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P. GREVE

DRYING MEANS FOR YARN SIZING MACHINES

Filed April 22, 1925

Fig. 1

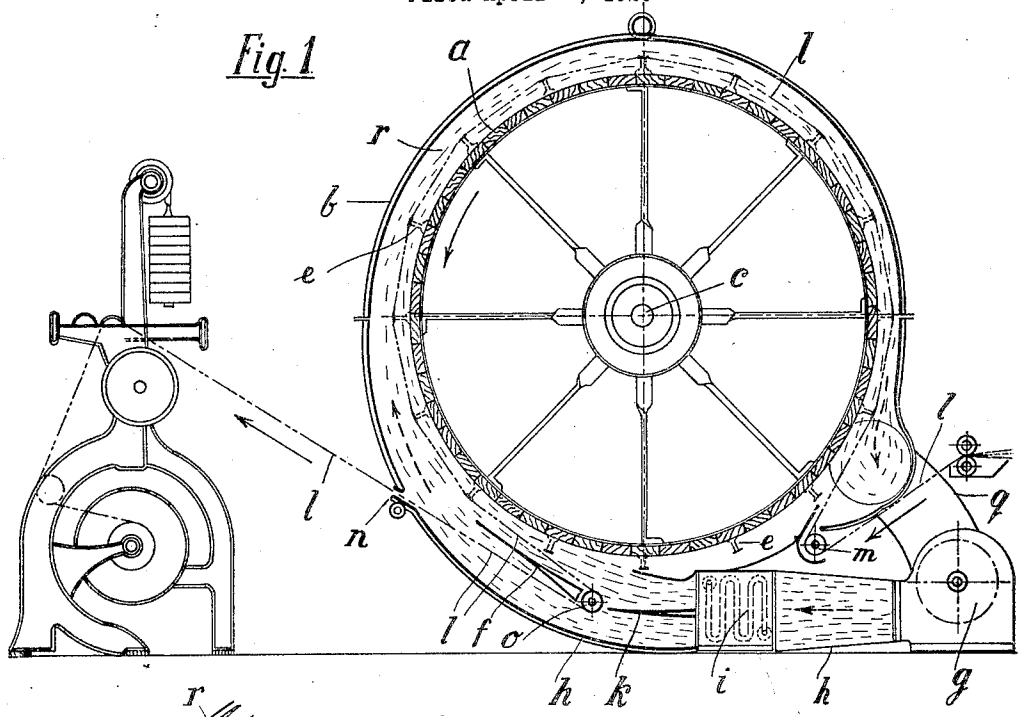
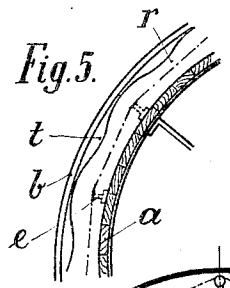


Fig. 5.



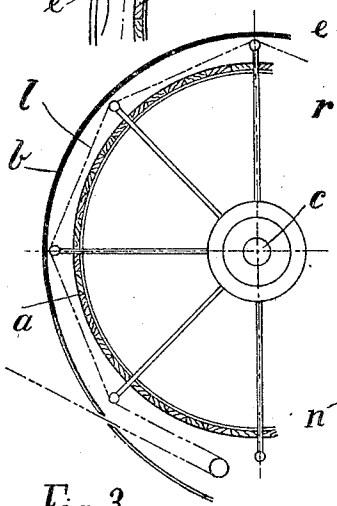


Fig. 3.

