

[54] **APPARATUS FOR THE CONTINUOUS TREATMENT OF THICK, VOLUMINOUS TEXTILE MATERIALS**

[75] Inventor: **Heinz Fleissner**, Egelsbach near Frankfurt am Main, Germany

[73] Assignee: **Vepa AG**, Basel, Schweiz, Switzerland

[22] Filed: **Mar. 20, 1972**

[21] Appl. No.: **235,906**

Related U.S. Application Data

[62] Division of Ser. No. 662,084, Aug. 21, 1967, abandoned.

Foreign Application Priority Data

Aug. 20, 1966 Germany..... V 31756

[52] **U.S. Cl.**..... 68/5 E, 68/DIG. 5

[51] **Int. Cl.**..... B05c 3/12, B05c 9/14

[58] **Field of Search**..... 68/DIG. 5, 5 D, 5 E

[56] **References Cited**

UNITED STATES PATENTS

2,199,233 4/1940 Williams..... 8/151 X
2,252,181 8/1941 Hunter et al..... 34/122

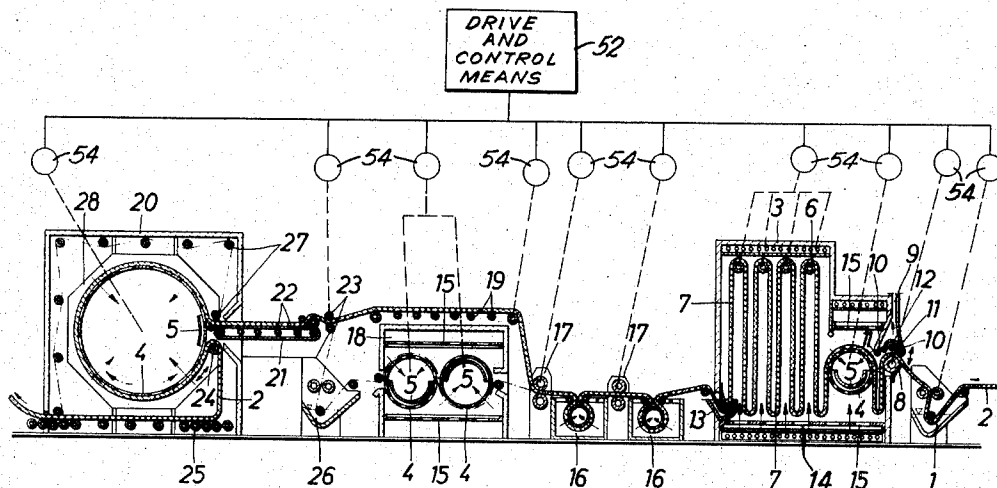
2,367,730 1/1945 Masland..... 8/151 X
2,417,916 3/1947 Dow..... 8/151 X
2,785,042 3/1957 Grajeck et al. 68/5 D X
3,124,429 3/1964 Alexeff et al. 68/5 D X
3,126,556 3/1964 Fleissner 68/DIG. 5
3,242,702 3/1966 Fleissner 68/DIG. 5

