

Dec. 7, 1926.

1,609,376

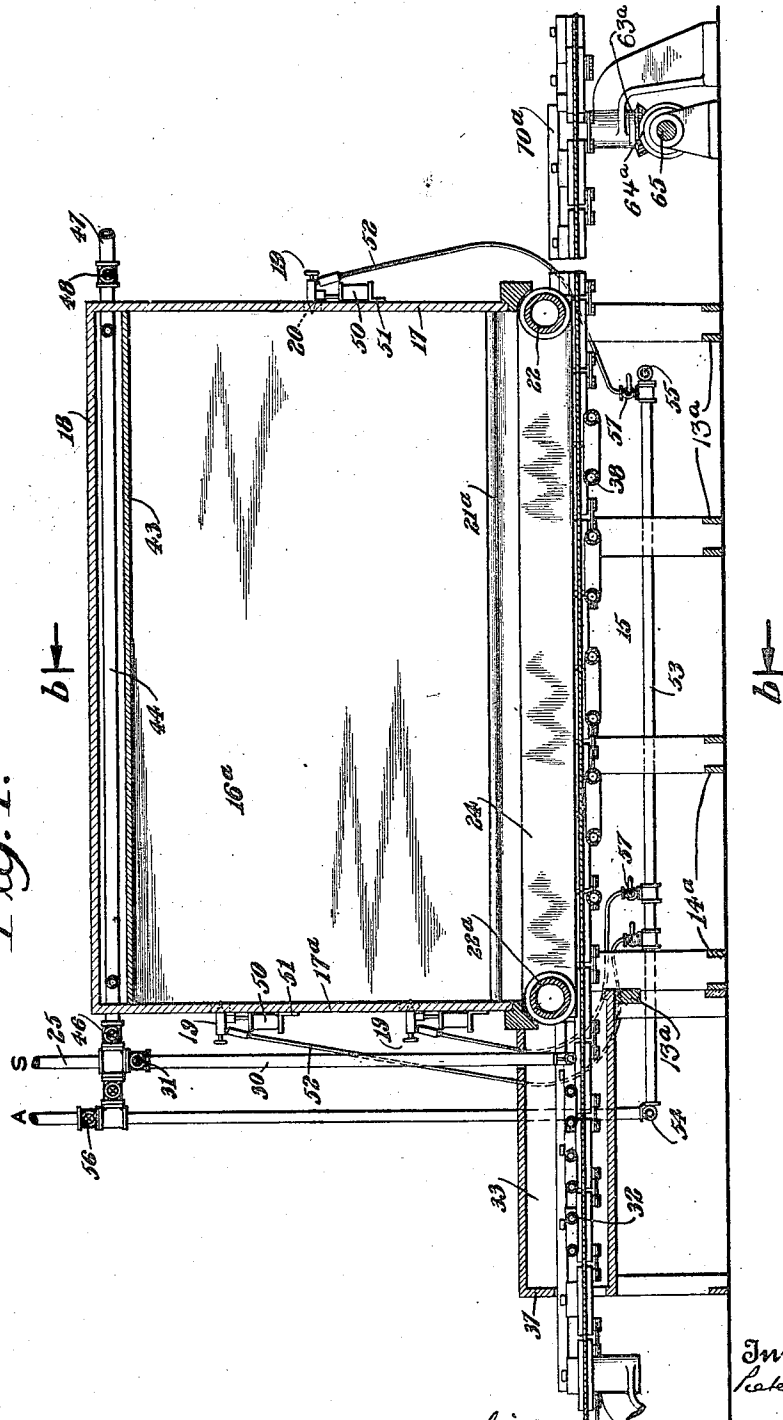
P. MIJER

PROCESS OF AND APPARATUS FOR DYEING TEXTILE FABRICS

Filed July 16, 1924

3 Sheets-Sheet 1

Fig. 1.