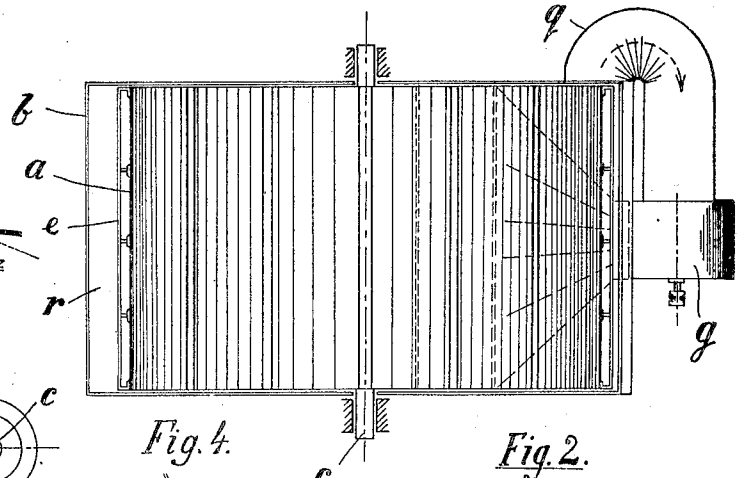
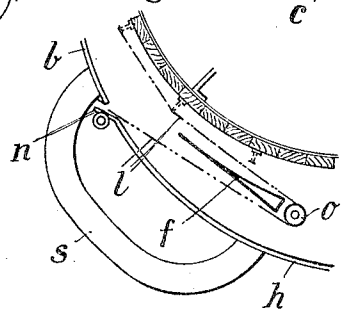


Fig. 4.

Fig. 2.



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UNITED STATES PATENT OFFICE.

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DRYING MEANS FOR YARN-SIZING MACHINES.

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This invention has reference to drying means for sizing machines for the treatment of warp threads and the like, and it is intended to provide means of bathing the threads on all sides with the drying air, to prevent sticking thereof as well as burning or unequal drying of the sizing material. With these and other ends in view which will appear from the specification and drawings use is made of a guide drum of comparatively large diameter revolving within a spacedly disposed enveloping casing, and adapted for the reception of the sized threads in combination with heating means disposed outside of the drum and with such an arrangement of the drum and of the surrounding air channel that the threads are caused to be supported at a distance from the drum and from the casing, means being provided to affect a substantially longitudinal division of the drying air current in the preferably gradually narrowing air current, so as to force the air from both sides against the material to be dried.

In further pursuance of my invention the revolving guide drum constitutes a perfectly closed, unheated support or jacket with preferably rib-like, perforated projections or with supporting rods or the like for the threads, while the channel of comparatively reduced diameter between the drum and the surrounding casing is caused to be charged with directly heated air passing therethrough in a circular path, or in a cycle. In a modification means may be provided to cause the heated drying air to return to the generator for the air current, a blower or the like, and after depositing its moisture to be heated over again and re-used.

The substantially annular gradually narrowing space between the slowly rotating, unheated closed drum and the surrounding casing placed at a comparativly small distance thereof is in communication according to this invention with a dry-air conduit with heating means and a return conduit of the pressure or suction producing blower, the sized web of threads being conducted at the air discharging side over a guide roller and to the large guide drum, and being then passed to the outside by means of another guide roller disposed in the air admission conduit and through a slot in the casing. By these simple means it is possible to produce an unobjectionable reliable drying action with a minimum expenditure of heat and while avoiding overheating and excessive drying of the material.

As compared with the machines heretofore in use for such drying purposes, which were provided with a plurality of reels, large drying space and great expenditure of heat my invention provides a very simple, easily accessible drying device which can be easily regulated and controlled, and in which a very satisfactory utilization of the heat with greatest saving and most careful treatment of the fibers is obtained in a comparatively small working space and by means of great velocity of the drying air. Even less durable warp threads have been found to run smoothly and without injury through the machine of this invention.

In accordance with the previous art, as far as I am aware, it has been suggested to cause a current of hot air to pass through and in contact with the repeatedly reciprocated web of threads. In other drying devices for sizing machines the threads are led over a plurality of larger sized reel-shaped frames in the interior of a spacious casing with blowers or ventilators inside thereof, and with heating means and suction blowers provided in the lower part of the surrounding casing. In other drying devices of the kind referred to a single, comparatively large interiorly heated perforated drum is employed with a surrounding casing with enlarged bottom portion for the reception of heating means and of a plurality of blowers and with means for the sucking off of the vapors from the hollow of the casing. But with these devices it is not possible to produce the thorough drying and the protection of the fibers from injury and over-heating as accomplished by my invention.

