

March 16, 1926.

1,576,906

P. GREVE

TWINE POLISHING AND DRYING MACHINE

Filed April 22, 1924

Fig. 1.

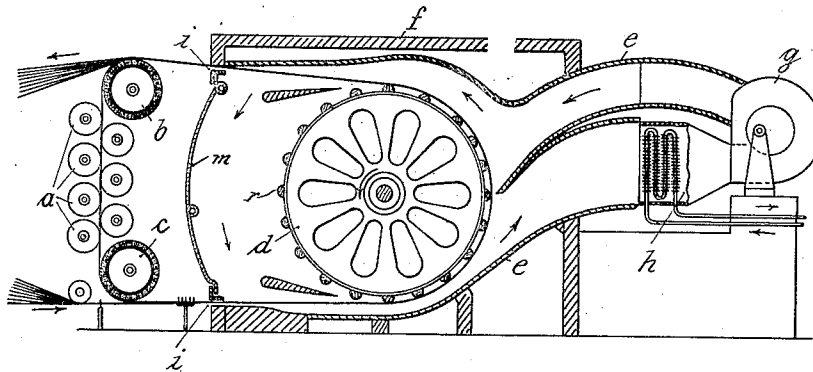
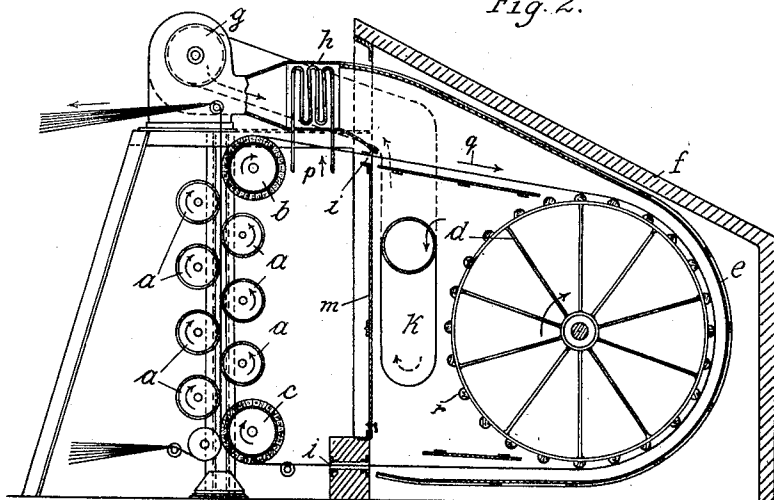


Fig. 2.



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Patented Mar. 16, 1926.

1,576,906

# UNITED STATES PATENT OFFICE.

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TWINE POLISHING AND DRYING MACHINE.

Application filed April 22, 1924. Serial No. 708,194.

*To all whom it may concern:*

Be it known that I, PAUL GREVE, a citizen of Germany, and a resident of house Number 220 in the town of Lindau, Harz, Germany, have invented certain new and useful Improvements in Twine Polishing and Drying Machines, of which the following is a specification.

This invention has reference to a combination of polishing and drying means for twines, cords and the like, and it is particularly intended to provide means for increasing and improving the output and the character of the product obtained, and to facilitate the general operation and to simplify the construction of devices of the kind referred to. Broadly speaking the invention is distinguished from the previous art among other important features by the fact that the drying is effected by means of an unheated cylinder and by hot air, the usual drying cylinder in accordance with my invention serving chiefly as a guiding means, while the drying proper is effected by hot air surrounding the twine, string, cord or the like before, during and after its passage over said cylinder; and in a preferred form of construction I may arrange the drying means in a separate enclosure and not containing the polishing or smoothing means for the threads which are usually coated or impregnated with size or the like. Means are also provided in the practice of my invention to cause the current of drying air to circulate through said drying room and over and around the threads several times, while the polishing or smoothing operation may be conducted outside of said drying room in the usual manner by conducting the threads over and between a plurality of rotating polishing rollers or the like.

The carrying out of the polishing or smoothing and of the drying operation in two separate enclosures is also an important feature of my invention, inasmuch as according to previous methods these operations have been carried out in one and the same enclosure, so that the exudations and vapors from the size greatly interfered with the success of the drying process, while the drying air caused a partial premature solidification of the size entailing the liability of breaking of the threads. Of such previous devices I may mention cursorily the alternate passing of the twine threads through a supply of paste and over felt-coated fric-

tion and guiding rollers while according to other suggestions the twine was guided over a plurality of fluted and moistening rollers, and subsequently through a heated container in which a series of polishing rollers were grouped around a heater. The drying operation was ordinarily effected heretofore by means of a plurality of adjacently arranged heated drying rollers between which vanes or the like were arranged, in order to impart a certain direction to the drying air, or according to another suggestion, a single interiorly heated drying cylinder cooperating with a polishing brush mounted in the proximity thereof has been employed. By employing an unheated drying cylinder according to my invention the fiber of the thread is preserved and saved from burning, and by this means and by the separation of the drying and polishing or smoothing means the entire operation may be more easily conducted and controlled, and the drying efficiency is increased by the repeated circulation of the drying air out of contact with the polishing means, the radiation of heat is overcome, and the operation is facilitated in view of the fact that the several steps may be controlled independently, and the polishing or smoothing rollers being arranged outside of the drying room are accessible from both sides.

