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P. F. BROWN

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DISINTEGRATION OF FIBERS

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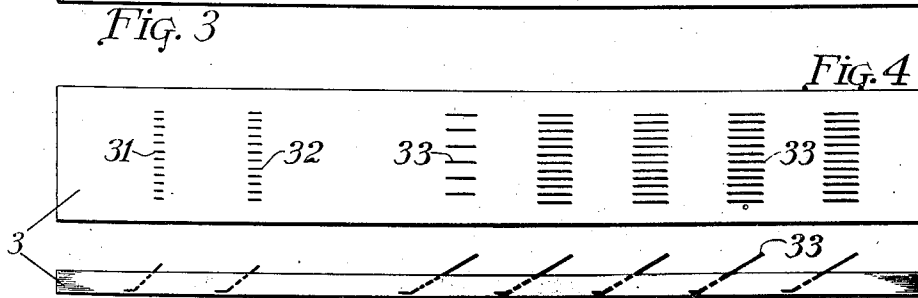
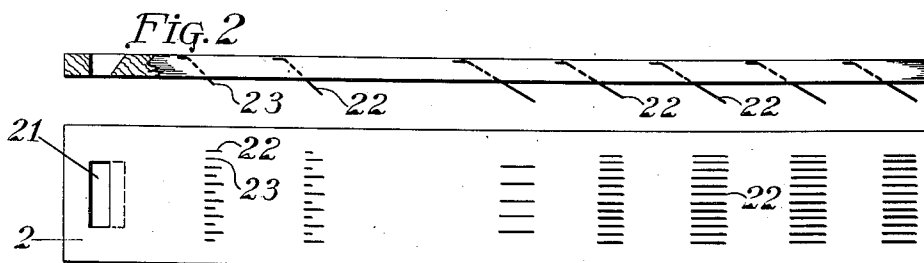
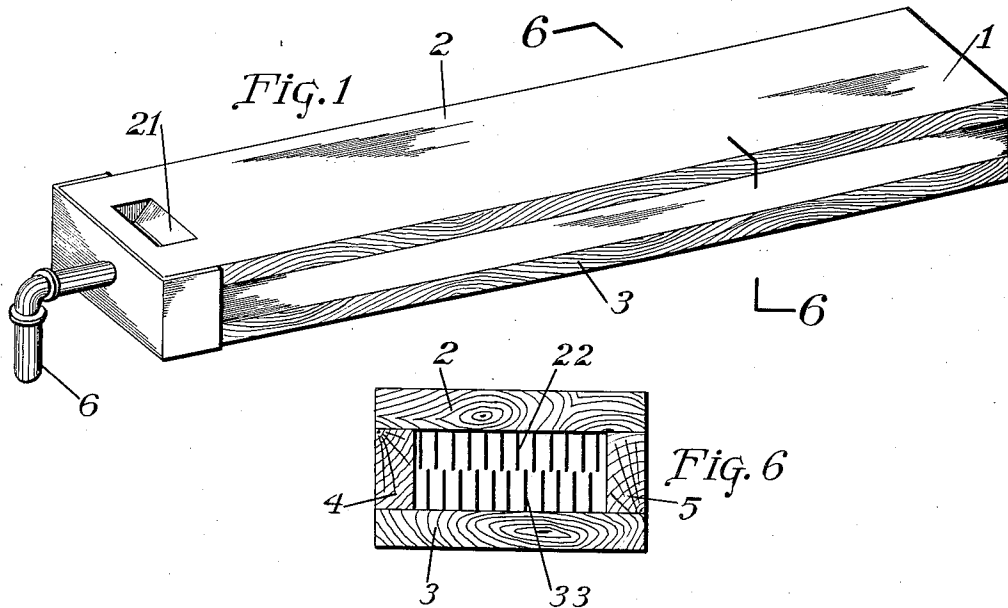


Fig. 5

Fig. 4

Fig. 3

Fig. 2

INVENTOR.
Philip Franklin Brown
BY
John Lawrence Seymour
ATTORNEY.

