June 9, 1953 E. A. WENTZ 2,641,062

APPARATUS FOR DRYING YARN AND THE LIKE

Filed Dec. 21, 1948 5 Sheets-Sheet 1

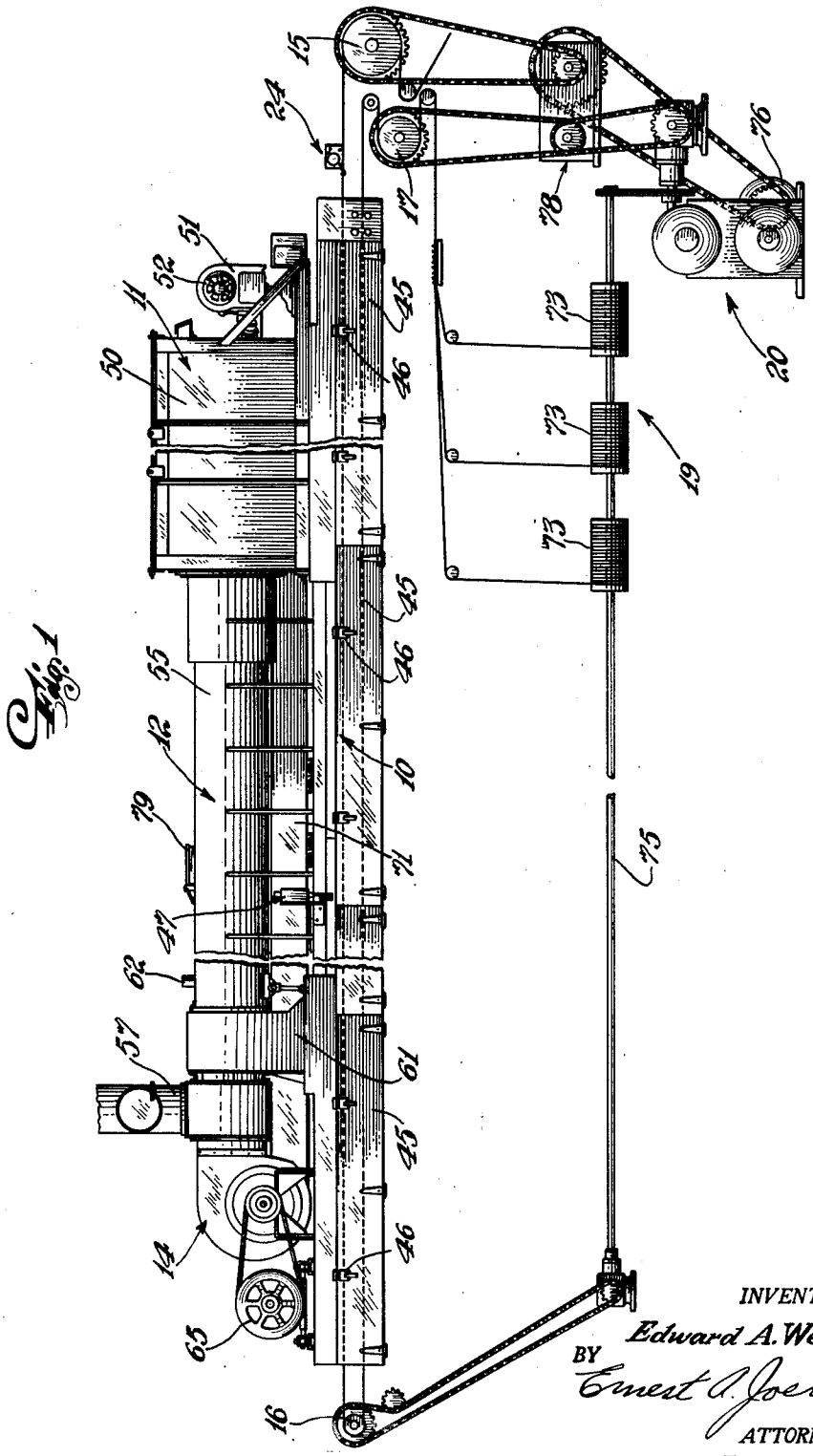


Fig. 1

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APPARATUS FOR DRYING YARN AND THE LIKE