The invention is shown by way of example on the accompanying drawing in Figure 1 in side view with parts in section; Figure 2 is a plan view of the same form of construction; Figure 3 is a side view of a somewhat modified embodiment; Figures 4 and 5 are respectively diagrammatic views of two other modified embodiments.

Referring particularly to Figures 1 and 2 a comparatively large closed drum *a* is shown between which and the surrounding jacket or casing *b* a space *r* is left through which the web of threads is caused to pass. The intro-

duction of the threads or yarns *l* delivered from the sizing tank is indicated in Figure 1 at the right hand side of the drawing by an arrow. The threads are then made to pass over the roller *m*, the drum *a*, roller *o* and then back to the outside through the opening *n*. By means of the blower, ventilator, fan or equivalent pressure-producing or aspirating means *g* an air current is produced flowing through the channel *h*. In this channel a heater *i* or several of them are arranged, and a separating partition *k* substantially in the middle plane of the channel and extending within close proximity of the guide roller *o*. Preferably I may also arrange another separating partition *f* on the other side of the guide roller *o*. These partitions which extend clear of the walls of the channel formed between the casing *b* and the drum *a* and between the guide roller *o* and the air heating means *i* produce the important result, that the heated air will bathe the band-like or similar material *l* at the broad end of the channel and before it is discharged therefrom on both sides, so as to remove any stickiness from such material. The channel *h* opens up in substantially tangential direction into the space *r*, while upon the opposite side a lateral return conduit *q* leads to the suction pipe of the blower *g* (compare Figure 2).

As appears particularly from Figure 1 the threads *l* do not bear directly upon the surface of the drum *a*, but perforated ribs or the like *e* (Figures 1 and 2) are provided at certain distances upon the periphery of the drum. These ribs may, for instance, be formed by freely exposed rods which are only supported in a few places. In the modified construction according to Figure 3 the thread guiding means on the drum are in form of a reel. The drum *a* may be carried around and rotated by the threads which are wound upon the ware-beam; or the drum may be moved by separate means. Of course, a very large number of threads, say about 700, may be conducted through the device.

The operation of the drying means is substantially as follows:

The air which has been heated by the heater *i* is forced through the space *r* by the operation of the fan *g* and then aspirated again. In this substantially circular movement which takes place in counter-current direction with relation to the movement of the threads the air current is first divided by the separating partitions *k* and *f* (Figure 1) in the channel *h*, and each of these divisional currents is caused to permeate the threads on their path above and below the guide roller *o*. The air current is then conducted through the gradually narrowing space *r* while completely surrounding the web of threads. In this comparatively small drying space a very efficient drying of the material at a high velocity of the air and with the greatest economy of heat is produced, and the threads or yarns are protected from injury. They are prevented from coming in contact with heated surfaces, and superheating cannot take place, inasmuch as after the stopping of the blower or fan there is no further utilization of the heating action.

The economy of heat is increased by the possibility of using the drying air over again, and it may be further increased by a heat protecting covering of the jacket or casing *b* and of the channels *h* and *q* and of the blower *g*. At suitable places of the casing *b* and of the channels *h* and *q* guard openings, windows and the like provided with closures and not shown on the drawings, or flaps, dampers or the like may be provided.

In view of the fact that the threads are freely exposed by the provision of the supporting frame or the like *e*, the air is freely admitted below the web of threads, as appears from Figures 1 and 3. It will also be seen from Figures 1 and 2 that on the right side of the device the jacket *b* comes up very closely to the path of the threads.

In place of the supporting frame or ribs shown in Figures 1 and 2 at *e* a freely exposed frame, similar to a reel and shown in Figure 3 may be employed. This insures the repeated flow and permeation of the drying air and contact therewith on all sides. In the case of an excessive resistance to the flow of air, when employing closely adjacent or specially prepared or strong threads at those points where the drying air is forced through the path of the threads, special by-pass conduits may be provided. This embodiment is shown for instance in Figure 4, where a channel *s* is laterally branched off at the point where the guide roller *o* is situated in the channel *h*, the said by-pass conduit *s* communicating with the jacket space *r* above the admission opening *n*, so that the drying air is given an opportunity to reach the space *r* wholly or in part without flowing through the lower portion of the path of the threads.

