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[56]

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3,354,035 11/1967 Gottwald et al. 34/111

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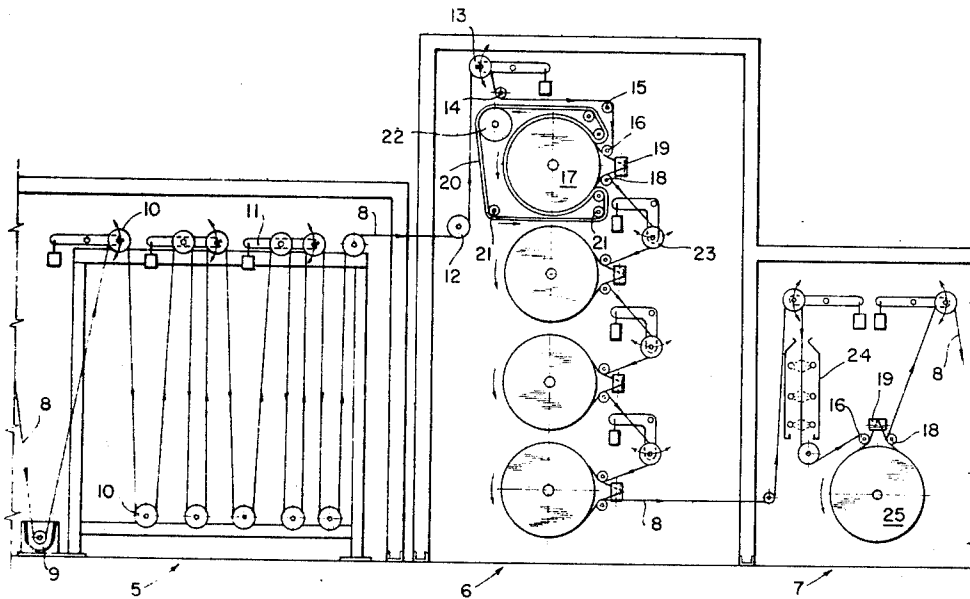
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[54] APPARATUS FOR ADVANCING FABRIC TAPE AROUND A HEATED DRYER DRUM

15 Claims, 4 Drawing Figs.

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68/5
[51] Int. Cl. F26b 13/18
[50] Field of Search 34/111,
116, 117, 120, 123; 68/5 D, 5 E

ABSTRACT: This invention is directed to a system for impregnating with liquid ammonia and drying a continuously advancing narrow fabric tape or ribbon and includes an initial impregnating and aging section, a primary drying section provided with an apparatus comprising a plurality of vertically aligned horizontal dryer drums each of which carries a plurality of wraps of the tape and each of which is provided with a plurality of sets of guide rolls for controlling each wrap of the tape, and a final steaming and drying section provided with at least one horizontal dryer drum that also carries a plurality of wraps of the tape under the control of a corresponding number of sets of guide rolls.



