Aug. 28, 1962 E. BARBOZA 3,051,560

APPARATUS FOR AGING ALKALI CELLULOSE

Filed May 11, 1959 4 Sheets-Sheet 1

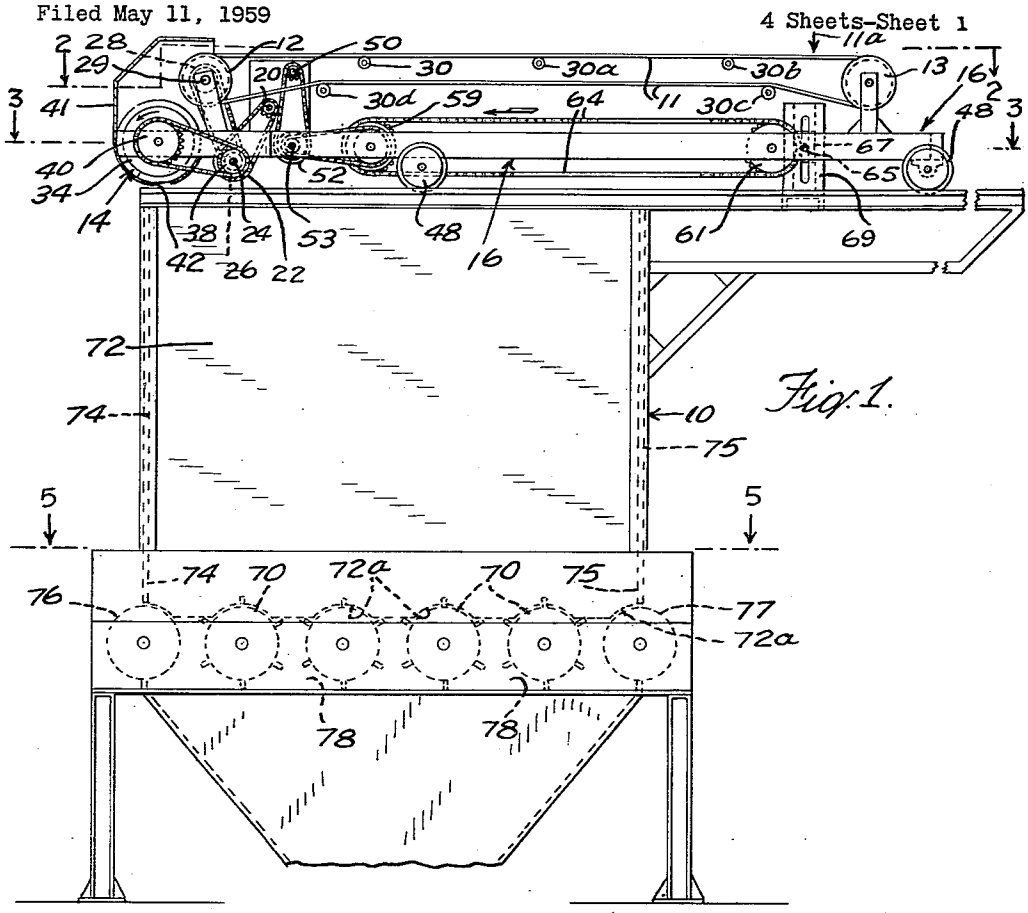


Fig. 1.

