Feb. 17, 1959 K. G. LYTTON 2,873,483

FIBER TINTER

Filed Jan. 8, 1954 2 Sheets-Sheet 1

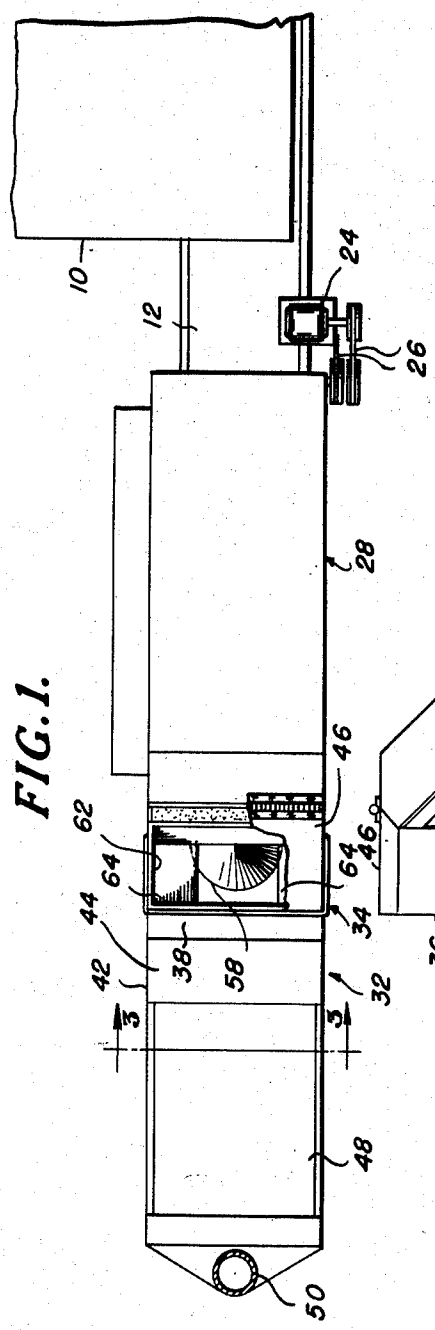

FIG. 1.

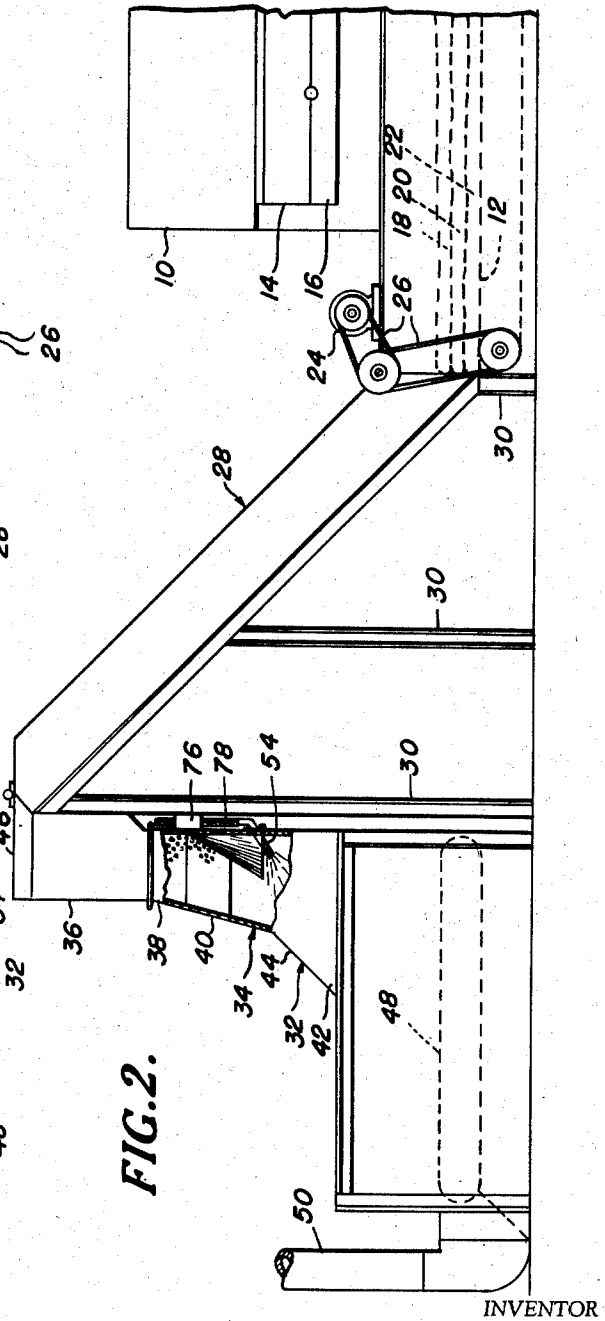

FIG. 2.