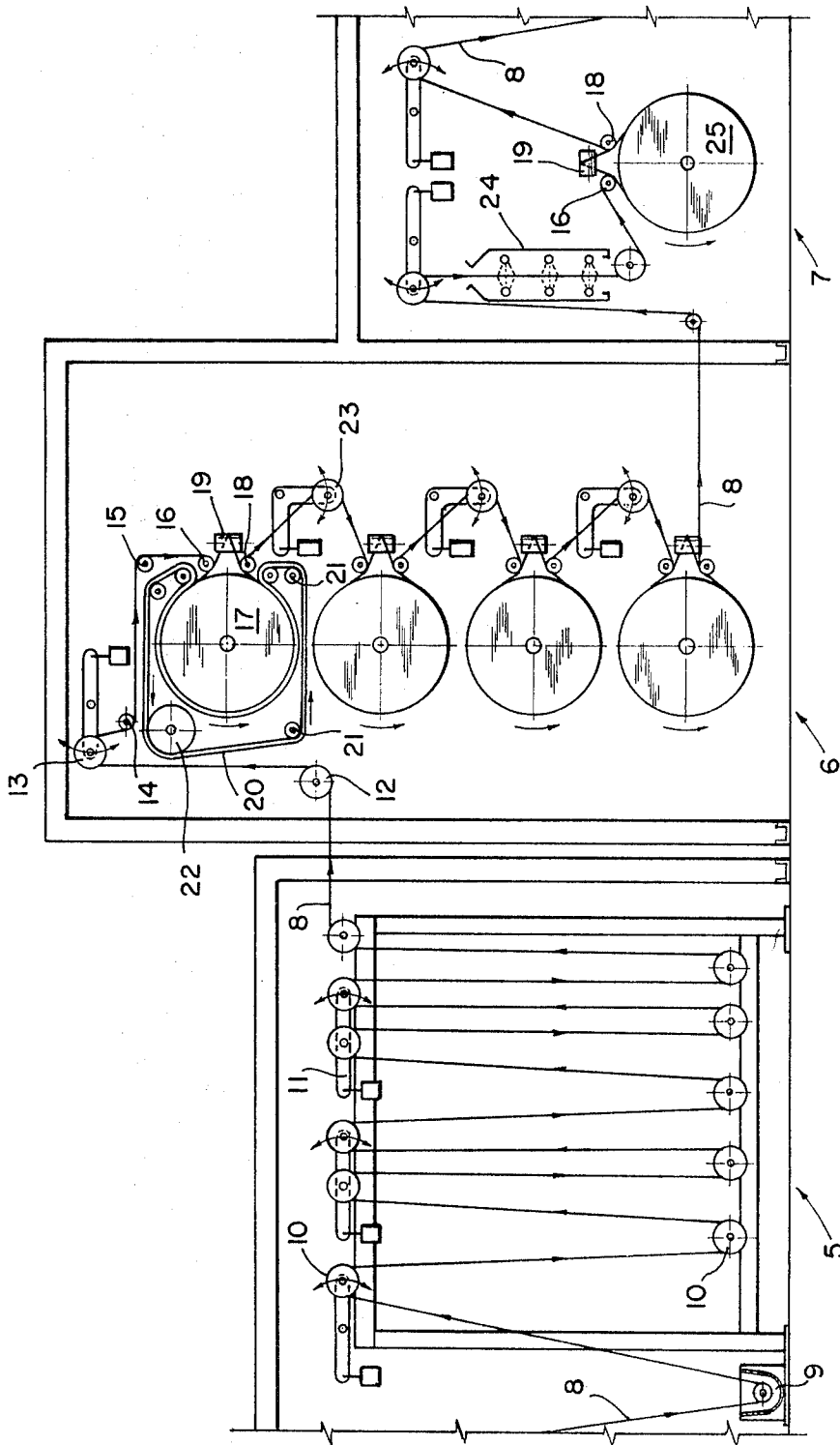


FIG. 1

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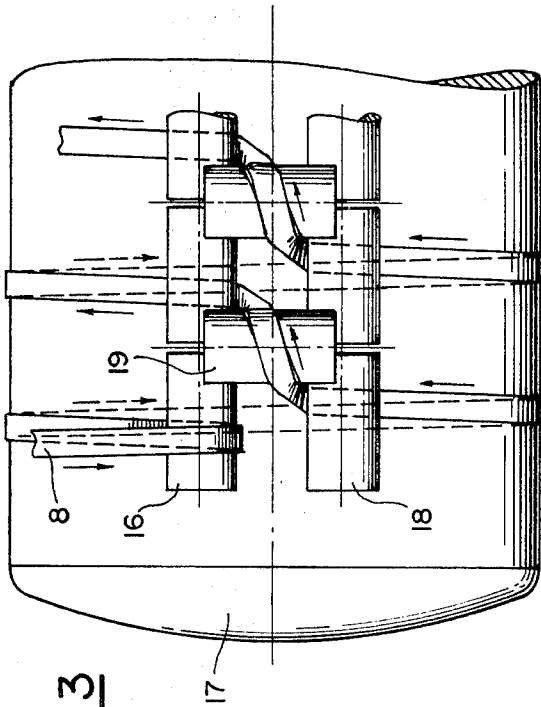