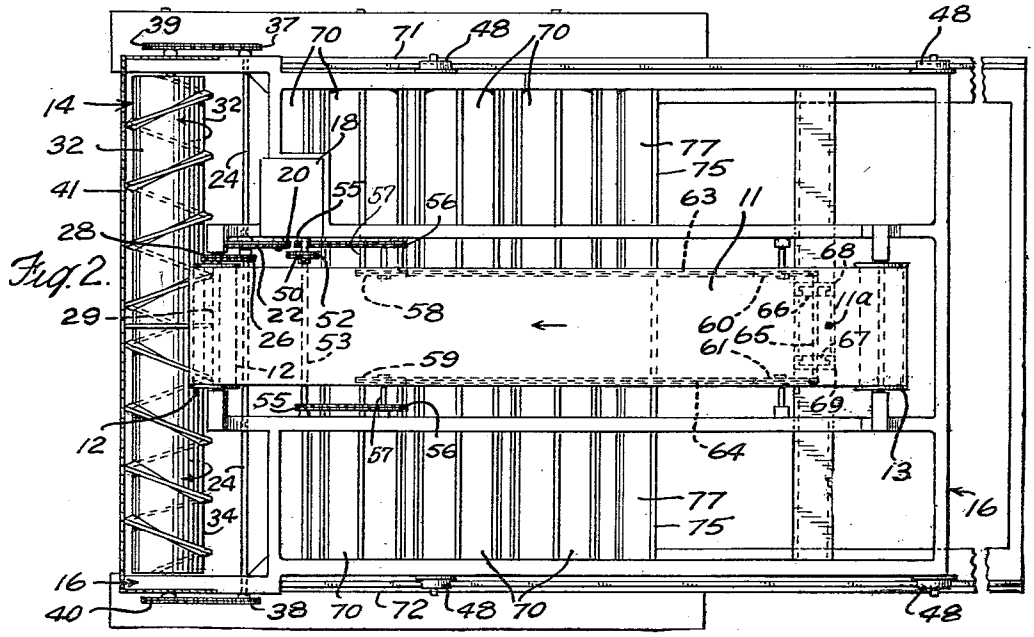


Fig. 2.

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Fig. 3.

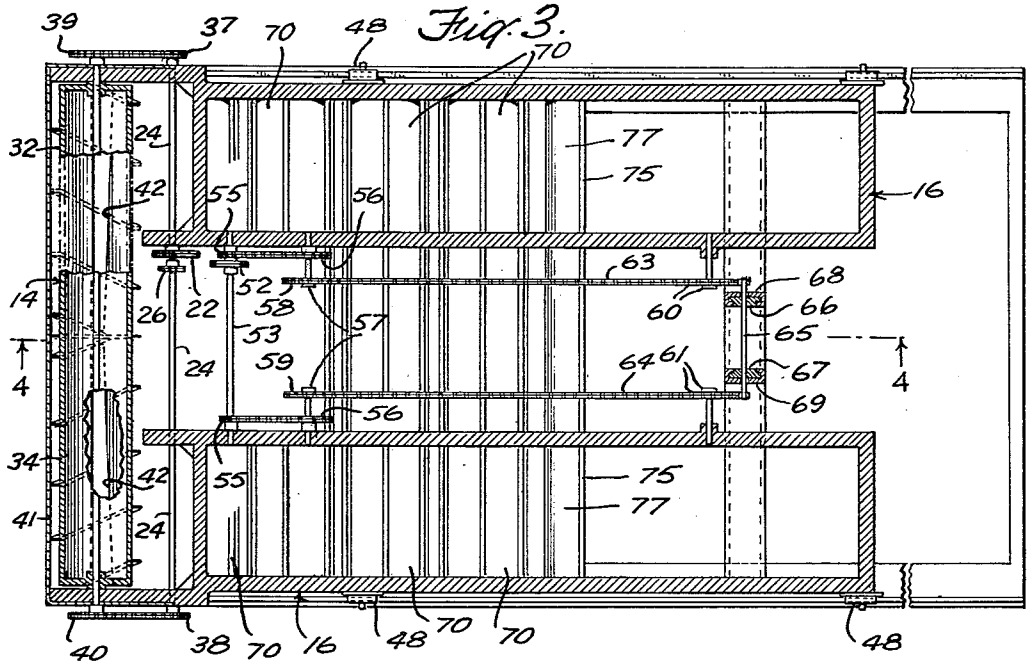
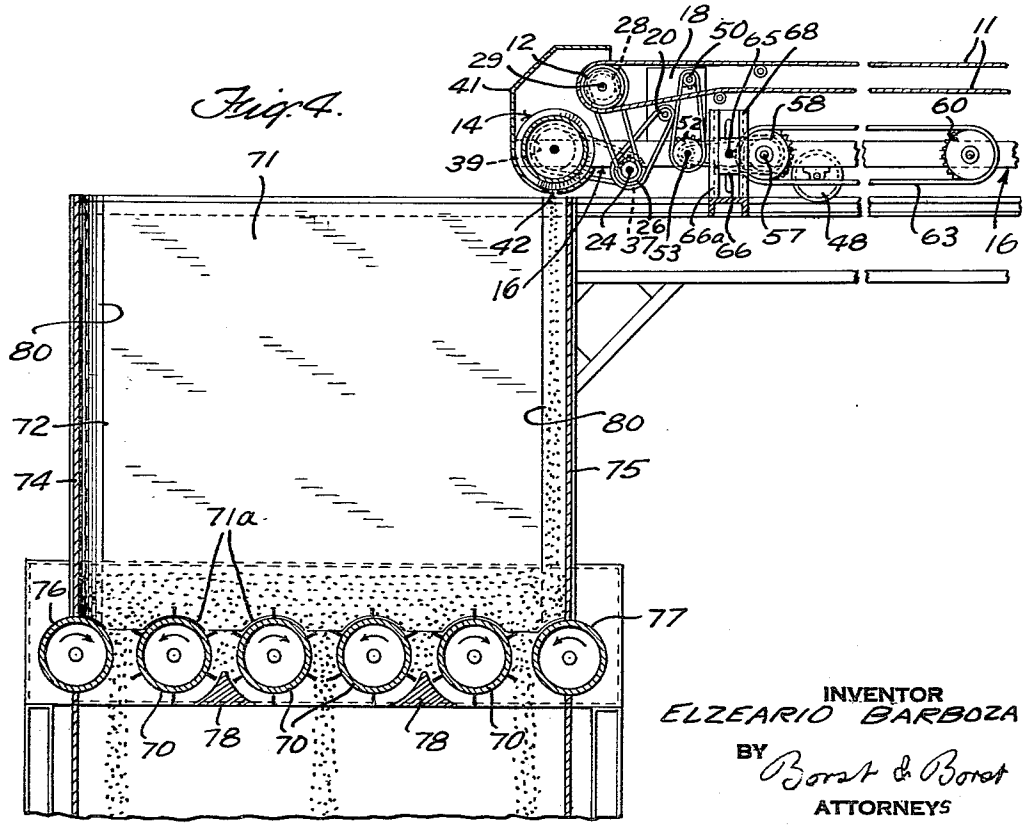