INVENTOR
Kenneth G. Lytton

BY Cushman, Darby & Cushman
ATTORNEYS

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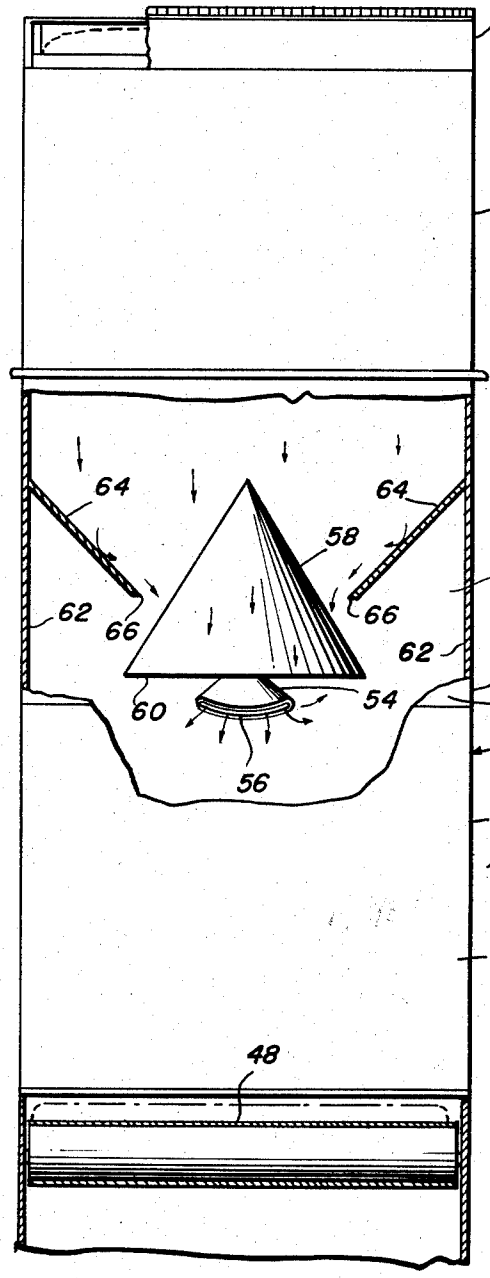

FIG. 3.

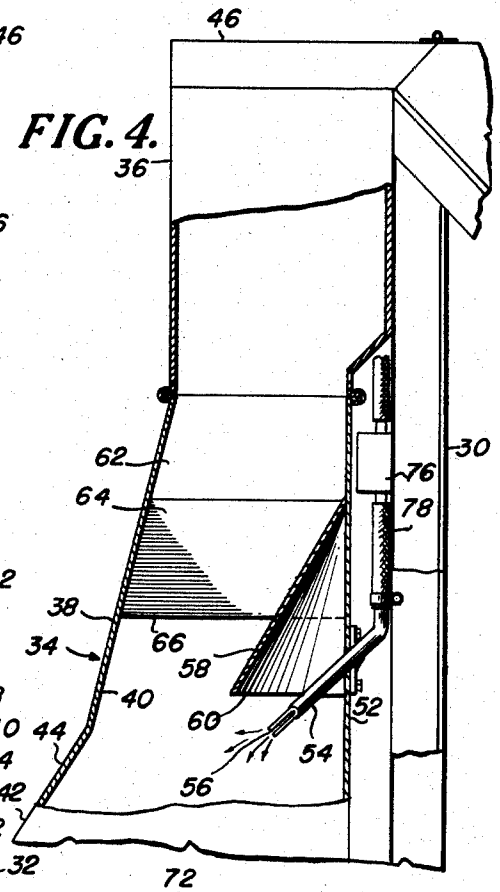

FIG. 4.