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3 Sheets-Sheet 2

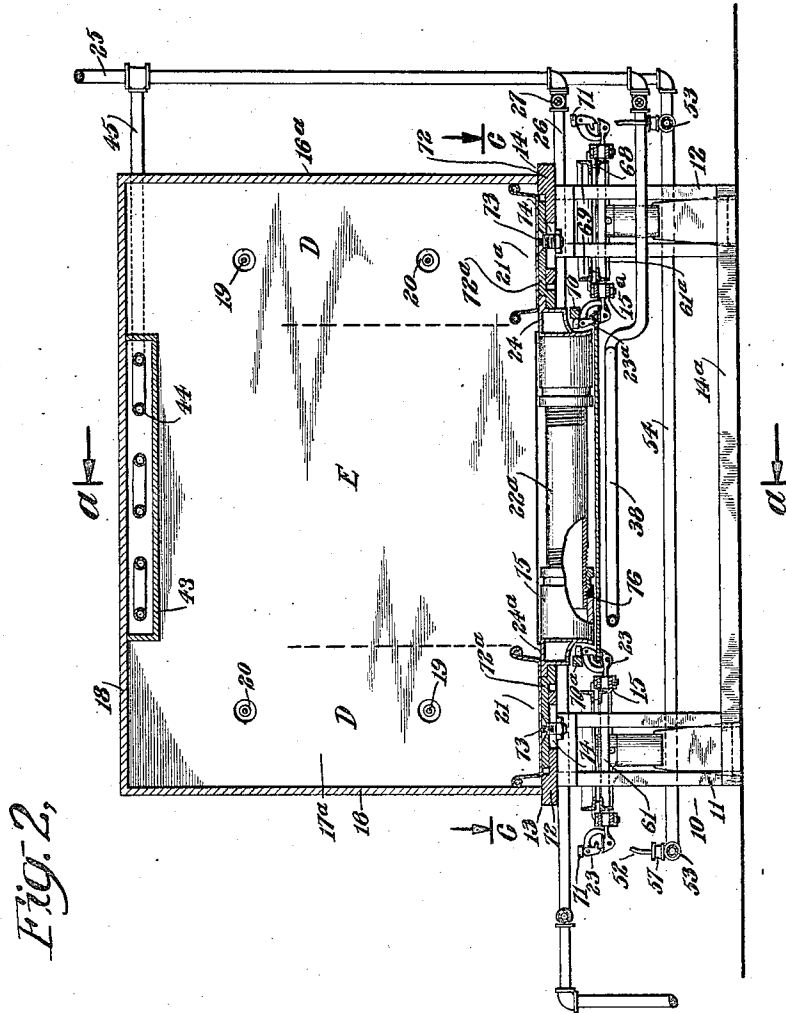


Fig. 2,

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3 Sheets-Sheet 3

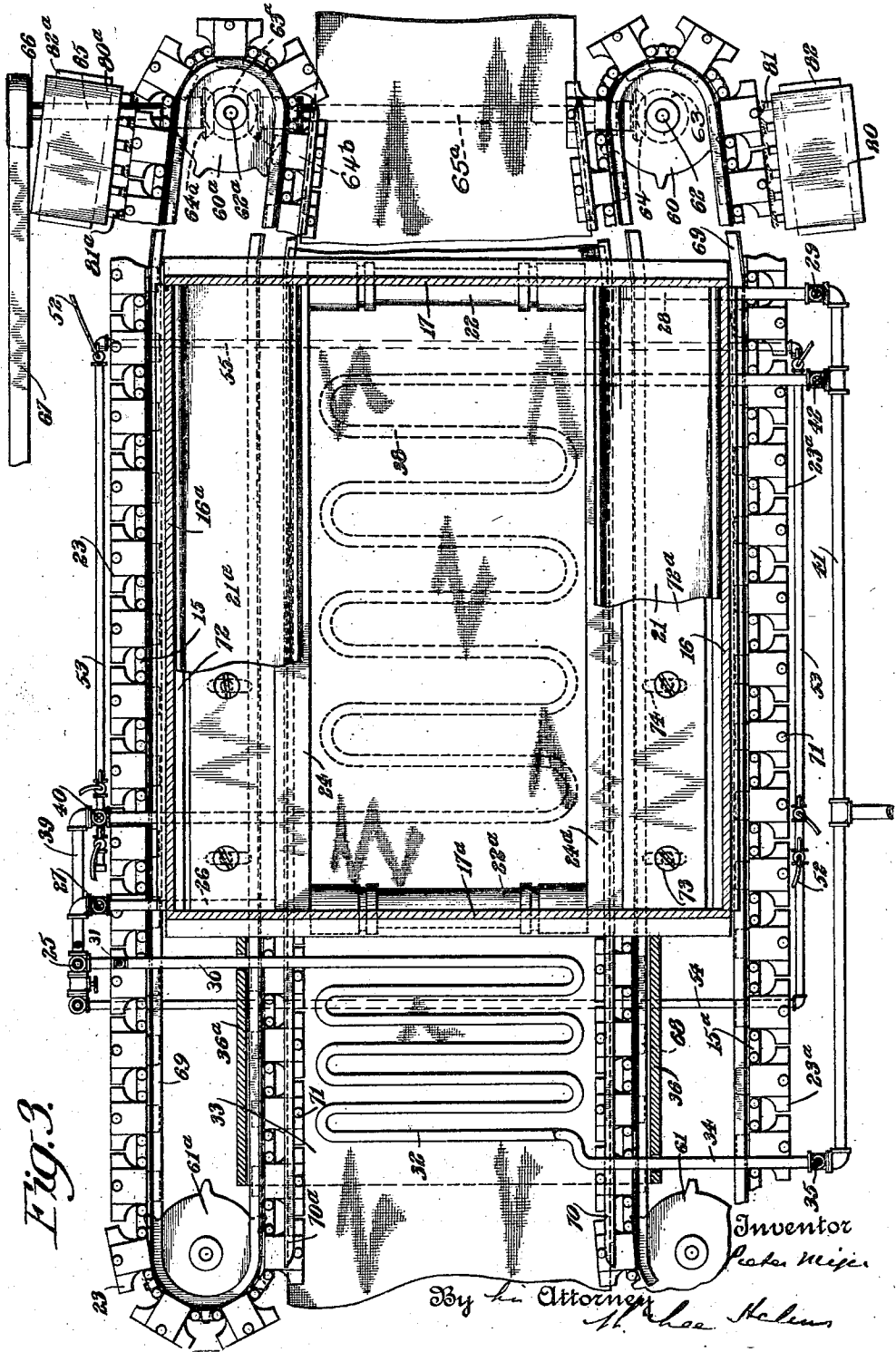


Fig. 3.

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UNITED STATES PATENT OFFICE.

PIETER MIJER, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE TWO-TONE CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

PROCESS OF AND APPARATUS FOR DYEING TEXTILE FABRICS.

Application filed July 16, 1924. Serial No. 726,249.

This invention relates to an improved process for dyeing or coloring fabrics such as textile fabrics, or for dyeing or coloring any other articles, and relates more particularly to an improved process of dyeing materials or articles preferably in the form of a continuous web, such as continuous pieces of ribbons, silk, cotton, linen and the like; the process is also applicable to the coating of articles or materials with liquids of all classes and descriptions.

The invention also relates to improved apparatus for dyeing or coloring materials or articles, and more particularly to an improved apparatus for dyeing textile materials; the invention also relates to apparatus for uniformly coating webs of fabric or for uniformly coating articles.

Among the objects of the invention is to provide a process and apparatus for substantially uniformly dyeing a textile fabric either on one or both sides thereof, either with the same color or with different tones of the same color, or with different colors, while substantially uniformly stretching the fabric or substantially uniformly holding the fabric against shrinkage.

Another object of the invention is to provide an apparatus which will continuously and uniformly dye a permeable textile fabric web on one side thereof or on both sides thereof with different colors or with different tones of the same color, while holding the fabric web stretched or while holding the fabric web against substantial shrinkage, or while holding the fabric web substantially flat.

Further objects of the invention will be apparent from the following description of the preferred form of the process and preferred embodiment of the apparatus which is illustrated in the accompanying drawings. In said drawings Fig. 1 is a part section and part elevation along the line *a-a* of Fig. 2, said figure being partly diagrammatic;

Fig. 2 is an elevation of the machine taken along the line *b-b* of Fig. 1;

Fig. 3 is a sectional plan of the machine taken along the line *c-c* of Fig. 2.

In accordance with the preferred embodiment of my invention, I move the substantially "dry" web of material in contact with a cloud or body of fine particles of liquid dye, preferably made by atomizing the liquid dye to form extremely small particles

thereof, and while moving said material in contact with said cloud I maintain said material stretched, or I maintain said material against shrinkage, or I maintain said material substantially flat.