Fig. 4.



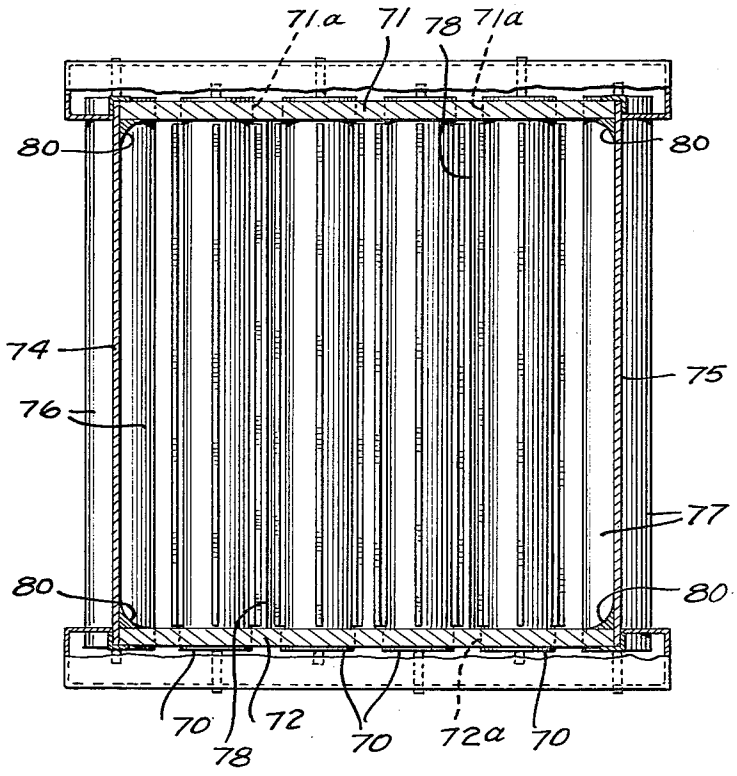
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Fig. 5.