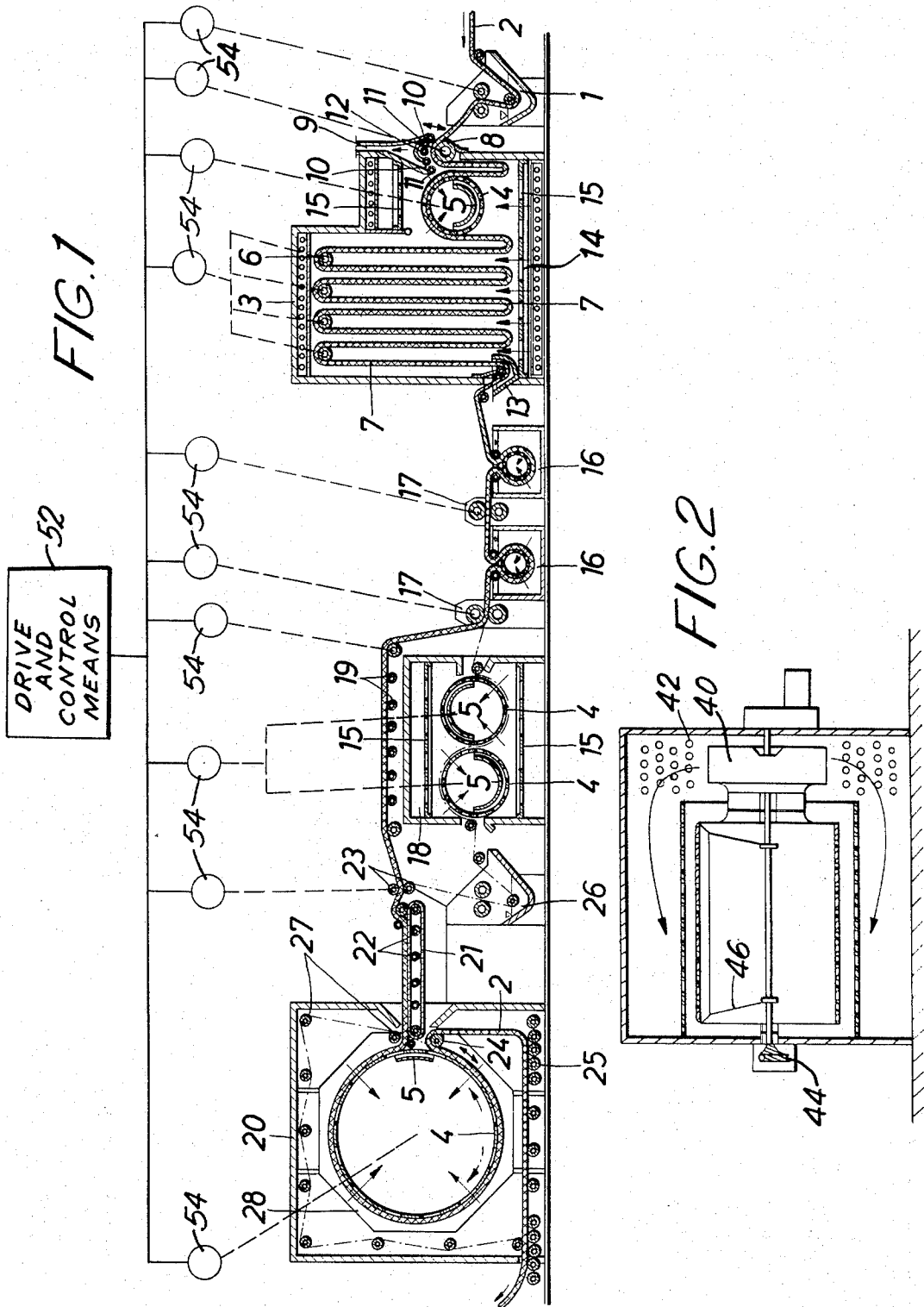
Primary Examiner—Harvey C. Hornsby
Assistant Examiner—Philip R. Coe
Attorney—Paul M. Craig, Jr. et al.

[57] **ABSTRACT**

The present disclosure relates to a process and apparatus for the treatment of thick, voluminous textile materials such as carpets, plushes, needled felts, and the like, made, for example, of wool, polyamides and polyacrylonitrile fibers. More particularly, the present disclosure is directed to a process and apparatus for dyeing or printing large widths of thick, voluminous textile materials which comprises applying the dyestuffs and auxiliary agents to the textile material, heat-treating said textile material in a heating-up zone, steam-treating the textile material to set the dyestuffs in a dwell zone, washing the textile material and drying the textile material with hot air.

30 Claims, 2 Drawing Figures





APPARATUS FOR THE CONTINUOUS TREATMENT OF THICK, VOLUMINOUS TEXTILE MATERIALS

CROSS-REFERENCE TO RELATED APPLICATION

This application is a division of application Ser. No. 662,084 filed on Aug. 21, 1967, which application is now abandoned.

BACKGROUND OF THE INVENTION

The present invention relates to an apparatus for the treatment, especially for dyeing and, or printing thick, voluminous textile materials having large widths. More particularly, the present invention is concerned with an apparatus for dyeing and, or printing textile materials such as carpets, plushes and needled felts, made, for example of wool and synthetic fibers.

Carpet floor-coverings made from synthetic materials such as texturized polyamide fibers, are becoming increasingly important. Because of their easy cleaning feature this type of carpet floor-covering is being frequently used not only in private homes but also in hotels, schools, offices and hospitals. Carpets of such fibers are mainly dyed discontinuously in winch becks. A decisive disadvantage of dyeing in winch becks is that (1) the sizes of the lots are limited, and furthermore there are always (2) shade differences between the individual lots. This renders the covering of large rooms very difficult. Another problem encountered when dyeing in winch becks is the utilization of the remaining portion of the dye. The remainders of various dyeing batches cannot be used for one room without the color differences being readily apparent.