The apparatus described herein resembles that set forth in my copending application Serial No. 723166 filed June 30th, 1924, but instead of employing the traversing means described in said application, I employ mechanism of the class known as tentering frames for traversing the material in contact with the dye. This permits of using the process in connection with certain classes of textile fabrics which tend to shrink during treatment in the dye chamber, as for example, certain grades of crepe de chine. Such tentering frames are well-known in the art, and any frame capable of holding the material flat while traversing it may be employed.

Referring to the drawings, 10 represents a frame comprising two frame members 11 and 12 supporting tables 13 and 14, said frame members 11 and 12 are connected together by cross-bars 13^a and 14^a. The clip chains 15, 15^a of the tenter frame run above said bars 13^a and 14^a and serve to traverse the fabric in the manner hereinafter more particularly described. The dye chamber consisting of the longitudinal walls 16, 16^a, transverse walls 17, 17^a and roof 18 are supported upon said frames 11 and 12 as illustrated, and a plurality of atomizing means here shown in the form of well-known air-brushes 19 are mounted in the transverse walls 17, 17^a of the dye chamber, and in proximity with the longitudinal walls 16, 16^a thereof, with their nozzles substantially parallel with the length of the material; beneath the air-brushes 19 which project into the chamber through openings 20 in the walls 17, 17^a, I provide troughs 21, 21^a which catch any drops or large particles which fall from the nozzles. In accordance with one feature of the present invention, means are provided for preventing liquid particles which collect on the walls 17, 17^a from falling on the material as it passes into and out of the dye chamber, and to this end the lower portion of said walls terminate in steam pipes 22, 22^a, which receive such drops and evaporate them. Furthermore, in accordance with the invention, to prevent particles of liquid coloring matter falling upon the

clips forming drops thereon, and causing a spotting or streaking of the material at the edges thereof, I provide means for protecting the tentering frame mechanism from the action of the cloud. More specifically, I provide shields which cover the clips of the tentering frame as they pass through the dye chamber, and to avoid the formation of drops of the coloring matter upon these clips I provide means to heat said shields.

Referring to Fig. 2, it will be seen that above the clips 23, 23^a of the tentering frame I have provided a pair of members 24 which are heated preferably by means of steam passed through the interior thereof and disposed in position to shield the clips 23 from the deposition of particles thereon. Any liquid particles falling on the shields 24, 24^a are immediately evaporated; said shields 24, 24^a also serve to heat the clips as they pass through the apparatus, so that should any particles find their way on to the clips they will be evaporated on the surface of the clips and will not form drops thereon.

In the form of the invention herein described the aforesaid means for protecting the tentering mechanism against deposition of color thereon are in the form of longitudinal steam-boxes and are connected at each end with the transverse steam pipes 22, 22^a. Member 24 is connected to the steam pipe 25 by pipe 26 controlled by cock 27; member 24^a is connected to steam pipe 28 controlled by cock 29; main steam pipe 25 is connected by pipe 30 controlled by cock 31 with a coil 32 located in drying chamber 33, said coil being positioned above the path of the material but near the surface thereof, and having a steam outlet 34 controlled by cock 35. It will be noted that the drying chamber comprises a box consisting of the longitudinal walls 36, 36^a transverse walls 37 suitably slotted to permit the passage of the fabric and the tenter chains therethrough; heating coil 38 connected by pipe 39 to main steam pipe 25 and controlled by cock 40 may serve to heat the under surface of the fabric as it passes through the dye chamber and said coil is connected with steam outlet 41 and controlled by cock 42. In some cases this coil 38 may be in actual contact with the fabric as it passes through the dye chamber. I may provide that portion of the roof which overhangs the path of the fabric as it passes through the apparatus with a false roof 43 heated by steam coil 44 connected by pipe 45 with main steam pipe 25, said connection being controlled by cock 46 said coil having an outlet 47 controlled by cock 48.