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Fig. 6

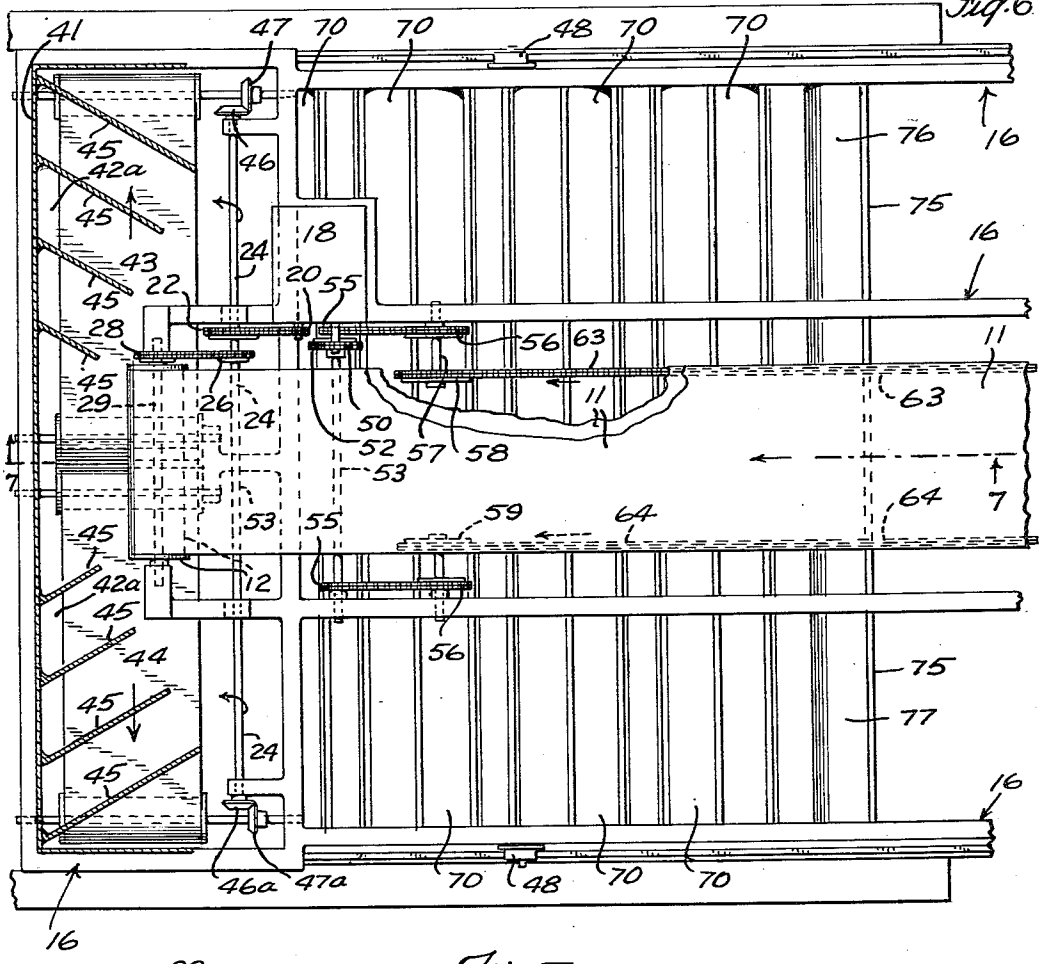


Fig. 7.

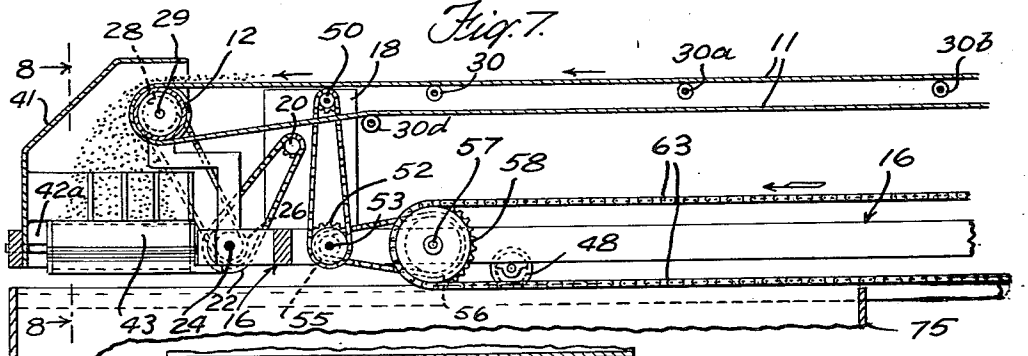
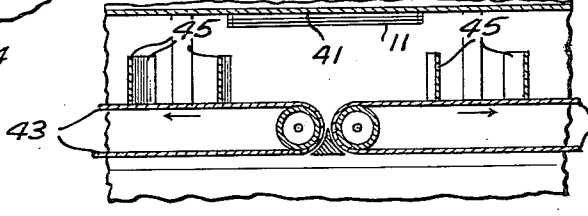


Fig. 8.