Needled felt made of polyamide fibers has gained great importance for floor-coverings. Up to now this material must be dyed in flock and then needled to the backing. Due to the fact that the flock has to be separately dyed together with the required subsequent needling of the dyed flock, the delivery times are rather long. In order to work economically large metrages have to be produced which are usually not required in one and the same shade. The same problems are confronted with carpet materials and plushes of polyacrylonitrile fibers and wool. With a continuous dyeing method any metrage can be effectively dyed. A continuous dyeing of needled felts is most economical for the producer because the raw white or blended flock can be needled to the backing, so that on short notice and depending on the order situation the desired shades can be dyed continuously and then the needled felt can be bonded with synthetic resin dispersions. However, with continuous dyeing a number of difficulties have to be overcome. Carpet floor-covering generally has widths of up to about 6 m. The shade must be level over the entire working width. Furthermore, the dyed piece must not show stripes and must be fast. In order to keep the price and the length of the plant within reasonable limits, (3) it is necessary to keep the individual treatment times as short as possible. Since carpet materials are thick and voluminous, it is extremely difficult to heat them up rapidly and uniformly. Also, washing and drying of such materials are frequently difficult. It is imperative that there is an (4) intimate contact between the treatment medium and the textiles during steaming and, or dyestuff setting, as well as during washing, drying and curing. Because of these exacting requirements it is understandable that continuous dye-

ing methods and plants which are properly functioning do not exist.

SUMMARY OF THE INVENTION

An object of the present invention is to avoid the prior art disadvantages in the treatment of materials, for example the dyeing or printing of thick, voluminous textile materials.

Another object of the present invention is to provide an improved apparatus for the dyeing or printing of thick, voluminous textile materials wherein shade differences in the material can be substantially avoided.

A further object of the present invention is to provide an improved apparatus for the continuous treatment of thick, voluminous textile materials wherein intimate contact between the treatment medium and the textile materials is provided during steaming and, or dyestuff setting, as well as during washing, drying and curing.

Other objects and further scope of applicability of the present invention will become apparent from the detailed description given hereinafter; it should be understood, however, that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

Pursuant to the present invention, it has been found that the abovementioned disadvantages may be eliminated and much improved apparatus for the treatment of large widths of thick, voluminous textile materials can be obtained if said textile materials are continuously subjected to the following treatment processes:

- a. Application of the dyestuffs and auxiliary agents, for example by means of a padder or a printing device,
- b. A heat-treatment, preferably a steaming treatment for setting the dyestuffs, especially with a material penetration at least during the heating-up stage,
- c. A washing or rinsing process, preferably with material penetration by the treatment liquor, and
- d. A heat-treatment, particularly a hot-air treatment for drying, preferably on at least one sieve drum subjected to a suction draft.

In another embodiment of the present invention it is frequently desirable to effect another treatment, for example the finishing of the textile material with synthetic resins for bonding the material, after the continuous dyeing or printing stage. An extremely economical processing method results if the textiles are not dried completely but only partially before further processing, for example before treating the material with the synthetic resin. In order to insure that a sufficient quantity of the synthetic resin dispersion is taken up by the material, it is generally desirable to dry the material down to a residual moisture content of less than about 50 percent, preferably to a residual moisture content of about 25 - 30 percent, which is referred to as the bone dry weight. Then the various agents, for example the bonding agents with a solvent or dispersion and, or the swelling agents are applied and the textiles are finally subjected to a heat-treatment, for example drying and curing the synthetic resin dispersion. A further processing may also consist of a coating of the backing, for example in the case of tufted carpets. The setting time can be reduced if steaming is effected with slightly super-

heated steam in the heating-up zone and with saturated steam in the dwell zone.

A very economical operating apparatus with small structural dimensions for carrying out the present invention comprises the combination of the following individual units:

- a. A padder or a printing device for the application of the dyestuffs and the auxiliary agents,
- b. A steamer for dyestuff setting with at least one sieve drum subjected to a suction draft utilized for heating up voluminous textiles,
- c. A washing device with at least two wash bowls and one squeezer means provided behind each bowl,
- d. A dryer advantageously provided with at least one sieve drum means subjected to a suction draft, and
- e. A drive control means which permits a joint speed variation of all individual units and speed variations between the individual units.

