement, and is found to move outwardly along the blades closely adhering to the surface of the blades. By virtue of the counter-rotational

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disposition of the curve of the blades the path of the cotton or other material being handled is found, in addition to being outward from the fan hub, to be slightly opposite to the direction of rotation, with the result that the velocity of the material is materially reduced until the cotton or other material has reached the tip sections 31 which abruptly drop off in a counter-rotational direction and permit the cotton to leave the blade surface with minimum velocity being picked up and carried forward, thence to discharge by the current of air established by the fan. It is found that the centrifugal action exerted by fans heretofore in use, by which materials such as cotton has been thrown forcibly against the housing and seed cracking has been caused, is substantially completely eliminated, so that damage to cotton handled by the fan of the present invention is found to be reduced to a minimum.

Due to the flow of air about a properly curved surface the air stream and materials cling to the convex side of the blade reducing the velocity, then releasing the materials gently and at an angle to the scroll of fan and are then picked up by the air current and carried to the exhaust.

I claim:

1. In a fan for handling seed cotton and the like, a housing, a fan blast wheel comprising a circular impeller plate rotatably mounted in said housing, means for rotating said plate in one direction, a central hub projecting from said plate, a plurality of identical curved blades, the roots of said blades being fixed to said hub in equally spaced relation, each said blade curving outwardly from said hub in a counterrotational direction along said plate, a like plurality of tip sections, each tip section being secured at one end in angular relation to the outer end of a blade with the other tip section end coinciding with the periphery of said plate, each said blade lying between two other said blades with said other end of the tip section of one of said other blades lying substantially on the radius of said plate which intersects the root of the second said other blade, whereby upon wheel rotation to handle and discharge seed cotton and the like substantially without impingement against said housing.

2. In a fan for handling seed cotton and the like, a housing, a fan blast wheel comprising an impeller plate rotatably mounted in said housing, means for rotating said plate in one direction, a central hub projecting from said plate, a plurality of identical blades each including a spiral segment, the roots of said blades being fixed to said hub in equally spaced relation, each said blade spiralling outwardly from said hub in a counterrotational direction along said plate, a like plurality of tip sections, each tip section being secured at one end to the outer end of a blade angularly joining its spiral segment and projecting away from said segment in a counter-rotational direction, and consisting of a segment of a cylinder centered on said hub, each said blade lying between two other said blades with the other end of the tip section of one of said other blades lying on the radius of said cylinder which intersects the root of the second said other blade, whereby upon wheel rotation to handle and discharge seed cotton and the like substantially without impingement against said housing.

3. In a fan for handling seed cotton and the like, a housing, a fan blast wheel comprising an

impeller plate rotatably mounted in said housing, means for rotating said plate in one direction, a central hub projecting from said plate, a plurality of identical blades, the roots of said blades being fixed to said hub in equally spaced relation, each said blade extending outwardly from said hub along said plate, a like plurality of tip sections, each tip section being secured at one end to the outer end of a blade, projecting in a counter-rotational direction away from said blade end, and consisting of a segment of a cylinder centered on said hub, each said blade lying between two other said blades with the other end of the tip section of one of said other blades lying on the radius of said cylinder which intersects the root of the second said other blade, said blades and tip sections being truncated along one corner diagonally to said plate, whereby upon rotation of said plate to handle and discharge seed cotton and the like substantially without impingement against said housing.

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