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APPARATUS FOR AGING ALKALI CELLULOSE

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Filed May 11, 1959, Ser. No. 812,502
8 Claims. (Cl. 23—284)

This invention relates to apparatus for the production of viscose and particularly to improvements in apparatus for the continuous aging of alkali cellulose.

While viscose manufacture today largely involves treatment of material in batch, there has been some progress made in the last few years in the development of apparatus which has the capacity to handle viscose producing material in continuously delivered quantities. For example, there are in present use continuous aging towers to which quantities of alkali cellulose in crumb form are introduced and allowed to settle by gravity to their bottom where rotating rollers pass the material out to conveying belts or containers in preparation for the next step in the process. It is most important, of course, that the cellulosic material be uniformly aged throughout its mass and the continuous aging tower as disclosed, for example, in Patent No. 2,490,097 affords an assurance that any discrepancy in the aging time or temperature of the crumb will not exceed tolerable limits. Due to the possibility of human error such assurance is not available to the batch process user who employs individual containers to age the material in discrete and relatively small quantities.

This invention contemplates an improved, continuous aging tower which guarantees meeting the required standards of aging time uniformity as do present towers and further enhances the capacity of the continuous aging tower to ripen the material uniformly. To this end the instant tower is provided with a translating distributor mechanism at its top end, which serves to deposit the crumb in the tower substantially in successive horizontal layers, which insures that the distance of descent is approximately the same for all the crumb. Additionally, the discharge rollers at the bottom of the tower are disposed and designed in such a manner that all of the material is discharged as a consequence of the positive feed or metering action of the rollers and virtually none of the material is permitted to drop solely by gravity through and out of the tower between its sides and the rollers or between the upwardly moving surfaces of adjacent rollers. Thus, the tower has an improved capability for maintaining uniformity in the height of the material across its mass and for controlling its velocity of descent through the aging zone and, as a consequence, the tower is enabled to deliver ripened alkali cellulose whose aging time has been strictly supervised.

One object of the invention is to provide an improved alkali cellulose aging tower which causes the material to be delivered continuously and uniformly to its aging zone and be discharged therefrom at a positively controlled velocity.

Another object of the invention is to provide an alkali cellulose aging tower which provides for continuous treatment of the material which is delivered to it and assures its uniform aging.

Other objects and advantages of the invention may be appreciated on reading the following detailed description of its preferred embodiments which is taken in conjunction with the accompanying drawings, in which

FIG. 1 shows a broken elevation of the alkali cellulose aging tower, some parts being shown in section,

FIG. 2 is a sectional plan taken on the line 2—2 of FIG. 1,

FIG. 3 is a sectional plan taken on the line 3—3 of FIG. 1,

FIG. 4 is a broken vertical section taken on the line 4—4 of FIG. 3 showing the carriage in extreme right hand position,

FIG. 5 is a section in plan taken on the line 5—5 of FIG. 1,

FIG. 6 is a broken section on enlarged scale showing a modified distributor mechanism,

FIG. 7 is a section taken on the line 7—7 of FIG. 6, and

FIG. 8 is a fragmentary section taken on the line 8—8 of FIG. 7.

Referring to the drawings there is disposed at the top of the alkali cellulose aging tower 10 a conveyor belt 11 which is adapted to receive the alkali cellulose as indicated by the arrow 11*a* in FIG. 1 from a continuous or intermittent alkali cellulose supply, the material being carried at a steady rate by the belt. The conveyor belt is of the endless type being carried by end rollers 12 and 13, the end roller 12 being disposed over a distributor 14. The conveyor belt 11 and distributor 14 are supported by means of a carriage 16 which causes the two components to travel from one end wall to the other end wall of the tower during operation. An electrical drive unit 18 actuates the conveyor belt 11, the distributor 14 and the carriage 16 as follows: A sprocket wheel 20 of the drive unit is connected through a chain to sprocket 22 which is mounted on a shaft 24. A second sprocket 26 on the shaft 24 is connected by a chain to sprocket 28 which is mounted on an axial shaft 29 of the end roller 12 which drives the conveyor belt 11. Intermediate rollers 30, 30*a*, 30*b*, 30*c* and 30*d* support the conveyor belt between the two end rollers. The belt 11 is thus enabled to pass the alkali cellulose on to the distributor 14. As shown in FIG. 2 the distributor may take the form of screw or spiral conveyors 32 and 34, the spirals of which on each side of the belt are oppositely pitched so that the crumb may be led away from the delivery end of the belt 11. The shaft 24 also carries sprockets 37 and 38 which are chained to distributor sprockets 39 and 40, respectively, which serve to turn the two distributor screws. The screws turn in a casing 41 which underneath the distributor has openings 42 which progressively increase in size toward the outer end of the screw conveyors in order to insure equal distribution of the alkali cellulose across the total surface of the tower.