If the apparatus is to be used for printing and for continuous dyeing, a printing device and a padder are arranged one behind the other at the inlet of the apparatus and guiding elements are provided which render it possible to bypass one of these two devices depending upon which operation is to be carried out. The steamer should be provided with at least one sieve drum means subjected to a suction draft for heating up the voluminous textile materials since this insures that the steam required for the heating up process is drawn through the materials and thus comes into intimate contact with all the fibers. Thus the condensate which forms during the heating up period is equally distributed throughout the cross section of the voluminous material. In this manner a concentration of condensate at the material surface is avoided, as occurs for example in a steamer with a resting steam atmosphere or with jetting. An excessive condensate concentration at the surface of the material may result in fog formation in the case of single-colored dyeings and in bleeding of the printing patterns in the case of printing. Equal condensate distribution furthermore offers the advantage that a festoon zone can be used as a dwell zone without difficulty.

In a further embodiment of the present invention, it is suggested to provide a steamer for materials which may only be guided unilaterally on the conveying elements, said steamer comprising a sump for the generation of saturated steam, at least one sieve drum subjected to a suction draft for heating up the material and dwell zone wherein the material is conveyed in the form of loops. Loops offer the advantage that the humidity does not sag and thus dyeing faults are less frequent than in a festoon compartment with rollers supported in conveyor chains.

With many dyestuffs it is necessary for a good color yield and fixation to expose the textiles to a steam atmosphere which contains as little air as possible. It is well known to provide an exhaust device at the inlet of the steamer for exhausting the steam-air mixture forming in the inlet box. An especially advantageous material guidance and sealing of the inlet is obtained if according to the present invention a roller or a drum is provided as a conveying element at the inlet instead of the usual conveyor belts or roller conveyors, and if above the roller or the drum a suction box with heated suction lips and possibly steam nozzles for blowing a steam barrier against the material are arranged. With the well known inlet boxes the exhaust device is generally provided at the side of the material so that the con-

densate which is formed in the suction ducts cannot come into contact with the material. However, with large working widths such an exhaust device is not effective when disposed in the middle of the working width. Therefore, in a further embodiment of the present invention it is suggested to provide a suction box with two suction slits extending over the entire working width and to heat the lips of the suction slips. Using this feature the condensate droplets are evaporated on the heated lips and thus the condensate forming in the suction ducts is prevented from dropping onto the material. An extremely effective separation of the air adhering to and mixed in the voluminous material, and thus a substantially air-free steam atmosphere in the steamer can be obtained if steam nozzles are provided in the space between some of the heated lips and if this space is not subjected to a suction draft or if so, only to the extent of subjecting the slits at the edges of the steam nozzles to a certain suction draft. By using the steam nozzles the air is removed from the material and the steam-air mixture is exhausted. In order to adapt to different material thicknesses and to carpets with variable thicknesses it is desirable if the suction box and, or the suction lips and, or the steam nozzles can be adjusted in height by any conventional means.

It is well known that the heating up of the material by means of steam is effected by means of the condensate phase, that is by the deposition of condensed steam on the material. However, too strong a condensate concentration on the material is not desirable as dyeing faults might result. In accordance with the present invention it is therefore desirable to effect a partial heating-up of the material by the condensate phase, that is by means of steam and partially by a condensate-free contact heat transfer. In accordance with the present invention, this can be readily effected by heating the roller or the drum at the inlet of the apparatus, preferably by means of a liquid heat carrier, for example hot water or diphyl. The use of a liquid heat carrier for heating the drum has the advantage that the drum temperature can be controlled accurately and that a certain nominal temperature can be maintained.

A sieve drum steamer with a loop dwelling zone is generally used wherein saturated steam is usually generated by means of a sump. A steamer with only sieve drums as the conveying elements may also be used. If the steamer is to be operated with superheated steam, this can be advantageously effected by correlating to the fan of the sieve drum a heating means for superheating the saturated steam generated in the sump. However, it is also possible to supply superheated steam directly through injector nozzles. In many cases, it is advantageous to use superheated steam for heating up procedures, as in this way the material temperature is slightly higher than the saturated steam temperature, or the maximum working temperature can be reached more rapidly. A slight increase of the material temperature reduces the setting time considerably. It has been found that it is of special advantage if the steam quantity circulated in the inlet zone, that is in the sieve drum compartment is heated to a temperature of about 105° - 120°C., depending on the particular type of material to be processed. In the festoon compartment of the steamer it is advantageous to work with an approximately saturated steam atmosphere.

If the bonding of the needled felt is to be included in the continuous process, another padder and another

heat-treatment device, preferably with at least one sieve drum subjected to a suction draft is used and disposed behind the dryer and connected to the common drive and control device. A particularly economical operation results if the material is only partially dehydrated. The intermediate dryer may then be built correspondingly smaller.