The invention is illustrated on the accompanying drawing in two forms of embodiment of the principles thereof by way of example, and in a conventional manner in Figures 1 and 2 in part side view and with parts in section.

In the drawings:—*a* are the polishing or smoothing rollers, *b* and *c* are the guiding and circulating reels, *d* is a drum with closed shell and surrounded by the casing *f*, and not adapted to be heated. *e* indicates passages or channels for the air communicating with the bellows *g* and containing the heating means *h*. The form of construction according to Figure 2 is chiefly distinguished from Figure 1 by the fact that the heater or radiator is mounted above the polishing rollers. In both forms of execution of the invention the drying room is closed by the wall *m* which only leaves the narrow holes or slots for the passage of the threads which, for the drying operation, are preferably arranged in one and the same plane.

The method of operation of the device is substantially as follows: A plurality of

threads, say 12, 16, 24 or more threads, depending upon the strength and thickness of the threads, are conducted during the polishing or smoothing operation simultaneously into the drying chamber and over the drum *d*. Upon their escape from the drying chamber the threads are again passed between the polishing rollers *a*, and are then caused to pass again through the drying chamber. This procedure may be repeated several times according to the number of threads introduced and depending upon the width of the machine, and may be carried on a dozen times or more. While the threads are passed around the drum *d* they are acted upon by a current of hot air furnished by the bellows *g* or in any other manner, the said air current circulating continuously around the drum *d*, as indicated by the arrows, thereby thoroughly bathing the threads. Fresh air may be introduced into the channel *e* or to the bellows at any suitable point and may be controlled in the usual manner. The drying chamber is preferably protected from loss of heat by heat insulating material or by several outer coatings.

In the form of construction according to Figure 2 the hot air, after having passed around the drum *d* and after having acted upon the threads during their entire passage through the chamber, is forcibly aspirated at a point *k* near the wall *m*, so that no hot air is likely to be lost at the points of entrance and discharge *i* of the threads. From Figure 2 it also appears that the passage or channel *e* is reduced in sectional areas at the parts where the threads are supported upon the large drum *d*, so that in this portion of the casing the velocity of the heating air is increased. In that portion of the casing *e* in which the threads are freely exposed they are bathed on all sides by the hot air, and before the threads are allowed to escape, the air is sucked off, is conducted through the bellows, fan or the like *g* and through the heating device and is then again introduced into the drying chamber after only a short outside passage. The heating means may be of any suitable kind desired, and it may also be arranged, if desired, in the drying chamber itself. The arrows *p* in Figure 2 indicate the way of the heating medium for heating the heater *h*. In Figure 1 there is a substantially fork-shaped channel *e* for the passage of the hot air so that the streams of incoming and outflowing air may not interfere with each other. In Figure 2 the air is conducted by the narrow passage *e* into close proximity with the drum *d*.

The threads, for instance, may be introduced at the lower left hand side of the two figures, and in a parallel direction, as indicated by the arrow. In Figure 1 they are

passed directly into the chamber *f*, while in Figure 2 they are first conducted upwards between the polishing rollers. In this figure they are then conducted around the upper rollers and reel *b* to the right and around the drum *d*. Some of the threads are then again passed downwards between the rollers and around the lower roll or reel *c* and through the slot *i*. By this means the threads are passed twice through the polishing device. In accordance therewith, and as appears from Figure 2, the incoming threads are preferably somewhat spaced from each other, so that the outgoing threads may pass in these spaces and between the incoming threads. In Figure 2 the threads enter the chamber *f* at the upper slot *i* in the direction of the arrow *q* which also approximately indicates the direction of flow of the heating air from the bellows or fan *g* over or between the heater pipes *h*, and into the room *f* and around the drum *d*, whereupon the air is sucked off at *k*.

Among the several advantages of the new arrangement I may mention the following:— The threads to be polished are not injured, inasmuch as they are prevented from coming in contact with steam heated surfaces or steam cylinders which would entail the danger of superdrying, overheating and burning, particularly in case of an unavoidable interruption of operation; hence, with the new method and means there is no liability of sticking of the sized threads, and in contradistinction to the machines with steam heated drying cylinders the tension of the threads may be increased to the maximum, so as to produce the very best degree of polish. There is the further advantage over steam heated drying cylinders that the drying surface is increased for a multiple thereof, and the drying operation is particularly efficient on account of the strong current of air. Then, the heat is utilized in the most efficient and economical manner, inasmuch as by the circulation of the air the greater part thereof is always re-conducted into the system, while, in view of the insulation of the drying chamber, the liability of loss of heat is reduced to a minimum; nor is there any radiation of strong heat into the working room, which is unavoidable in the case of steam heated drying cylinders. It therefore appears that with the device according to my invention lower temperatures may be used in the drying process than usually employed heretofore, so that a great economy in fuel and steam may be effected, while at the same time a highly superior polishing effect is produced, such as is not produced by the instrumentalities heretofore suggested, as far as I am aware. Generally a drying temperature of, say, from 35 to 40 degrees centigrade will be found satisfactory and sufficient. By dis-