UNITED STATES PATENT OFFICE

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DISINTEGRATION OF FIBERS

Philip Franklin Brown, Yonkers, N. Y., assignor
to Du Pont Rayon Company, New York, N. Y.,
a corporation of Delaware

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10 Claims. (Cl. 19--31)

This invention relates to the disintegration of fiber aggregates. A particular application of the invention is the disintegration of rayon staple chips. The invention also relates to a method and apparatus for disintegrating aggregates. The invention will be described in its application to the disintegration of staple rayon chips but it is equally applicable to the disintegration of fiber aggregates of any kind.

In one method of manufacturing staple rayon, viscose is extruded into a coagulating bath and the threads therein formed are combined to make strands of regenerated cellulose filaments which are subsequently combined with other similar strands to form a thick rope-like bundle containing upward of 100,000 filaments. This rope-like bundle is purified, passed through wringers, and chopped into short lengths. The bundles of short length fibers, known in the art as staple chips, when dried are quite compact; the fibers cohere making it difficult to spin them into thread; they become contaminated with grease and dirt and, because of these disadvantages, greatly increase the cost of the spinning process.

It has been proposed to disintegrate these aggregates by cascading them with a suitable liquid through a tower filled with baffles, the separated fibers and liquid being centrifuged in order to remove the surface water. This method has, however, been found unsatisfactory because the fibers, dispersed in the liquid, are aggregated again in the centrifuging.

It is an object of this invention to disintegrate fiber aggregates. A specific object of the invention is to disintegrate rayon staple chips. Another object of the invention is to provide an inexpensive and efficient apparatus for the disintegration of fiber aggregates.

The objects of the invention are attained, generally speaking, by blowing the aggregates at high velocity into contact with baffles. The specific means and method hereinafter described also assist in the accomplishment of the objects of this invention.

In the drawing Figure 1 is a view in perspective of my apparatus. Figure 3 is a plan view of the interior of the top board of the apparatus shown in Figure 1. Figure 2 is a side view of the top board of the apparatus shown in Figure 1. Figure 4 is a plan view of the inside of the bottom board of the apparatus shown in Figure 1. Figure 5 is a side view of the bottom board. Fig. 6 is a cross section on the line 6--6 of Fig. 1 of my disintegrator.

Referring to the numerals of the drawing, 1 is

a disintegrator made according to the principles of my invention; 2 refers to the top board; 3 refers to the bottom board; 4 and 5 are the side wall boards; these four boards form a rectangular wind tunnel; 21 is an opening in the top board of the disintegrator providing means whereby fiber aggregates may be admitted to the disintegrator; 22 are spikes or pins more preferably made of nickel wire or the like imbedded in, or attached to, the top board; 23 are pins of shorter length; and 6 is a pipe through which air may be injected into the wind tunnel.

In Figures 4 and 5, 3 is the bottom board of the tunnel; 31 are short pins projecting at an angle of about 45° from the board; 32 are pins projecting from the board at about an angle of 40°; 33 are pins projecting from the board at an angle of about 30°.

There has been above described a preferred form of wind tunnel in which baffle pins are arranged in rows and the rows of baffle pins in the top and bottom boards are sequentially arranged. The pins in the first two rows in the top board are preferably alternately short and long and are arranged so that the first pin on the left of the first row will be short (or long) and the corresponding pin on the second row will be long (or short). After these two rows of pins there is inserted a comparatively widely spaced group of a few pins and thereafter several rows of pins. The pins of the bottom and of the top rows are preferably arranged in staggered relation as shown in Figure 6.

It is advantageous to arrange the pins at different angles in the boards. For example, the first row may be set at an angle of 45°, the second at an angle of 40°, the third at an angle of 35° and the remainder at an angle of about 30°. Great latitude and variation are permissible in selecting the angle at which the pins may be mounted. The pins should be slanted away from the jet rather than toward it because the pins, when slanted away from the jet, break up the aggregates without tending to hold them or to greatly retard their speed; whereas, if they are pointed toward the jet they tend to catch and hold the aggregates and the latter tend to wedge between the pins and the boards. In general, preferred results are obtained if the angles of the pins with relation to the floor board is about 45° or less. To mount the pins at angles greater than about 45° tends to undesirably retard their passage through the disintegrator.