Producers of carpet floor-coverings generally make needled felt carpets as well as tufted carpets. These producers usually demand that the plant be suitable for both material types. In accordance with the present invention this requirement is complied with by providing conveying elements, for example a roller conveyor, which renders it possible to bypass the intermediate dryer and the second padder when handling tufted carpet and by reversing the direction of rotation of the sieve drum of the final dryer in order to change the contact surfaces with needled felts and tufted carpets. With tufted carpets the upper side of the material should not come into contact with the guiding elements in a hot atmosphere in order to avoid compressing of the pile. However, it has been found that with needled felt it is more favorable if the upper side of the material being treated rests on the sieve drum, as in this way the concentration of the synthetic resin bonding agent at the upper side of the material is reduced. When drying the synthetic resin dispersion there is always a migration towards the heat source, and as the hot air is drawn from the outside into the drum, a migration of the synthetic resin towards the side away from the drum can be observed. The concentration of the bonding agent at the surface of the material resting on the drum is, therefore, reduced and the material acquires a softer handle.

If a certain final width for example with tufted carpets, is desired, it is advantageous to correlate a tenter zone as an inlet means to the giant drum dryer. A tenter zone contains tenter frames which hold the material at its edges by means of heavy pins or clip chains. Advantageously, a roller conveyor is disposed between the tenter chains which preferably passes the material to the sieve drum at the level of the drum shaft. By providing a roller conveyor between the tenter chains, the material is additionally supported so that it is not torn out of the pin chains, even if a delicate material is involved. It is also possible to feed the material to the giant drum dryer without providing the tenter zone.

In order to utilize the space well it is suggested in a further embodiment of the present invention to provide conveying elements, preferably guide rolls, above and behind the sieve drum and preferably near the housing (as seen in the direction of material passage). This additional passage in the treatment chamber may be used as a curing passage for bonding needled felts. Furthermore, it is suggested to arrange a conveying element, preferably a roller conveyor, beneath the sieve drum near the bottom, and to provide at the point where the material is discharged from the sieve drum two axially adjustable needle disks for a bilateral holding and deflection of the tufted carpets and similar materials, the surface of which should not be supported in the hot atmosphere. By the use of the two needle disks a safe material guidance until the material is discharged from the sieve drum and a proper deflection of the material is insured. Needle rings can also be used in place of the needle disks. If the apparatus is to be used for various material widths, it is advisable to mount the two needle

disks or the like in such a way that they can be adjusted in the axial direction. In general, it is not necessary to drive the needle disks. When using a device with only one sieve drum, that sieve drum must have a relatively large diameter. For example, for needled felts and tufted carpets with a material weight of about 1000g/m² the drum diameter should be approximately 3.5m in order to obtain proper drying of these materials at a speed of about 4m/min.

An adjustment of the baffle plate when changing the direction of rotation can be avoided if according to another embodiment of the present invention the baffle in the interior of the sieve drum extends from the point where one material type, for example the needled felt, is discharged from the drum, to the point where the other material type, for example the tufted carpet, is discharged from the drum. If, with this arrangement, the point where the material is taken up by the sieve drum is not subjected to the suction draft, the distance at which no suction draft prevails is so small that the drying capacity is essentially not reduced. However, instead of a device with one giant drum, it is also possible to use a sieve drum dryer with several drums of the standard size, that is with a drum diameter of about 1400 mm. The same applies to the steamer. In order to obtain the required treatment times, several sieve drums arranged in one line, for example about 6 sieve drums, are frequently required with these devices for the aforementioned material type and speed of material passage. In order to comply with the requirements established for the various material types, that is for a unilateral material guidance with tufteds and an alternate material guidance with needled felts, it is necessary to mount the baffles in the interior of the sieve drums which guide the material at their lower portions, which baffles are generally mounted stationary in such a way that they can be swivelled by 180°.

In the case of large working widths of about 3 - 6 m, the baffles have a correspondingly heavy weight. Therefore, swiveling and a safe locking of these baffles is not possible without difficulty. In order to render it possible to swivel the baffles in a simple way, it is suggested in a further embodiment of the present invention to connect the stationary drum shaft supporting the baffles with a worm gear outside of the housing, which is operated by means of a hand wheel or possibly by means of a servomotor. Marking on the worm gear and, or the stationary drum shaft facilitate the accurate setting of the baffle to the two operating positions. However, it is not sufficient to only swivel the baffles. The direction of rotation of the respective sieve drums must also be changed. In general, for driving the sieve drums a worm gear and possibly an infinitely variable gear synchronized with the worm gear for adjusting the speed is required. With such a device the direction of rotation can be changed if a reversible change gear is synchronized with the worm gear.