The atomizing means here shown which have given excellent results in practice are the so-called Wold air-brush model X-7 made by the Wold Air Brush Mfg. Co., of Chi-

cago, Ill. These brushes are adjusted to a point where they produce a stream of extremely fine particles of coloring matter in suspension which in turn forms a cloud within the dye chamber. The liquid inlet 49 of the air-brush is connected to dye tank 50 mounted on shelf 51 on the outside of the transverse walls. The flexible conduits 52 of the brushes are connected with the main air manifolds 53 located one on each side of the dye chamber and these air manifolds are connected together under the chamber by pipe 54 and by pipe 55 with a source of compressed air, liquid carbonic acid gas or other fluid pressure medium. The supply of the fluid pressure medium to the manifold 53 is controlled by the cock 56, and the supply of pressure medium to each individual air-brush is controlled by individual cocks 57 mounted on the manifolds and located in the connections between the manifolds and the air pipes 52. As already stated, the fabric is traversed through the dye chamber and the drying chamber by means of the well-known tenter frame mechanism or tentering mechanism here illustrated diagrammatically, the construction and operation of such mechanism being well-known to those skilled in the art. Briefly stated, such mechanism holds the fabric evenly along its edges and maintains it flat and without the formation of wrinkles thereon; the tentering mechanism can be adjusted either to stretch the fabric substantially or slightly, or to hold the fabric against shrinkage, as may be desired, and will be operated at speeds considerably lower than those at which such mechanism usually operates, this depending upon the length of the dye chamber and the number of brushes therein contained.

Since the specific tentering machine shown is in itself no part of the present invention, I have herein described and illustrated only those parts thereof which are necessary for an understanding of how the tentering mechanism is combined with the dye chamber, without any structural change in said mechanism.

Referring to Fig. 3, it will be noted that two sets of tentering clips 23, 23^a are respectively connected to constitute two endless chains passing over sprocket wheels 60, 60^a at the entering end, and sprocket wheels 61, 61^a at the exit end. Sprocket wheels 60, 60^a, are mounted on shafts 62, 62^a, carrying bevel pinions 63, 63^a, on the lower ends thereof. Drive shaft 65 driven by belt 67 passing over pulley 66 at one end thereof carries bevel pinion 64^a meshing with bevel pinion 63^a, which pinion 63^a also meshes with bevel pinion 64^b mounted on drive shaft 65^a and bearing at its other end bevel pinion 64 meshing with bevel pinion 63. The clips 23, 23^a are guided in a determined

path by means of lips 68 engaging the guide bars 69 constituting the usual raceway, and pass through the dye chamber along parallel lines. Said guide bars, however, are formed to provide approaching paths to the clips at the entering end of the machine; that is to say, the clips 23 first approach the clips 23^a, but are thereafter moved away from said clips 23^a, and said clips 23, 23^a maintain parallel alignment as they pass through the dye chamber. Machines of this character are provided with suitable cam means for opening and closing the clips, and I have here diagrammatically illustrated a conventional form of cam member which consists of the bars 70, 70^a. These bars act upon the jaws of the clips, which are normally spring-pressed to open position, and when the cam rollers 71 on said clips ride over the cam bars, said clips are forced into closed position. The fabric enters the jaws of the clips when they are in open position, and when they pass into the machine the bars 70, 70^a close the jaws; the diverging path of the guides at the entering end of the machine causes the jaws to commence stretching the fabric once they take hold of the fabric, and the fabric is held throughout the dyeing operation.

It is customary in machines of this character to provide means for varying the stretching effect by causing relative movement between the endless chains of clips. I have not described and illustrated this well-known adjusting means herein, but I have provided means in the apparatus for adjusting the parts in accordance with the adjustment of the tentering frame clips. These means provide for the adjustment of the steam-boxes 24, 24^a towards or away from one another in accordance with the adjustment of the clips, and the corresponding lengthening or shortening of the transverse steam pipes 22, 22^a. The adjustment of the steam box 24 is effected owing to the fact that table 13 is made in two parts 72, 72^a connected together by bolts 73 engaging in elongated slots 74 (see Fig. 3). This permits of extending or decreasing the area of the table, and thereby changing the position of the longitudinal steam boxes 24, 24^a. Transverse steam pipes 22, 22^a can be adjusted to increase or decrease their length transversely of the fabric owing to the fact that the ends of each of said pipes are connected with the longitudinal steam boxes 24, 24^a, through the intermediary of sockets 75, the outer ends of which are provided with steam-tight gaskets 76 adapted to prevent escape of steam in the joint between the pipe and the socket.

It will be obvious from the above description that lateral adjustments may be made of the aforesaid steam boxes and transverse steam pipes to fit the machine for operation

with different kinds of fabric and different adjustments of the tentering frame.