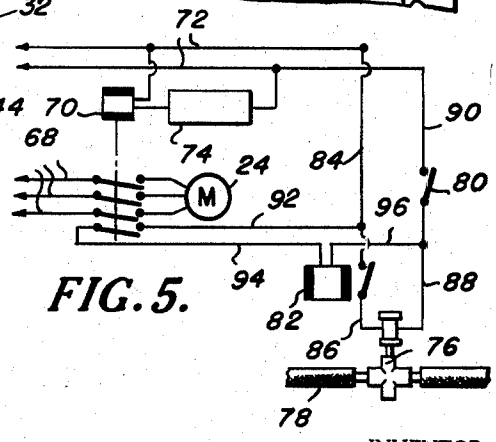

FIG. 5.

INVENTOR

Kenneth G. Lytton

BY Cushman, Darby & Cushman

ATTORNEYS

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2,873,483

FIBER TINTER

Kenneth G. Lytton, Gastonia, N. C., assignor to Fiber Controls Corporation, Gastonia, N. C., a corporation of North Carolina

Application January 8, 1954, Serial No. 402,981

8 Claims. (Cl. 19—66)

This invention relates to improved apparatus for tinting or coloring textile fibers for identification purposes.

In the preparation of textile fibers for processing into yarn, different types of fibers frequently are blended together for the production of yarn having particular characteristics. A blend is made by weighing out predetermined proportions of the various types of fibers which will constitute the blend, opening the fibers of each of the several weighed-out lots, and then mixing and blending all of the lots together. Numerous different types of blends may be made in a single mill, and since untreated cotton and synthetic fibers are all of substantially the same color, i. e., various shades of white, a particular blend of fibers normally cannot be identified as to its components without intensive analysis. Since ready identification of blends by mere inspection is essential, it is customary in textile mills to tint each blend a distinctive assigned color immediately following the blending operation and before further processing.

The tinting is accomplished with a fugitive dye that usually is not washed out until the blend has been made into cloth, and apparatus for so tinting or coloring a blend of fibers is known in the art as a "tinter."

The application of fugitive dyes to synthetic fibers, however, gives rise to problems. Fugitive dyes cannot be washed out readily from certain types of synthetic textile fibers if the latter become saturated with the tinting dye. Tinters presently in use frequently permit various portions of the synthetic fibers to become so saturated, with the result that the fibers become what is known in the art as "tagged," i. e., spotted with dye-saturated portions. Obviously, if a blend of fibers is so tagged, the final cloth product is permanently spotted either throughout or in parts, so that either all of the cloth must be classified as a second, or the tagged or spotted portions must be cut out of the whole cloth, with consequent monetary loss in either event.

Further, present day tinters do not always tint a blend uniformly throughout, with a consequent blotched appearance arising from large areas or portions of undyed fibers. This lack of tinting uniformity sometimes results in the production of long lengths of yarn, or whole bobbins of the same, that are undyed and cannot be identified readily.

Accordingly, it is an object of this invention to provide an improved tinter which will apply a dye uniformly throughout a blend of textile fibers.

It is another object of this invention to provide an improved tinter which will not tag the fibers.

It is another object of this invention to provide an improved textile tinter of relatively simple design, with consequent economies of manufacture and ease of operation.

Other objects and advantages of the invention will become apparent from the following description and accompanying drawings, in which:

Figure 1 is a plan view of a tinter for textile fibers embodying this invention and showing the same installed in a production line. The tinter cover is shown removed for better illustration of details.

Figure 2 is a front elevational view of the apparatus shown in Figure 1, with parts broken away to show details.

Figure 3 is an enlarged vertical sectional view taken substantially on line 3—3 of Figure 1, with portions of the tinting enclosure broken away to illustrate details.

Figure 4 is an enlarged fragmentary elevational view of a portion of the apparatus shown in Figure 1, with parts of the same being shown in vertical section in order to illustrate details.

Figure 5 is a schematic wiring diagram of the controls for the improved tinter.

Referring now to the drawings, there is shown in Figures 1 and 2 a portion of apparatus for proportioning out different types of textile fibers and blending them together. This apparatus is disclosed more in detail in the copending application of Lytton et al., Serial No. 348,406, filed April 13, 1953, to which reference is made for a better understanding of the same. It is sufficient to state here that the apparatus comprises a plurality of individual fiber feeding machines **10**, one for each separate type of fibers to be blended. These feeders are commonly known in the art as "hopper feeders" and only a portion of one of these feeders **10** is shown in the drawings. The feeders **10** are arranged in a line along an endless belt collecting conveyor **12** for discharging the different fibers from each feeder **10** thereonto. Beneath the discharge opening of each feeder **10** is a weigh pan **14** that is supported on a scale beam (not shown) and has bottom dumping doors **16**.