It is also possible to correlate to each sieve drum a D.C. -motor as a drive means. With this design and for changing the direction of rotation of the drums it is expedient to provide the D.C. -motors which drive the drums which, in the case of an alternate material guidance, guide the material at their lower portions, with an electrical reversing switch. However, it is also possible to drive the devices with D.C. -motors wherein a worm gear and an infinitely variable gear are synchronized to each drum and to at least provide those motors which

drive the sieve drums with an electrical reversing switch for changing the direction of rotation of the drums. Another advantageous embodiment of the present invention is a device wherein the sieve drums, which in the case of an alternate material guidance, carry the material on one and the same side are provided with a common drive and wherein a reversible drive is provided for the group of sieve drums which carry the material at their lower portions. This offers the advantage that only one reversing gear or only one electrical reversing switch is required.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will become more fully understood from the detailed description given hereinbelow and the accompanying drawing which are given by way of illustration only and thus are not limitative of the present invention and wherein,

FIG. 1 of the drawing shows a longitudinal section of the apparatus of the present invention; and

FIG. 2 shows a cross-section of one of the dryer units having a sieve drum therein with its associated fan means, heating means, and baffle means.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawing wherein like reference numerals are used throughout the various views to designate like parts, the apparatus of the present invention comprises a padder 1 for impregnating a material 2. A steamer 3 as shown in FIG. 1 has a heat-insulated housing containing a sieve drum 4 subjected to a suction draft. A baffle means 5 is provided in the interior of the sieve drum for interrupting the suction draft at that portion of the drum which is not covered with the material being treated. With the arrangement of the sieve drum 4 and drive rollers 6 which function as conveying elements, the material being treated forms loops 7 in the steamer. At the inlet of the apparatus a heated roller 8 is provided as a conveying element above which a suction box 9 containing suction slits 10 and extending over the whole roller width is disposed. Lips 11 of the suction box and/or the suction slits 10 are heated. Between the suction slits a tube 12 is arranged with drillings directed toward the material 2. Steam flows out of the drillings which removes the air from the voluminous material. The steam/air mixture is then exhausted through the suction slits 10. Thus, through this inlet the voluminous material enters the steamer substantially air-free. On the sieve drum 4 steam is drawn through the material insuring a shock-like heating up of the material and a uniform condensate distribution. At the discharge end of the steamer 3 a water seal 13 is provided. A heated sump 14 at the bottom of the steamer serves for the generation of saturated steam. Above the sump a sieve sheet 15 is arranged in order to prevent water droplets from being carried along with the rising steam which could stain the material being treated. The suction draft of the sieve drum is produced in a well known way by means of radial fan wheel means 40 correlated to the face of the sieve drum, said fan wheel means drawing the steam out of the sieve drum and thus maintaining a certain partial vacuum in the sieve drum. A heating device 42 is correlated to the fan wheel for heating up and superheating the saturated steam. Thus it is possible in an effective way to obtain the degree of superheating of the steam which is most

favorable for the specific purpose. The fan means and heating device are shown in the FIG. 2 of the drawings. Their design corresponds to the well known design of fans and heaters used in sieve drum dryers and sieve drum steamers.

For washing out the unfixed dyestuff portion and the auxiliary agents, two sieve drum wash bowls 16 are disposed behind the steamer 3. The wash bowls may be provided with sieve drums subjected to a suction draft. A material penetration can also be obtained solely by the level difference between the liquid in the wash bowl and the liquid in the sieve drum. A squeezer means 17 is correlated to each bowl.

A dryer 18 with two sieve drums subjected to a suction draft is provided behind the sieve drum bowls. Depending on the required evaporation, one or more sieve drums may be used. The sieve drum dryer 18 is required for the intermediate drying of needled felts and similar materials which subsequently are finished with synthetic resins or the like for bonding the material. With tufteds, an intermediate drying process is not required. In this case, the dryer 18 is bypassed as shown by the alternate material guidance system. For this purpose, a roller conveyor 19 is provided on top of the dryer. The material guidance for needled felts is shown by the dash-dot line in the drawing.