Operation of apparatus.—The fluid medium is supplied at constant pressure to the air-brushes which draw the dye in liquid form from the containers 50 and form a color cloud. The air-brush is regulated so as to produce a stream of extremely minute particles held in suspension in the air. With some or all of the brushes in operation depending upon the depth of color required a cloud soon forms in the apparatus. It is preferable to prevent this cloud from passing out of the apparatus by closing the opening between the two sets of clips, as by first feeding muslin into the machine to be followed later by the silk when the machine is ready for operation. Steam is supplied to the transverse pipes 22, 22^a and to members 24, 24^a and said members are maintained "hot" during the running of the apparatus. When the cloud has reached the desired density, the tentering frame mechanism is started in operation and the clips thereof draw the fabric through the dye chamber and the drying chamber at the desired speed; as the material passes through the settling zone E of the dye chamber it colors it on one side thereof, the spray being controlled as to the size of the liquid particle therein, so that said liquid particles will not entirely penetrate through the silk by the time it has passed from one end of the dye chamber to the other. Coil 38 assists in checking the penetration by heating the material, and coil 32 dries the fabric as it passes through the drying chamber.

It is to be noted that the cloud forms in front of the air-brush spray, and that no portion of this air-brush spray is located directly above the fabric so that any large particles, drops or particles of solid matter which may drop from the air-brush spray by gravity do not drop on the fabric itself, but drop to one side thereof. A cloud is continuously formed by the battery of air-brushes, and continuously depleted of color which settles by gravity on to the material as it moves across the bottom of the material. The particles and drops which settle or fall in the zone D—D in proximity with the air-brushes collect in the troughs 21, 21^a. Owing to the fact that the tenter frame holds the material substantially flat (with or without actual stretching, as desired) it cannot shrink and form wrinkles which may result in too uneven a coloration. While the combination of my dyeing mechanism with the tenter frame is extremely valuable for traversing silk such as crepe de chine, it is also valuable for all fabrics since no creases are formed during the exposure of the fabric to the color cloud. The invention may be employed to carry out the processes of my prior applications Serial No. 692,762 filed

February 14th, 1924, Serial No. 723,166 filed June 30th, 1924, and Serial No. 724,262 filed July 5th, 1924.

It will be obvious that after the material has been colored on one side thereof it can be turned over and colored on the other side thereof either by changing the color cloud in the apparatus herein illustrated, or by passing it through a second apparatus substantially similar to the apparatus herein illustrated.

In some cases I may dispense with the heating members 24, 24^a and expose the clips directly to the action of the cloud by preliminary heating of the clips before they pass into the chamber, so that any particles falling on them are immediately evaporated. To this end I provide gas heaters 80, 80^a having burners 81, 81^a, the flames of which heat the upper surfaces of said clips as they pass towards the inlet side of the dye chamber; burners 80, 80^a are mounted upon suitable frames 82, 82^a.

While I have described the process and apparatus of the present invention with reference to a preferred embodiment thereof, it will be obvious to those skilled in the art that changes and alterations may be made without departing from the spirit of the invention and appended claims.

What I claim is:

1. The process of treating textile fabrics consisting in forming a cloud of atomized coloring matter and traversing the fabric relative to the cloud and exposing it to the action of said cloud while holding said fabric at the longitudinal edges thereof.

2. The process of coloring fabric consisting in forming a cloud of finely divided coloring matter, and traversing the material relative to said cloud and exposing it to the action of said cloud while stretching said material transversely to avoid wrinkle formation.

3. The process of coloring fabrics consisting in forming a cloud of finely divided coloring matter and traversing the fabric relative to said cloud while applying transverse tension to the material at its longitudinal edges.

4. The method of coloring fabric consisting in forming a cloud of particles of finely divided coloring matter, stretching the fabric, and traversing the fabric in stretched condition beneath said cloud and relative to said cloud while positively stretching said material transversely.

5. The method of coloring materials consisting in forming a color cloud and holding said material against shrinkage while traversing it relative to the color cloud.

6. The process of coloring textile materials which consists in forming a color cloud and traversing the material relative to said cloud while positively maintaining substan-

tially all portions of said material stretched flat transversely and longitudinally.

7. A dyeing or coloring apparatus including a source of dye liquid, means for forming a color cloud from said dye liquid in combination with a tenter frame mechanism for traversing the fabric relative to the color cloud, while exposing the fabric to said color cloud.