FIG. 3

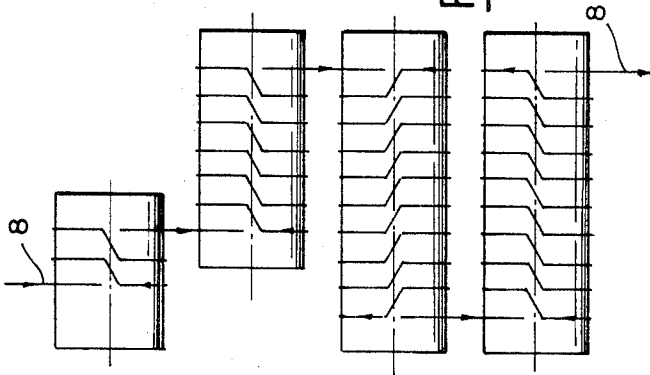


FIG. 4

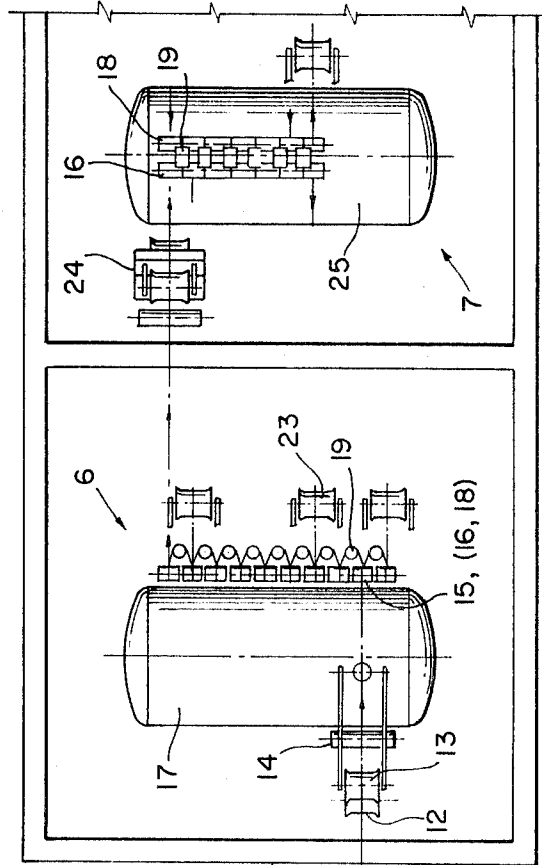
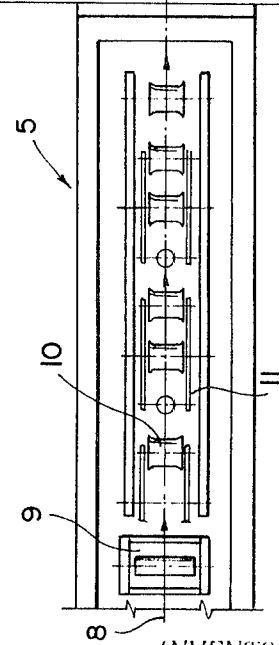


FIG. 2



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APPARATUS FOR ADVANCING FABRIC TAPE AROUND A HEATED DRYER DRUM

THE INVENTION

This invention relates generally to new and useful improvements in a system for treating with liquid ammonia and drying a continuously advancing fabric web and particularly seeks to provide novel apparatus for treating with ammonia, physically conditioning and drying narrow fabrics (such as zipper tapes) under relatively high-speed short-time conditions.

In general, such a system includes a low temperature liquid ammonia impregnating and aging section, a primary drying apparatus and a final steaming and drying section. Where such a system is used for treatment of a wide fabric web, the web usually spans the full width of each of the various guide rolls and dryer drums of apparatus employed therein and any of several types of edge guides may be employed to control lateral positioning of the web as it passes through the apparatus.

However, when applying similar treatments to narrow tapes or ribbons it has been found necessary to have a multiplicity of wraps of the tape over one or more dryer drums in order to achieve a desired degree of drying within time available at a given linear speed of operation. Furthermore, with multiple wraps of tape around a dryer drum the path of the tape must be accurately controlled to prevent fouled turns and where more than one dryer drum is used, the tape feed from one drum to another also must be controlled accurately.

Therefore, an object of this invention is to provide a novel apparatus for treatment with ammonia and drying of fabric tapes or ribbons that are continuously advanced at relatively high speeds.

Another object of this invention is to provide an apparatus of the character stated that includes a dryer section having a plurality of heated dryer drums each of which has associated therewith a number of guide roll assemblies equivalent in number to the number of tape turns to be made therearound.

A further object of this invention is to provide an apparatus of the character stated in which at least the first of the dryer drums is backed by a dryer belt of a suitable material.

A further object of this invention is to provide an apparatus of the character stated that is simple in design, rugged in construction and economical to manufacture.

With these and other objects, the nature of which will be apparent, the invention will be understood more fully by reference to the drawings, the accompanying detailed description and the appended claims.

In the drawings:

FIG. 1 is a somewhat schematic side elevation of a fabric tape treating and drying apparatus constructed in accordance with this invention;

FIG. 2 is a top plan view thereof;

FIG. 3 is an enlarged broken elevation showing certain of the guide and transfer rolls along with their relationship to the tape and a dryer drum; and

FIG. 4 is a schematic representation of the tape in relation to a series of dryer drums.