When handling tufteds, drying is effected in a giant drum dryer 20. At the inlet, the dryer is provided with a tenter zone 21 in order to stretch the material in width to obtain a certain final material width. With material widths of about 3 to 5 m. sagging of the material between the tenter chains can be avoided if, as shown in the embodiment of the invention, a roller conveyor 22 is provided between the tenter chains. Instead of a roller conveyor, one or several conveyor belts may be provided. For drawing the material off the roller conveyor 19, a driven pair of rollers 23 is used. In order to avoid compressing the pile of the tufteds, they are, as shown in the embodiment, first guided over the upper portion of the sieve drum. The sieve drum is thereby almost completely embraced by the material. Axially adjustable needle disks 24 provide a safe deflection of the material 2 from the sieve drum. The needles of the needle disks engage with the non-tufted edges of the material. Via a roller conveyor 25, the material is discharged from the dryer. By means of the needle disks 24, contact with the pile is avoided. In order to make it possible to process various material widths, the needle disks 24 as well as the tenter chains of the tenter zone 21 are adjustable in width.

In the apparatus shown, needled felt materials and the like are passed after intermediate drying in the dryer 18 through another padder 26 where they are impregnated with a synthetic resin dispersion or another treatment medium. The material is then dried on dryer 20. In order to obtain a soft handle of the surface of, for example, needled felt materials, it is advantageous if the direction of rotation of the sieve drum is changed according to the dash-dot arrow so that the upper side of the material rest on the sieve drum. After drying the material on the sieve drum, the material is guided as shown by the dash-dot line over rollers 27 so that the material is exposed to the hot air for a considerable period of time. During this period, the synthetic resin bonding agent cures. By providing this curing passage near the housing, a space saving construction results. The giant drum dryer 20 is of similar design as the well

known sieve drum dryers, that is, the housing is subdivided by a partition means **28** into a treatment chamber with a sieve drum **4** and into a fan chamber (not shown) with a fan wheel and a heating device correlated to the fan wheel. Instead of one fan wheel, several fan wheels may also be provided. Also the air can be exhausted from the sieve drum at both sides, that is fans may be provided at the two faces of the sieve drum so that such a device has two fan chambers which limit the treatment chamber at both sides. The air exhausted from the drum may then flow back from the fan chamber into the treatment chamber at all sides and be drawn into the drum again. FIG. 1 also illustrates the drive and control means **52** which provides for joint speed variation of all the units and speed variation between the individual units of the apparatus. This means includes a plurality of drive means **54** in the form of D.C. -motors which drive the drums and associated rollers, the motors associated with the drums being also provided with an electrical reversing switch to provide for alternate material guidance of the textile material.

In FIG. 2 the conventional arrangement of a sieve drum and its associated radial fan means **40** and heating means **42** for heating the gaseous medium is illustrated. Also, in FIG. 2 is the means **44** for swiveling the baffle means **46** by 180°.

In the apparatus shown, carpets can be dyed stripe-free and fast in an economical way.

The materials which can be treated by the apparatus of the present invention include any of the natural or synthetic fibers. The apparatus of the present invention is also applicable to blends of the above-mentioned textile materials.

The apparatus of the present invention provides a realization for the dyeing of carpets, floor coverings and other household textiles. However, this continuous dyeing of floor coverings is also suitable for normal woven materials and applies also to the finishing of piece goods.

The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications are intended to be included within the scope of the following claims:

What is claimed is:

1. An apparatus for dyeing or printing large widths of thick, voluminous textile materials which comprises in combination means for applying dyestuffs and auxiliary agents to textile material, a steaming chamber for dyestuff fixation containing a heating-up zone and a dwell zone, said heating-up zone containing at least one sieve drum subjected to a suction draft, a washing means, a final dryer containing at least one sieve drum subjected to a suction draft and a drive and control means which provides for joint speed variation of all units and speed variation between the individual units of said apparatus.

2. The apparatus of claim 1, wherein additional dryer means and padder means are provided after the washing means and before the final dryer means, said additional means also being associated with the drive and control means.

3. The apparatus of claim 2, wherein by-pass means are provided for by-passing the additional dryer and padder means and said drive and control means includes means associated with the final dryer means for

reversing the direction of rotation of the sieve drums disposed therein.

4. The apparatus of claim 1, wherein the steaming chamber is provided with a sump means for the generation of steam and the dwell zone contains drive rollers for unilaterally guiding the material in loops there-through.

5. The apparatus of claim 4, wherein the heating-up zone contains a heating roller for heating the textile material prior to said textile material being conveyed on said sieve drum.