8. A dyeing or coloring apparatus comprising a source of dye liquid, a chamber and means for forming a color cloud from said dye liquid therein in combination with means for traversing the fabric through said chamber relative to said color cloud while stretching said fabric, and means for protecting the fabric from the effect of drops accumulating in said chamber at the edges of the fabric.

9. A dyeing or coloring apparatus comprising a source of dye liquid, means for forming a color cloud from said dye liquid in combination with means for traversing the fabric relative to the color cloud while holding the fabric to avoid shrinkage, while exposing the fabric to the color cloud.

10. A dyeing or coloring apparatus comprising a source of dye liquid, means for forming a color cloud from said dye liquid, and means for holding the longitudinal edges of said fabric and traversing it relative to the color cloud, while exposing the fabric to the color cloud.

11. A dyeing or coloring apparatus comprising a dye chamber in combination with tenter frame traversing mechanism passing through said dye chamber, and means for preventing the formation of drops on said tenter frame mechanism.

12. A dyeing or coloring apparatus comprising a dye chamber, a plurality of tenter clips traversing said dye chamber, and means for preventing the formation of drops on said clips.

13. A dyeing or coloring apparatus comprising a dye chamber, tenter frame mechanism in said dye chamber including a plurality of tenter clips, and heated members for preventing the formation of drops on said clips.

14. A dyeing or coloring apparatus comprising a source of dye liquid, a dye chamber, tenter frame mechanism in said dye chamber including a plurality of tenter clips, and means for drying said clips.

15. A dyeing or coloring apparatus comprising a source of dye liquid, a dye chamber, means for forming a color cloud in said dye chamber, tenter frame mechanism in said dye chamber including a plurality of tenter clips, and means for heating said clips.

16. A dyeing or coloring apparatus comprising a dye chamber, tenter frame mechanism in said dye chamber including a plurality of tenter clips, and means having

shield portions overlying said clips in the dye chamber.

17. A dyeing or coloring apparatus comprising a source of dye liquid, a dye chamber, means for forming a color cloud in said chamber, a drying chamber, and tenter frame mechanism for traversing the material through the dye chamber and the drying chamber.

18. A dyeing or coloring apparatus comprising a dye chamber, means for forming a color cloud therein, tenter frame means for traversing the material longitudinally relative to said color cloud, and heating means disposed both longitudinally and transversely relative to the path of the fabric through the chamber.

19. A dyeing or coloring apparatus comprising a dye chamber, means for forming a color cloud therein, means including a plurality of clips for traversing the material through the chamber, a pair of longitudinal heating members arranged above said clips and a pair of transverse heating members arranged above the fabric and below the transverse walls of said chamber.

20. A dyeing or coloring apparatus comprising a dye chamber, means for forming a color cloud therein, fabric-holding means for traversing the material longitudinally through said dye chamber relative to said color cloud while holding the material flat, heating means disposed longitudinally relative to the path of the fabric through the chamber, and means for adjusting the position of said heating means.

21. A dyeing or coloring apparatus comprising in combination with a tenter mechanism, protecting means overhanging the tenter clips of said mechanism, and means for adjusting said overhanging means.

22. A dyeing or coloring apparatus comprising a dye chamber, means for forming a color cloud therein, a tenter frame mechanism for traversing the material through the dye chamber, heating members arranged above the fabric and below the transverse walls of said chamber, and means for adjusting said heating members.

23. The process of coloring fabrics consisting in atomizing a dye liquid to form a cloud of finely divided coloring matter while separating therefrom undesired large particles or drops, and traversing the material relative to the color cloud and exposing it to the action of said cloud while holding said fabric at the longitudinal edges thereof.

24. A dyeing or coloring apparatus, including means for atomizing a dye liquid to form a cloud while separating undesired large particles or drops, and means for holding the longitudinal edges of the fabric and traversing it relative to the color cloud, while exposing the fabric to said color cloud.

25. A dyeing or coloring apparatus, including means for atomizing a dye liquid to form a cloud while separating out undesired large particles or drops and a tenter frame mechanism for traversing the fabric relative to said color cloud, while exposing the fabric to said color cloud.

26. A dyeing or coloring apparatus, comprising, a cloud chamber provided with an opening on one side thereof and means for forming a color cloud therein, in combination with traversing means for exposing the fabric to the color cloud while closing the opening in said chamber.

In testimony whereof, I have signed my name to this specification.

PIETER MIJER.