In FIG. 6 there is shown a different form of distributor made in accordance with the invention. This distributor takes the form of a pair of endless belts 43 and 44, which are supported for rotation in the casing 41. There is dependent from the roof of the casing 41 oblique deflectors 45 which extend progressively farther over the surface of the belts according to their distance from the delivery belt 11. In this instance beveled gears 46 and 46*a* are mounted respectively on the ends of the shaft 24 and are disposed in driving engagement with beveled gear wheels 47 and 47*a* respectively which are fixed integrally to the shafts of the driving drums of the two conveyor belts, the upper surfaces of which are caused to travel in opposite directions away from the belt 11 as indicated by the arrows. It is thus apparent that as the two belts are driven, the conveyed material successively impinges on the deflectors and is moved obliquely over the edge of the belts and through opening 42*a* into the tower thus securing an even distribution along the length of the belts.

The alkali cellulose must also be distributed evenly from one end wall of the tower to the other. To this end the carriage carrying the conveyor belt 11 and distributor 14 and their driving connections is caused to move back and forth on its four wheels 48 by the drive unit 18. The driving connections between the unit and the carriage may be described as follows: A sprocket 50 on the drive unit is in chain connection with a sprocket 52 which is mounted on a shaft 53. On each end of the shaft 53

are mounted sprocket wheels 55 in chain connection with sprocket wheels 56 which are in turn mounted on shaft 57. A pair of sprocket wheels 58 and 59 are also carried by the shaft 57 and are connected to freely rotatable sprockets 60 and 61, respectively, by means of separate chains 63 and 64. A cross-bar 65 is affixed to the chains and the ends of the cross-bar extend through apertures in vertical slides 66 and 67 which are carried in guides 68 and 69, respectively, and through vertically disposed slots in the guides 68 and 69. The guides are fixed to the casing of the tower so that they are prevented from horizontal movement relative to the tower. The slides are vertically adjustable in the guides and are selectively adapted to be controlled by the cross-bar in either its upper or lower position of chain travel. The driven sprocket wheels 58 and 59 and the freely rotatable sprockets 60 and 61 are caused to move toward the right relative to the fixed guides 68 and 69 when the chains 63 and 64 are driven in the direction indicated by the arrows in FIG. 1 and the cross-bar 65 is in its upper chain position. When the driven sprockets 58 and 59 reach the fixed guides, the slides are moved to the lower position in the guides by the cross-bar so that the carriage is driven to the left. When the freely rotatable sprockets 60 and 61 reach the guides, the slides are moved to their upper position in the fixed guides and the direction of movement of the carriage relative to the tower is reversed and returned to the position in FIG. 5. Consequently the incoming alkali cellulose, supplied at the top of the tower, is distributed uniformly with respect to time over the entire interior horizontal cross-section of the tower. This feature, together with the uniform alkali cellulose, discharge mechanism described below, assures a uniform time of travel down through the tower of each individual element of alkali cellulose crumb.