The apparatus is used as follows: By any satisfactory contrivance rayon staple chips or other

fiber aggregates will be brought over the opening 21 of the wind tunnel and a blast of air will be directed through the tunnel from the pipe 6. This air tends to suck the fiber aggregates through the opening 21 into the interior of the disintegrator. The chips strike against the pin baffles in the box at extremely high velocities and, in a completely disintegrated, fluffy mass, are caught at the end of the disintegrator in a chamber that retains the fibers but allows the air to escape. This staple fiber, when rayon is the fiber that is disintegrated, when run through my disintegrator can be used much more advantageously in the production of staple products than the staple which has heretofore been used; the fiber mass is soft and fluffy and usually contains not more than about 5% of the fibers in parallel and unseparated relationship. This is an improvement of several hundred percent over the best prior methods.

A wide range of air velocities can be used in the practice of my invention. Speaking in terms of tunnel velocity, the air velocities may vary upward of about 10,000 feet per minute. It is not desirable to operate at speeds averaging less than 10,000 feet per minute because at lower speeds the chips (speaking of staple fiber chips) may not be completely opened. It will be understood, of course, that the velocities which are satisfactory will differ according to the particular product which is to be disintegrated. In normal operation in the treatment of rayon staple chips an average tunnel air velocity of between 25,000 and 40,000 feet per minute produces satisfactory results and these velocities are recommended. Satisfactory results can also be obtained by greater or less speeds.

The staple chips should be fed into the box at a rate such that the operation will be inefficient neither because of low output nor because of a choked tunnel. A high air velocity at the orifice of pipe 6, for instance 100,000 or 200,000 feet per minute or even more, draw chips into the disintegrator and so accelerate them that they will receive a maximum effect upon striking the first pins.

The invention is particularly useful in the disintegration of staple rayon chips but it can be used for the disintegration of fiber aggregates of any type.

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 disintegrating rayon staple chips which comprises blowing the chips, by means of a gaseous medium, at a velocity of over 10,000 feet per minute into contact with rows of pin baffles of progressively increasing length inclined in the direction of flow at progressively de-

creasing angles, the pins of certain of the rows first contacted being of non-uniform length.

2. The method of disintegrating rayon staple chips which comprises blowing the chips, by means of a gaseous medium, at a velocity of over 10,000 feet per minute into contact with rows of pin baffles of progressively increasing length inclined in the direction of flow at progressively decreasing angles.

3. The method of disintegrating staple rayon chips which comprises blowing the chips, by means of a gaseous medium, at a velocity of over 10,000 feet per minute into contact with rows of pin baffles of progressively increasing length inclined in the direction of flow.

4. The method of disintegrating rayon staple chips which comprises blowing the chips, by means of a gaseous medium, at a velocity of over 10,000 feet per minute into contact with rows of pin baffles inclined in the direction of flow at progressively decreasing angles.

5. The method of disintegrating rayon staple chips which comprises blowing the chips, by means of a gaseous medium, at a velocity of upward of 10,000 feet per minute into contact with a series of baffles arranged to obstruct but not to stop the passage of the fibers.

6. The method of disintegrating fiber aggregates which comprises blowing the aggregates at a velocity upward of 25,000 feet per minute into contact with a series of baffles arranged to obstruct but not to stop the passage of the fibers.

7. The method of disintegrating fiber aggregates which comprises blowing the aggregates at a velocity of about 25,000 feet per minute into contact with a series of baffles.

8. An apparatus for the disintegration of rayon staple chips comprising a wind tunnel of rectangular cross section, pins arranged in rows on one side of the interior thereof, the pins in certain of the first said rows being of non-uniform lengths, pins arranged in rows in the side of the tunnel opposed to the said side, the rows of pins on the opposite sides being arranged in staggered relation, pins in the first said rows being arranged in the direction of flow at an angle of 45°, the other rows of pins being arranged in the direction of flow at an angle of 30°, means for injecting air into the tunnel at high velocity, and means for utilizing the velocity of the injected air to draw material to be disintegrated into the tunnel.

9. The method which comprises disintegrating staple rayon chips to render them suitable for spinning purposes by blowing the same, by means of a gaseous medium, at a velocity of over 10,000 feet per minute into contact with a series of pin baffles.

10. The method of disintegrating rayon staple chips which comprises blowing said chips, by means of a gaseous medium, into contact with baffles, and drawing the said chips into the disintegrator by means of said gaseous medium having a velocity exceeding 10,000 feet per minute.

PHILIP FRANKLIN BROWN.