Referring to the drawings in detail, the invention is embodied in a system for treating with liquid ammonia and drying a continuously advancing narrow fabric tape or ribbon to improve its extensibility, resistance to shrinkage and resistance to wrinkling or creasing. The apparatus includes an initial impregnating and aging section generally indicated 5, a primary drying apparatus generally indicated 6, and a final steaming and drying section generally indicated 7.

U.S. Pat. No. 3,406,006 discloses and describes a system for treatment of woven or knitted fabric containing natural or regenerated cellulosic fibers to improve extensibility or stretch, resistance to shrinkage and resistance to wrinkling or creasing of such fabrics. The improvement attained by the treatment in such patent depends, to some extent, on the time that the impregnated fabric remains saturated with liquid ammonia and the elapsed time before removal of the ammonia

from the fabric. These times vary, from fabric to fabric, depending upon the composition of the fabric, its weight or thickness, whether the fabric is woven or knitted, the tightness of the fabric, and other factors.

The instant invention is concerned with apparatus for carrying out the system of the aforementioned patent on a commercial and industrial scale on a narrow fabric tape or ribbon. In order that this might be done, it is of course necessary that the system be capable of processing large quantities of tape or ribbon with consistent and uniform results in a safe manner. Furthermore, it is important that the system be capable of processing a wide variety of tapes or ribbons, tapes or ribbons that are light and those that are heavy, tapes or ribbons with low cellulosic content and those with high cellulosic content, loosely woven or knitted and tightly woven or knitted, etc.

A fabric tape 8, supplied from a reel or truck (not shown) is first passed through immersion tank 9, which contains liquid ammonia, and is then threaded back and forth over a series of upper and lower guide rolls 10 in aging section 5 (which is saturated with ammonia vapor) for a total linear distance predetermined by the linear speed of advance of the tape and the aging time desired. Certain of the upper guide rolls 10 may be floating rolls on counterbalanced pivot arms 11 for tension control purposes.

The tape 8 is then threaded into primary dryer apparatus 6 around fixed guide roll 12 and thence upwardly over floating tension roll 13, under fixed guide roll 14, over fixed guide roll 15 and down and around upper entrance guide roll 16 from which it is wrapped around heated upper dryer drum 17 and leaves the dryer drum over lower discharge guide roll 18.

All of the various guide rolls preferably are spool-shaped to prevent the tape from running off the ends thereof.

It is an essential feature of this invention to positively control travel of tape 8 around drum 17 (and succeeding drums). Toward this objective, at each location where tape 8 is to be wrapped around a major portion of the drum periphery, there is provided two axially aligned pairs of horizontal upper and lower guide rolls 16 and 18 and a vertical guide roll 19 having its axis in the plane intermediate the opposed ends of guide rolls 16 and 18 and laterally spaced therefrom.

The initial wrap of tape 8 occurs at the front of upper drums 17 (see FIG. 2) and proceeds from front upper guide roll 16 (see FIG. 3) around the drum, then over front lower guide roll 18, around front vertical guide roll 19 and back under second upper guide roll 16 to commence a second wrap. Each succeeding wrap of the tape is similarly threaded from front to rear through successive sets of guide rolls 16, 18 and 19 until the required number of wraps have been made. The final wrap is discharged over the rearmost lower guide roll being used.

In the illustrated embodiment of the invention primary dryer apparatus 6 includes four vertically aligned heated dryer drums 17, each of which is provided with a plurality of sets of guide rolls 16, 18 and 19, and at least the upper drum is provided with a dryer belt 20 snugly holding the tape wraps on its surface and mounted on guide rolls 21 and heated dryer roll 22.

It will be understood that the lengths of dryer drums 17 may all be the same, in which case each drum will be provided with the same number of sets of guide rolls 16, 18 and 19, which provides for versatility in determining the number and locations of the tape wraps around each drum. However, if primary dryer apparatus 6 is to be used for treatment of a single type of tape at predetermined conditions of speed and temperature, it is possible to effect heat savings by having each dryer drum only long enough to accommodate the particular number of wraps required therearound. For example, if a particular type of tape were to be run at 400 feet per minute and requires a 22-second drying time on 23-inch diameter drying drums, a total of 28 wraps would be required, so that the upper drum would carry three wraps of tape controlled by the front three sets of guide rolls, and the tape would be discharged to the fourth set of guide rolls of the next lower drum which would carry six wraps of tape controlled by the

fourth through the ninth set of its guide rolls. The tape is then discharged to the ninth set of guide rolls of the next lower dryer drum which would carry nine wraps of tape controlled by the ninth to first sets of its guide rolls, and the tape is then discharged to the bottom dryer drum which would carry 10 wraps of tape controlled by the first to 10th sets of its guide rolls. Here, the upper drum needs to be only long enough to accommodate three wraps of the tape, the next lower drum only long enough to accommodate six wraps of the tape, while the remaining two lower drums would be full length.