In operation of the proportioning apparatus each feeder runs and discharges opened fibers into its weigh pan **14** until a predetermined weight of fibers has been collected therein, at which time the discharge of fibers into the pan ceases. The dumping of the weigh pans **14** of the several feeders **10**, by opening the dumping doors **16**, is coordinated with the movement of the horizontal conveyor **12**, so that the load of fibers dumped from each weigh pan substantially coextensively overlies a load previously deposited on the conveyor from an adjacent upstream feeder. Hence, a sandwich comprising stacked layers of the different types of fibers is built up on the conveyor **12**, as indicated at **18**, **20**, and **22** in Figure 2. The conveyor **12** may be driven by an electric motor **24** mounted at any appropriate or convenient location and having a belt or chain drive **26** to one of the conveyor end rollers. In Figure 2 of the drawings, the conveyor motor **24** is shown as being mounted above the discharge end of the conveyor **12**.

The sandwiched fibers **18**, **20**, and **22** are fed by the conveyor **12** in a continuous and uninterrupted stream directly into a machine **28** for mixing or blending the fibers. This machine may comprise a beater type of blender, such as a superior cleaner, that is well known in the art, or any other appropriate type of fiber blending machine. In this instance, the blender **28** is supported in an inclined position on posts **30** so that the fibers are carried upwardly therethrough and thoroughly mixed and opened still further by the beaters therein before being discharged from the upper end of the blender. This machine **28** is conventional in the art, so a detailed description thereof is unnecessary here.

In the operation of the proportioning and blending apparatus, the blender **28** is driven independently of the conveyor **12**, by any appropriate means, such as an electric motor (not shown). The blender **28** runs continuously during the operation of the apparatus, while the conveyor **12** may halt at various intervals, and at the end

of a run or when the apparatus is shut down, the blender is kept running, even after the conveyor has been stopped, until all the fibers therein have been processed thereby and discharged therefrom.

From the upper end of the blender 28, the blend of fully-opened fibers is discharged into the upper end of a tinter 32 embodying this invention. The tinter 32 includes a vertically-disposed tubular enclosure 34 which is substantially rectangular in horizontal section and of substantially the same width as the blender 28, as best shown in Figure 1. The enclosure 34 consists of an upper section 36 of substantially uniform horizontal dimensions, an intermediate section 38 having a front wall 40 which is inclined outwardly and downwardly, and a lower section 42 having a front wall 44 which is inclined outwardly and downwardly at a somewhat greater angle of inclination than the front wall 40 of the intermediate section. Preferably, a hinged cover 46 overlies both the upper section 36 and the discharge outlet of the blender 28. As the fibers fall downwardly through this tinting enclosure 34 they have a fugitive dye applied thereto, as will be described in more detail hereinafter, and land on a relatively short endless-belt horizontal conveyor 48. This conveyor 48 may conduct the fibers directly to a picker (not shown) or, as shown in the drawings, to a suction duct 50 which may convey the fibers to a storage bin (not shown) or to a picker.

Projecting into the tinting enclosure 34 from the back wall 52 of the intermediate section 38 thereof is a downwardly-inclined spray nozzle 54, desirably of an atomizing type, constructed to discharge a fan-shaped spray of a fugitive dye. Preferably, the spray is in the form of a fine mist, so that no large droplets of the dye will cause tagging of the textile fibers. In order to prevent the descending fibers from collecting on the nozzle 54 or passing too close to its discharge orifice 56, both of which instances might cause tagging of the fibers, a shield 58 is secured to the back wall 52 of the tinting enclosure 34 in position to completely overlie or overhang the nozzle 54. This shield 58 is formed as a vertical segment of a cone, so that the shield tapers upwardly to an apex and has a smooth steeply-inclined exterior surface on which fibers cannot collect. The shield 58, at its lower edge 60, projects a considerable distance into the enclosure 34 so that the space between this lower edge and the front wall 40 of the intermediate section 38 is relatively narrow. The lower edge 58 of the shield is spaced from the discharge orifice 56 of the nozzle, and the fan-shaped spray from the latter attains its fully atomized or mist-like state as it passes outwardly beyond the lower edge of the shield. It further will be seen that the downward inclination of the nozzle 54 and the positioning of its discharge orifice 56 below the lower edge 60 of the shield precludes the spray from contacting the latter, to prevent the possibility of droplets of the dye collecting on and wetting the lower edge 60.