At the base of the tower there is provided a plurality of rollers 70, adjacent rollers being caused to turn in opposite directions and in opposite phase, the drive therefor being described in co-pending application Ser. No. 812,366, filed May 11, 1959. Preferably, the rollers are provided with cleats or blades which are axially and circumferentially distributed about the surface thereof. Additionally, the rollers 70 are sufficiently long that they extend beyond the two sides 71 and 72 of the casing of the tower and the bottom of the casing is provided with arcuate recesses 71*a* and 72*a* formed at uniformly spaced intervals proximate the rollers in the bottom edges of the sides 71 and 72 forming complementary profiles with the roller surfaces. By thus extending the rollers beyond the tower on two sides and by snugly disposing the rollers within the recesses the escape of material between the rollers and the sides is prevented. The two sides 71 and 72 of the casing are joined by end walls 74 and 75, the casing being rectangular in cross-section. Inside corners of the tower are rounded off as by fillets 80 to prevent compacted deposit from forming in the corners of the tower. Directly underneath the end walls 74 and 75 are disposed rollers 76 and 77, respectively, which also extend beyond the sides of the tower. The rollers 76 and 77 are driven, respectively, in a clockwise and counterclockwise direction so that the alkali cellulose in this region of the tower is moved inwardly by these rollers and is thus prevented from escaping by falling straight through the tower along the sides of the end walls 74 and 75 or between the rollers 76 and 77 and the sides 71 and 72 at their juncture with the end walls. The uniform discharge of the evenly distributed material from the tower is thus assured because no material is allowed to pass from the bottom of the tower unless it is positively metered through under the action of a roller.

Preferably, guards 78 are disposed under each pair of rollers being disposed under the adjacent surfaces thereof which are ascending so that material is prevented from falling of its own weight between adjacent, ascending roller surfaces. The guards present arcuate surfaces to the scraping blades of the rollers.

It has been found in practice that the continuous aging tower made in accordance with this invention for performing the aging or ripening step in the viscose process not only serves to enhance the continuity of the steps immediately before and after aging but significantly improves the consistency of the aged product; as a consequence the succeeding step, namely xanthation, is also better adapted to be performed with improved consistency of result.

Various modifications of the invention may be effected by persons skilled in the art without departing from the scope and principle of invention as defined in the appended claims.

What is claimed is:

1. An alkali cellulose aging apparatus comprising a vertical tower open at the upper end thereof and defining an aging chamber, a pair of spaced parallel elongated guide rails secured across the upper end of said tower and extending out beyond one end thereof, a carriage mounted on said rails for reciprocal back and forth movement over the open upper end of said tower, a longitudinally extending endless conveyor belt mounted on said carriage, a transversely disposed distributor means mounted on said carriage adjacent the discharge end of said conveyor and extending substantially the entire width of said carriage, a non-reversible drive unit mounted on said carriage in fixed position thereon, operative connections between said drive unit and said endless conveyor and said distributor means through which said endless conveyor and said distributor means are constantly driven in the same direction by said non-reversible drive unit during operation, and interconnecting means between said carriage and said non-reversible drive unit through which said carriage is driven by said non-reversible drive unit and which is operative to periodically reverse the direction of movement of said carriage, said distributor means being operative to receive material discharged from said conveyor and for continuously and progressively discharging said material into said chamber in a direction normal to the movement of said carriage to thereby effect an even distribution of said material transversely of said chamber as said carriage is reciprocated back and forth, and means located in the lower end of said tower by which said material is discharged therefrom at a positively controlled velocity.

2. An alkali cellulose aging apparatus comprising a vertical tower open at the upper end thereof and defining an aging chamber, a pair of spaced parallel elongated guide rails secured across the upper end of said tower and extending out beyond one end thereof, a carriage mounted on said rails for reciprocal back and forth movement over the open upper end of said tower, a longitudinally extending endless conveyor belt mounted on said carriage, a transversely disposed distributor means mounted on said carriage adjacent the discharge end of said conveyor and extending substantially the entire width of said carriage, a non-reversible drive unit mounted on said carriage in fixed position thereon, operative connections between said drive unit and said endless conveyor and said distributor means through which said endless conveyor and said distributor means are constantly driven in the same direction by said non-reversible drive unit during operation, and interconnecting means between said carriage and said non-reversible drive unit through which said carriage is driven by said non-reversible drive unit and which is operative to periodically reverse the direction of movement of said carriage, said interconnecting means comprising; chain means which is mounted on said carriage and is adapted to be constantly driven in the same direction by said non-reversible drive unit during operation, and means which is operatively connected to said chain means and is operative to periodically reverse the direction of movement of said carriage; said

distributor means being operative to receive material discharged from said conveyor and for continuously and progressively discharging said material into said chamber in a direction normal to the movement of said carriage to thereby effect an even distribution of said material transversely of said chamber as said carriage is reciprocated back and forth, and means located in the lower end of said tower by which said material is discharged therefrom at a positively controlled velocity.