At suitable points of the channels through which the air is caused to flow regulating or controlling means, not shown, because their construction and arrangement are obvious, may be provided, in order to be able to cause a throttling action or to admit fresh air, whenever desired. The driving means for the blower or fan *g* are, of course, likewise such, as to admit of regulation, and possibly so as to depend upon the speed of rotation of the drum *a*. Instead of the heating means *i* I may use a heated outer jacket *b*, so that the circulating current of air is heated by contact with the outer surfaces of the jacket or casing *b*.

With a view of causing the hot air in the substantially annular space *r* to be brought

into most intimate contact with the threads the inner surface of the jacket or casing *b* may be provided with ribs, projections or the like or may be corrugated or of undular shape, as shown at *t* in the diagrammatic view of Figure 5 of the drawing. By this means the dry air is forced away from the periphery and against the path of the threads.

I do not intend to limit the invention in every respect to the details of construction and to the particular embodiments and arrangement of parts shown by way of exemplification only, but changes and alterations may be made in accordance with varying conditions of application, and to suit the convenience of the operator, and without deviating from the scope and spirit of the invention, as defined in the appended claims.

I claim:—

1. In a device of the kind described in combination, a slowly rotatable, comparatively large, closed drying drum, an outer casing, eccentrically and spacedly surrounding said drum, and forming a channel of gradually decreasing diameter between the casing and the drum, hot-air-admitting means at the broad end of the channel, and air-discharging means at the narrow end of said channel, guiding means, spacedly and peripherally mounted on the drum in the interior of the channel, a supply of thread-like material in contact with said guiding means and passing from the broad end of the channel to the narrower end thereof, and substantially plate shaped subdividing means substantially in the direction of the thread-like material and extending from the air-admitting means to said material.

2. In a device of the kind described in combination, a slowly rotatable, closed drying drum, a substantially drum-shaped casing, spacedly and eccentrically surrounding the drum, and forming a substantially circular channel of gradually decreasing cross section between the drum and the casing, air admitting means communicating with the wide end of the channel, and air discharging means adjacent the admitting means and communicating with the narrow end of the channel, heating means on the air admitting means, guiding means for flexible yarn-like material in said wide end and spaced from the walls of the channel and from the air admitting means, subdividing partitions in the said wide end extending from the air admitting means on both sides of the guiding means substantially in parallelism to the wall of the casing, and supporting means of the material in the channel and spaced from the walls thereof.

3. In a device of the kind described in combination, a slowly rotatable, closed drying drum, a substantially drum-shaped casing, spaced and eccentrically surrounding said drying drum, and forming a substantially circular channel of gradually decreasing cross section between the drum and the casing, air-admitting and heating means at the broad end of said channel, and air discharging means at the narrow end of the channel and adjacent the air-admitting means, admitting and guiding means for yarn-like flexible material at the narrow end of the channel near the air-discharging means, and discharging means and guiding means for said material in the broad end of the channel spaced from the channel-walls and from the air admitting means, subdividing partitions in the said broad channel-end, extending on either side of the guiding means of said broad end, substantially in parallelism with the channel-walls, and supporting means for the material around the drum and spaced from the channel-walls.

4. In a device of the kind described in combination, a slowly rotatable, closed drying drum, a substantially drum shaped outer casing, spacedly and eccentrically surrounding the drum, and forming a substantially circular channel of gradually decreasing cross section between the drum and the casing, air-admitting and heating means at the broad end of said channel, and air-discharging means at the narrow end of the channel and adjacent the air-admitting means, guiding and admitting means for flexible yarn-like material at the narrow end of the channel, and guiding means for said material within the broad end of the channel spaced from its walls and from the air-admitting means, subdividing partitions in said broad end, extending on opposite sides of the guiding means up to the air admitting means at one side and substantially parallel to the walls of the channel and intermediate said walls, and a by-pass conduit outside the casing and extending from the vicinity of the guiding means of the broad end to somewhat beyond said partitions, and discharging means for the material at said broad channel-end intermediate the two ends of said conduit, and supporting means for the material around the drum and clear of the walls of the channel.

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