It will be noted that the tinting enclosure 34 is somewhat transversely elongated. Hence, in order to insure that all of the descending fibers are contacted by the dye spray, each of the two side walls 62 of the tinting enclosure 34 is provided with a downwardly-inclined generally rectangular deflector plate 64 extending from the front to the back wall of the enclosure. These plates 64 are located in the intermediate section 38 of the tinting enclosure 34 with their lower edges 66 positioned somewhat above the lower edge 60 of the nozzle shield. The lower edges 66 of the deflector plates 64, however, are disposed in spaced relation to the conical outer surface of the shield 58, so that falling fibers are deflected into contact with the latter and tend to balloon out somewhat as they pass by the lower edge 60 of the shield. Thus, the spray impinges directly on and into a relatively-thin curtain-like stream of fully-opened descending fibers, without contact with any of the structural parts of the tinter. By this arrangement the fibers do not become very wet with the dye and, therefore, do not tend to adhere to any surfaces they may contact. It also will be noted that, because the front wall 44 of the lower section 42 of the tinting enclosure 34 is inclined outwardly and downwardly at a relatively large angle from the level of the discharge orifice 56 of the nozzle 54, any tendency of the velocity of the spray to move the slightly-dampened fibers into adhering contact with such front wall is precluded.

When the thus-tinted fibers fall onto the conveyor 48, they are substantially uniformly and evenly tinted throughout, with no blotchy condition and no tagged spots. It has been found in actual practice that fibers tinted by this apparatus need not have forced drying, i. e., drying heat applied thereto, before further processing, and that the short length of time that they remain on the conveyor 48 is sufficient for the dye to dry completely.

As has been stated above, the blender 28 runs continuously, while the collecting conveyor 12 beneath the fiber-feeding machines 10 may occasionally stop during the proportioning operation. Further, the conveyor 12 is stopped at the end of a run before the blender 28 is stopped. It is highly undesirable to permit the discharge of a dye spray in the tinting enclosure 34 when there are no fibers falling downwardly therethrough. Were such a spray permitted in the absence of fibers, the spray would tend to collect on the side 62 and front walls 40 and 44 of the tinting enclosure, and also on the lower conveyor 48, to thus form wet spots which would tag fibers subsequently put through the tinter. Accordingly, the operation of the spray nozzle 54 is desirably coordinated with the proportioning and blending apparatus, so that a dye spray will be discharged only when fibers are falling through the tinting enclosure 34. Hence, means are provided to delay the commencement of the spray, when the apparatus is started up, until fibers commence to pass through the tinter 32. Spray control means for accomplishing this result are shown in Figure 5.

The conveyor motor 24 is conventionally supplied with three-phase, e. g., 550 volts, from three conductors 68, and the motor is controlled by a motor-control relay 70 having three sets of normally-open contacts interposed between the conductors 68 and the motor 24. The energizing coil of the motor control relay 70 is supplied with power, e. g., 110 volts A. C., from two conductors 72. Interposed between the energizing coil of the motor-control relay 70 and one of the conductors 72 are appropriate control switches 74 for starting and stopping the motor 24, as disclosed more in detail in the aforementioned application. The supply of dye to the nozzle 54 is controlled by a solenoid valve 76 interposed in the supply line 78 leading to the nozzle 54 and adapted to be open when energized and closed when deenergized. The coil of the valve 76, a hand switch 80, and a set of normally-open contacts of a time-delay relay 82 are connected in a series circuit with the conductors 72 by conductors 84, 86, 88, and 90. The relay 82 is of a type which delays both the opening and the closing of its contacts on deenergization and energization, respectively, of its coil. The motor-control relay 70 is provided with a fourth set of normally-open contacts, and these contacts, together with the hand switch 80 and the coil of the time-delay relay 82, are connected in series with the two conductors 72 by conductors 84, 92, 94, 96, 88, and 90. The time-delay relay 82 is set to delay closing its contacts on energization of its coil for a time interval equal to that necessary for fibers to travel from the discharge end of the collecting conveyor 12, through the blender 28, and into the tinter 32. The relay is also set for the same time-delay interval for opening its contacts on deenergization of its coil.