Counterweighted floating rolls 23 may be provided between successive dryer drums for controlling the tension of the tape as it passes from one drum to another.

Tape 8 is discharged from the 10th set of guide rolls at the rear of the bottom dryer drum and is led into final steaming and drying section 7 where it passes through steam chest 24 and is further dried by six wraps around heated dryer drum 25 provided with the required number of sets of guide rolls 16, 18 and 19. The tape is then discharged from section 7 to a winding or collecting device (not shown) or to further processing equipment.

Although a preferred embodiment of the instant invention has been described here in detail, it will be understood that rods could be used instead of rolls and a continuous rod could be employed in place of a pair of the rolls. Further, although plural wraps have been suggested about each of the dryer drums, one or more of said drums may have a single wrap thereabout. Also, the chemical treatment of the fabric might vary. Accordingly, the preferred embodiment set forth here may be modified readily by one skilled in treating fabrics and/or in the manufacture of equipment for treating fabrics without departing from the spirit of invention.

We claim:

1. In a system for impregnating with liquid ammonia and drying a continuously advancing narrow fabric tape, an apparatus for controlling wraps of the tape around a rotating cylinder, a first pair of guide means each adapted for guiding the tape thereabout and located in proximity to said cylinder, a second pair of guide means each adapted for guiding the tape thereabout and disposed in spaced relation to said first pair of guide means, said pairs of guide means lying in a plane substantially parallel with a plane tangent to said cylinder, and a separate guide means located outwardly from said pairs of guide means and adapted to receive the tape from one of said pairs of guide means and to deliver the tape to the other of said pairs of guide means.

2. The apparatus of claim 1 in which both of said guide means in each of said pairs are integral each with the other.

3. The apparatus of claim 2 in which said cylinder is a heated dryer drum.

4. The apparatus of claim 3 in which said dryer drum is backed by a dryer belt in contact with a substantial portion of a periphery thereof.

5. In a system for impregnating with liquid ammonia and drying a continuously advancing narrow fabric tape, an apparatus for controlling wraps of the tape around a rotating cylinder, a first pair of guide means each adapted for guiding the tape thereabout and located in proximity to said cylinder, a second pair of guide means each adapted for guiding the tape thereabout and disposed in spaced parallel relation to said first pair of guide means, said pairs of guide means lying in a plane substantially parallel with a plane tangent to said cylinder, and a separate guide means located outwardly from said pairs of guide means and adapted to pass the tape about an axis that is normal to the axis of said cylinder in a plane parallel to said plane tangent to said cylinder.

6. The apparatus of claim 5 in which both of said guide means in each of said pairs are integral each with the other.

7. The apparatus of claim 6 in which said cylinder is a heated dryer drum.

8. The apparatus of claim 7 in which said dryer drum is backed by a dryer belt in contact with a substantial portion of a periphery thereof.

9. In a system for impregnating with liquid ammonia and drying a continuously advancing narrow fabric tape, an apparatus for controlling wraps of the tape wound around a continuously rotating cylinder, a first pair of axially aligned rotatable guide rolls located in proximity to said cylinder, a second pair of axially aligned rotatable guide rolls disposed in spaced parallel relation to said first pair of guide rolls, the axis of said pairs of guide rolls lying in a plane substantially parallel with a plane tangent to said cylinder, and a separate guide roll located downwardly from said pairs of guide rolls and adapted to pass the tape about an axis that is normal to the axes of said pairs of guide rolls, the separate guide roll intermediate the opposed ends of said pairs of guide rolls.

10. The apparatus of claim 9 in which said separate guide roll is rotatable about an axis that is normal to the axes of said pairs of guide rolls and lies within a plane that is intermediate the opposed ends of said pairs of guide rolls.

11. The apparatus of claim 10 in which said pairs of guide rolls are symmetrically positioned with respect to said separate guide roll.

12. The apparatus of claim 11 in which said cylinder is a heated dryer drum.

13. The apparatus of claim 12 in which said dryer drum is backed by a dryer belt in contact with a substantial portion of a periphery thereof.

14. The apparatus of claim 13 in which a set of guide rolls is provided for each wrap of said tape.

15. The apparatus of claim 14 in which the second roll of each of said pairs of rolls also serves as the first roll of the next succeeding pair of rolls, and in which a said separate guide roll is provided in the plane intermediate the opposed ends of each successive pair of said guide rolls.

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