6. An apparatus for dyeing or printing large widths of thick, voluminous textile materials which comprises in combination a first means for applying dyestuffs and auxiliary agents to textile material, a steaming chamber for dyestuff fixation containing a heating-up zone and a dwell zone, said heating-up zone containing at least one sieve drum subjected to a suction draft, at least one sieve drum wash bowl means, a first dryer means containing at least one sieve drum means subjected to a suction draft, a second means for applying a treatment medium to the textile material and a second dryer means containing at least one sieve drum subjected to a suction draft, said sieve drum in said second dryer means provided with means for reversing its direction of rotation, and a drive and control means which provides for joint speed variation of all units and speed variation between the individual units of said apparatus.

7. The apparatus of claim 6, wherein by-pass means are provided for by-passing the first dryer means and the second means for applying a treatment medium to the textile material.

8. The apparatus of claim 7, wherein the by-pass means is a roller conveyor.

9. The apparatus of claim 6, wherein exhaust means are provided at the inlet of the heating-up zone of the steaming chamber, said exhaust means being associated with heated roller means which conveys the material into the steaming chamber.

10. The apparatus of claim 9, wherein the exhaust means extends over the working width of the material and is provided with heated suction lips which define suction slits for removing the air contained in the material.

11. The apparatus of claim 10, wherein at least one steam nozzle means is provided between the heated lips for blowing a steam barrier against the material.

12. The apparatus of claim 11, wherein the exhaust means, the suction lips and the nozzle means are adjustable in height.

13. The apparatus of claim 6, wherein a heating means is associated with a fan of the sieve drum in the steaming chamber for superheating the saturated steam generated in the sump.

14. The apparatus of claim 6, wherein a tenter zone comprising a roller conveyor positioned between tenter chains is provided for conveying the material to the second dryer means at the level of the sieve drum shaft therein.

15. The apparatus of claim 6, wherein the dwell zone contains drive rollers for unilateral guidance of the material being treated.

16. The apparatus of claim 6, wherein the heating-up zone also contains a heating roller for heating the textile material prior to being conveyed on the sieve drum therein.

17. The apparatus of claim 6, wherein squeezer means are correlated to each sieve drum wash bowl.

18. The apparatus of claim 6, wherein conveying elements are arranged in the second dryer means, near the housing above and behind the sieve drum, said elements providing a curing passage for the material being treated.

19. The apparatus of claim 6, in which conveying elements are arranged in the second dryer means, near the bottom of the housing underneath the sieve drum wherein at a point where the material is discharged from the sieve drum two axially adjustable needle disks are provided for the bilateral holding and deflection of the textile material being treated.

20. The apparatus of claim 6, adapted to treat both needed felt and tufted carpets wherein baffle means are provided inside the sieve drum of the second dryer means between a point where needled felt is discharged from the sieve drum and a point where tufted carpet is discharged from the sieve drum.

21. The apparatus of claim 6, wherein the first dryer means is provided with several sieve drums disposed for alternate or unilateral material guidance, said sieve drums being capable of reversible rotation and containing baffle means in the interior of the sieve drums which can be swivelled by 180°.

22. The apparatus of claim 21, wherein said first dryer means includes a housing and a stationary drum shaft which supports the baffle means is connected outside the housing with means for swivelling the baffle means.

23. The apparatus of claim 21, wherein each sieve drum is provided with a D.C. motor means as a drive means, at least part of said motor means being provided with an electrical reversing switch.

24. The apparatus of claim 21, wherein in the case of an alternate material guidance the sieve drum which

carry the material on the same portion of the drum are connected to a common drive means, said drive means for the sieve drum carrying the material at their lower portions being reversible.

25. The apparatus of claim 1, wherein said final dryer is a large drum dryer having one sieve drum therein.

26. The apparatus of claim 6, wherein said second dryer means is a large drum dryer having one sieve drum therein.

27. The apparatus of claim 6, wherein a tenter zone is provided for conveying the material to the second dryer means at the level of the sieve drum shaft therein.

28. An apparatus for dyeing or printing large widths of thick voluminous textile material, which comprises, in combination, means for applying dyestuffs and auxiliary agents to textile material, a steaming chamber for dyestuff fixation containing a heating-up zone and a dwell zone, said heating-up zone containing at least one means for heating and for conveying the textile material therein, a washing means, a final dryer containing at least one means for heating and for conveying the textile material and a drive and control means which provides for joint speed variation of all units and speed variation between the individual units of said apparatus.

29. The apparatus of claim 28, wherein additional dryer means and padder means are provided after the washing means and before the final dryer means, said additional means also being associated with the drive and control means.

30. The apparatus of claim 28, wherein the steaming chamber is provided with a sump means for the generation of steam and the dwell zone contains drive rollers for unilaterally guiding the material in loops there-through.

* * * * *

40

45

50

55

60

65