From the foregoing, it will be seen that, when the

conveyor motor **24** is started, with a sandwich of fibers on the conveyor **12** but no fibers in the continuously-running blender **28**, all of the contacts of the motor-control relay **70** close, thus simultaneously energizing the time-delay relay **82**. Thereupon, fibers will be fed in a continuous stream from the conveyor **12** into the blender **28** and will travel therethrough and be discharged into the tinter **32**. The solenoid valve **76** will not be energized to permit the discharge of a spray from the nozzle **54**, however, until the contacts of the time-delay relay **82** are closed, and these will not close, upon energization of the relay **82** simultaneously with the starting of the conveyor motor **24**, until after the time interval necessary for fibers to pass through the blender **28** and start their passage into the tinter **32**. Similarly, when the conveyor motor **24** is deenergized at any time to thus stop the conveyor **12** but the blender **28** continues to run and discharge fibers into the tinter **32**, the contacts of the time-delay relay **82** will not be opened, to thereby deenergize the solenoid valve **76** and stop the flow of dye to the nozzle **54**, until after a time interval equal to that necessary for the blender **28** to process the fibers therein and discharge them into the tinter **32**.

It will thus be seen that the objects of this invention have been fully and effectively accomplished. It will be realized, however, that the specific embodiment of this invention shown and described to illustrate the principles thereof is suceptible of change without departure from such principles. Accordingly, this invention includes all modifications encompassed within the spirit and scope of the following claims.

I claim:

1. Apparatus for tinting opened textile fibers comprising: nozzle means mounted for emitting a generally outwardly-directed sheet-like spray of finely-divided dye; shield means overlying said nozzle means, tapering upwardly to an apex, and provided with an uninterrupted smooth upper surface, whereby fibers falling onto said shield means do not collect thereon, the lower peripheral edge of said shield means being spaced radially outwardly from said nozzle means and above the sheet-like spray issuing therefrom; and means confining fibers for uninterrupted fall in a curtain-like stream past said lower edge of said shield means, the velocity of said spray being insufficient to carry the fibers against said confining means.

2. Apparatus for tinting opened textile fibers comprising: a vertically disposed tubular enclosure adapted to have fibers fall downwardly therethrough; an atomizing nozzle projecting into said enclosure from a side wall thereof for spraying a dye onto the falling fibers without carrying the latter against the other side walls of said enclosure; and steeply-upwardly-tapering shield means secured to said side wall, overhanging said nozzle, and having an unobstructed smooth upper surface to preclude collection of fibers thereon.

3. The structure defined in claim 2 in which the shield means tapers upwardly to an apex.

4. The structure defined in claim 2 in which the upper surface of the shield means is of sectional conical configuration.

5. The structure defined in claim 2 in which the nozzle emits a sheet-like spray and including a pair of downwardly-inclined deflector plates secured to opposite interior side walls of the enclosure above the bottom edge and on opposite sides of the shield means to constrict the downward flow of fibers past said shield means bottom edge to substantially a curtain-like stream.

6. The structure defined in claim 2 in which the nozzle is downwardly inclined and the side wall of the enclosure opposite the nozzle-bearing wall thereof inclines outwardly and downwardly from the level of the nozzle to preclude contact therewith by wetted fibers.

7. In apparatus for tinting opened textile fibers wherein intermittently-operating conveyor means feeds a continuous stream of fibers thereon into continuosuly-operating fiber blending means which discharges the blended fibers into a tinting enclosure having a nozzle therein for spraying a dye onto the fibers, the combination comprising: means for controlling the supply of dye to the nozzle; means coordinated with the conveyor means for operating said controlling means to supply dye to said nozzle when the conveyor means is moving and for discontinuing said supply when the conveyor means is stopped; and time-delay means associated with said coordinated means for delaying the dye supply on the starting of the conveyor means, until the stream of fibers therefrom has reached the tinting enclosure and for delaying the discontinuance of said dye supply on the stopping of the conveyor means until all the fibers in transit between the conveyor means and the tinting enclosure have been discharged into the latter.

8. The structure defined in claim 7 wherein the conveyor means is driven by an electric motor, the controlling means comprises a solenoid valve, the coordinated means comprises an electric circuit associated with said motor and including said valve, and the time-delay means comprises a time-delay relay controlling said circuit.

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