posing the smoothing and polishing rollers at the outside of the air chamber the scraping and rubbing off of the size from the cords or threads and the thereby resulting clogging up and soiling of the air chamber and of the drum *d* are prevented and the polish is more uniform and permanent than in the case of the rollers acting upon the size in its hottest condition. My invention is also particularly distinguished by the fact that in its most preferred embodiment the warm drying air is caused to pass in the same direction as the threads or cords by which means roughening of the fibers and scorching thereof is prevented, which is liable to occur, when the nearly dried and hot threads meet the warm current of air at its highest temperature. In my invention the warm air travels in the same direction as the threads or cords, so that the warm air current is cooled off gradually as it flows along the threads, and the dried thread is surrounded by a comparatively cooled current of air, and is prevented from becoming ruptured in leaving the air chamber by the sudden drop of temperature which it would have to undergo, in case of the air current flowing in the opposite direction, and there is the further advantage that the air current in my invention by its co-directional course will lay down and smooth the fibers, instead of blowing them up and roughening them. By arranging the polishing rollers outside of the air chambers any occurring ruptures of threads may be easily remedied, while the staggered relation of the rollers prevents jamming and irregularity of pressure.

It is obvious that other modifications are possible within the scope of my invention, to better adapt the same to varying conditions of application, and without deviating from the spirit of the invention, as set forth in the claims hereunto appended.

The invention may be modified by providing the drum *d* with projections or ribs *r*, so that the twine or cord to be dried and polished may be more easily surrounded on all sides by the hot air. Instead of air equivalent inert gases or fluids may be used.

I claim:—

1. In a device of the character described in combination, a substantially closed drying chamber, an unheated supporting closed roller in said chamber, a plurality of polishing rollers outside of the chamber, means to pass a plurality of threads over and between said rollers and through said chamber and in contact with the supporting roller, air heating and circulating means communicating with said chamber, and air aspirating means in the said chamber near the outer wall thereof and communicating with the air circulating means.

2. In a device of the kind described in

combination, a substantially closed drying chamber, an unheated supporting closed roller in said chamber, a plurality of polishing and smoothing rollers outside of the chamber, means to pass a plurality of threads repeatedly over and between said rollers and through said chamber and in contact with the supporting roller, an endwise widening air channel within the chamber and surrounding the supporting roller, and hot air circulating means communicating with the air channel.

3. In a device of the kind described in combination, a substantially closed drying chamber, an unheated rotatable supporting closed roller in the chamber, a plurality of alternately arranged polishing rollers outside of the chamber, means to pass a plurality of twine threads repeatedly over and between said polishing rollers and through the chamber in contact with the unheated roller, and hot air heating and circulating means communicating with the chamber.

4. In a device of the kind described in combination, a rotary, closed supporting cylinder, an air chamber in which said cylinder is housed and comprising a portion surrounding the cylinder at a small distance from the periphery thereof, a plurality of polishing rollers outside of said air chamber, and operatively engaging a plurality of sized threads carried by the supporting cylinder and moved thereby, and means to pass a current of heated air through said air chamber in contact with said threads and co-directional therewith.

5. In a device of the kind described in combination, a single rotating closed supporting cylinder, a substantially closed air chamber around said cylinder and at a small distance from a portion of its periphery, thread-supporting projections on said cylinder, a plurality of polishing rollers outside of the air chamber and engaging a plurality of sized threads, carried by the supporting projections of the cylinder and moved thereby, means to pass a current of heated air through said air chamber in contact with the threads and codirectional therewith, and thread-guiding means in the wall of the air chamber and intermediate the same and the polishing rollers.

6. In a device of the kind described in combination, an unheated, single rotating closed supporting cylinder, a substantially closed air chamber around said cylinder, differently spaced from different parts of the periphery of said cylinder, thread-carrying projections on said cylinder, a plurality of rotating staggeringly disposed polishing rollers outside of said air-chamber in engagement with a plurality of sized cords, carried by the projections of said cylinder and moved thereby, means to pass a current of heated air within the air chamber in

contact with the cords and codirectional therewith, and thread-guiding means in the wall of the air chamber and intermediate the same and the polishing rollers.

- 5 7. In a device of the kind described in combination, a substantially closed drying chamber, unheated rotatable outwardly closed supporting means in said chamber, ribs on said supporting means, a plurality

of polishing rollers outside of the chamber, 10 means to pass a plurality of threads in contact with said polishing rollers, and through the chamber and in contact with the ribs on the supporting means and hot air heating and circulating means communicating with 15 the chamber.

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