3. An alkali cellulose aging apparatus comprising a vertical tower open at the upper end thereof and defining an aging chamber, a pair of spaced parallel elongated guide rails secured across the upper end of said tower and extending out beyond one end thereof, a carriage mounted on said rails for reciprocal back and forth movement over the open upper end of said tower, a longitudinally extending endless conveyor belt mounted on said carriage, a transversely disposed distributor means mounted on said carriage adjacent the discharge end of said conveyor and extending substantially the entire width of said carriage, a non-reversible drive unit mounted on said carriage in fixed position thereon, operative connections between said drive unit and said endless conveyor and said distributor means through which said endless conveyor and said distributor means are constantly driven in the same direction by said non-reversible drive unit during operation, and interconnecting means between said carriage and said non-reversible drive unit through which said carriage is driven by said non-reversible drive unit and which is operative to periodically reverse the direction of movement of said carriage, said interconnecting means comprising; chain means which is mounted on said carriage and is adapted to be constantly driven in the same direction by said non-reversible drive unit during operation, means mounted in fixed position on said tower, and interconnecting means between said chain means and said fixed position means by which the direction of movement of said carriage is periodically reversed; said distributor means being operative to receive material discharged from said conveyor and for continuously and progressively discharging said material into said chamber in a direction normal to the movement of said carriage to thereby effect an even distribution of said material transversely of said chamber as said carriage is reciprocated back and forth, and means located in the lower end of said tower by which said material is discharged therefrom at a positively controlled velocity.

4. An alkali cellulose aging apparatus comprising a vertical tower open at the upper end thereof and defining an aging chamber, a pair of spaced parallel elongated guide rails secured across the upper end of said tower and extending out beyond one end thereof, a carriage mounted on said rails for reciprocal back and forth movement over the open upper end of said tower, a longitudinally extending endless conveyor belt mounted on said carriage, a transversely disposed distributor means mounted on said carriage adjacent the discharge end of said conveyor and extending substantially the entire width of said carriage, a non-reversible drive unit mounted on said carriage in fixed position thereon, operative connections between said drive unit and said endless conveyor and said distributor means through which said endless conveyor and said distributor means are constantly driven in the same direction by said non-reversible drive unit during operation, and interconnecting means between said carriage and said non-reversible drive unit through which said carriage is driven by said non-reversible drive unit and which is operative to periodically reverse the direction of movement of said carriage, said interconnecting means comprising: a pair of spaced similar longitudinally disposed endless driving chains which are mounted on said carriage and are adapted to be constantly driven in one direction during operation by said non-reversible drive unit, a pair of vertically disposed guides secured in fixed position on said tower and extending upwardly between said pair of driving chains, each of said guides having a vertically disposed slot therein, a transversely extending cross bar secured to said pair of driving chains for movement therewith with the outer ends thereof disposed in said slots, operative connections between said pair of driving chains and said non-reversible drive unit through which said chains are constantly driven in the same direction during operation by said non-reversible drive unit whereby said carriage is driven in one direction when said cross bar is disposed in the upper flight of said driving chains and in the opposite direction when said cross bar is disposed in the lower flight of said driving chains, said distributor means being operative to receive material discharged from said conveyor and for continuously and progressively discharging said material into said chamber in a direction normal to the movement of said carriage to thereby effect an even distribution of said material transversely of said chamber as said carriage is reciprocated back and forth, and means located in the lower end of said tower by which said material is discharged therefrom at a positively controlled velocity.

5. An alkali cellulose aging apparatus as defined by claim 1 in which said distributor means comprises a pair of spiral screws.

6. An alkali cellulose aging apparatus as defined by claim 5 in which said pair of spiral screws are disposed in a casing having a pair of oppositely extending transverse material delivery slots which progressively increase in width outwardly from said conveyor.

7. An alkali cellulose aging apparatus as defined by claim 1 in which said distributor means comprises a pair of aligned transversely extending oppositely driven delivery belts which are disposed within a casing having a pair of oppositely extending material delivery slots which progressively increase in width outwardly from said conveyor.

8. An alkali cellulose aging apparatus as defined by claim 7 in which said casing is provided with a plurality of fixed stationary obliquely disposed deflectors which are disposed over said delivery belts in close proximity to the upper surfaces thereof and which progressively increase in length in accordance with the distance thereof outwardly from said conveyor.

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