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Fig. 2

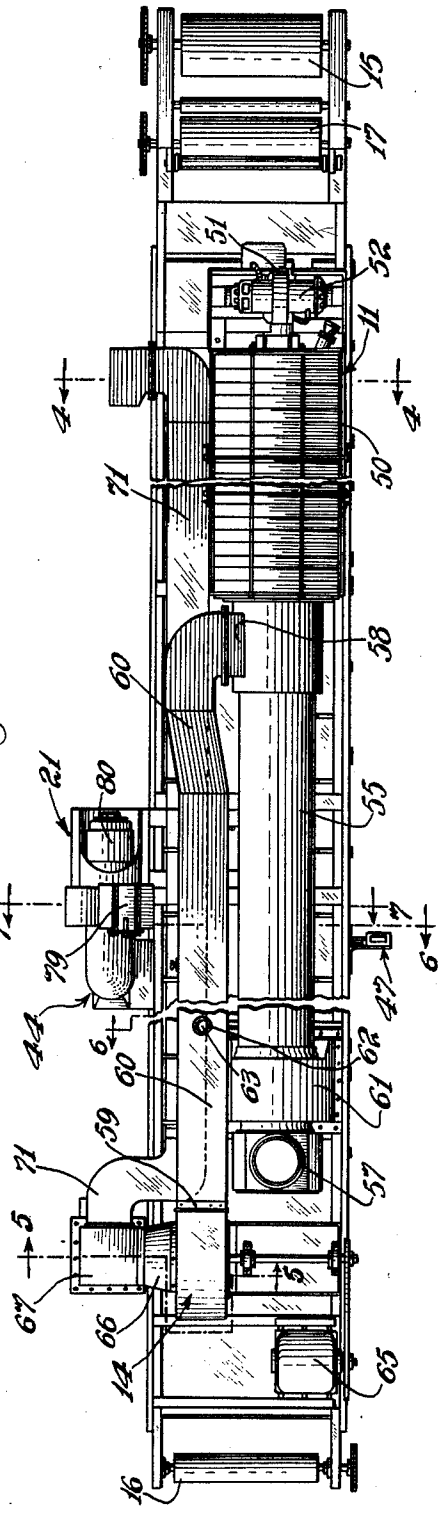
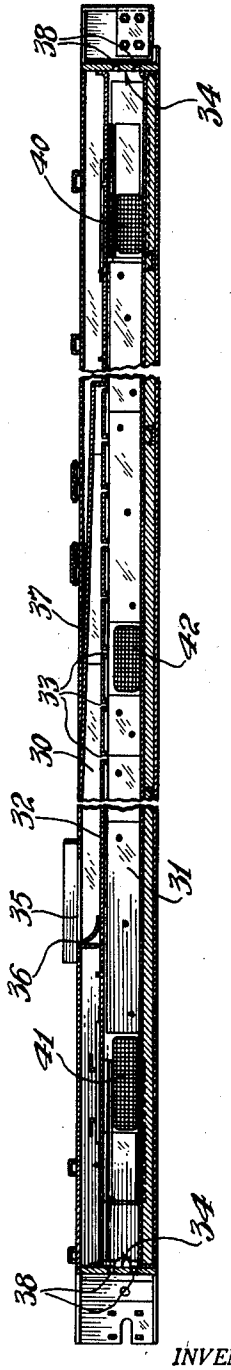


Fig. 3



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APPARATUS FOR DRYING YARN AND THE LIKE

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Fig. 4

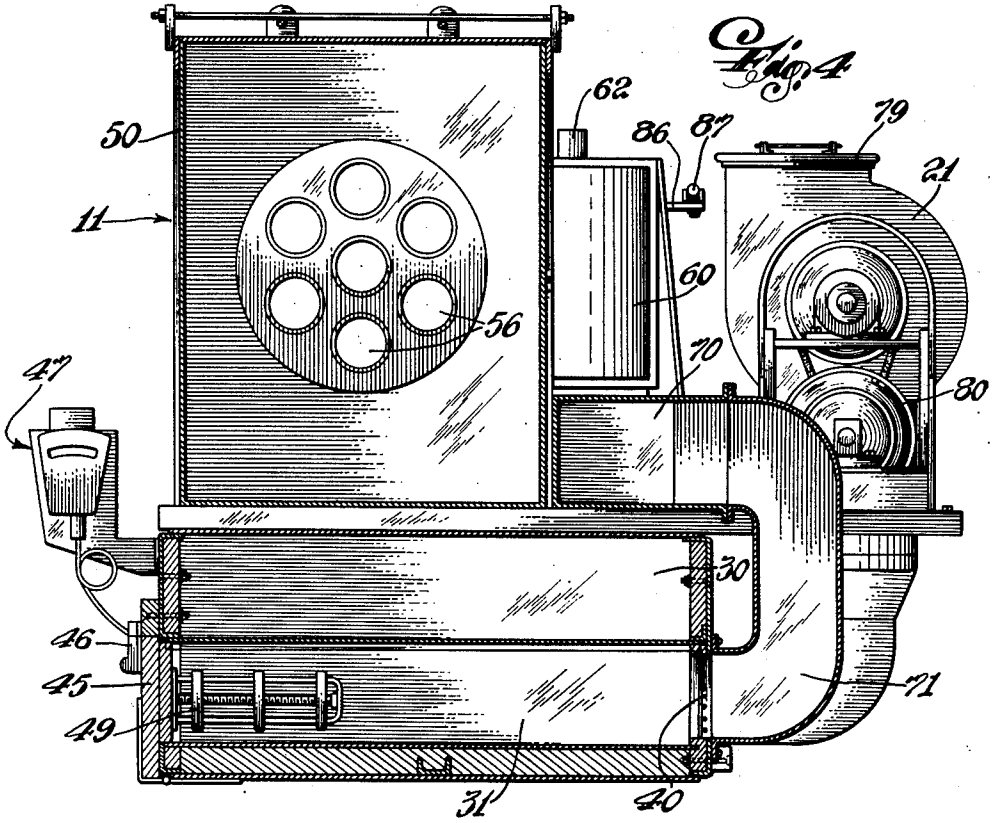
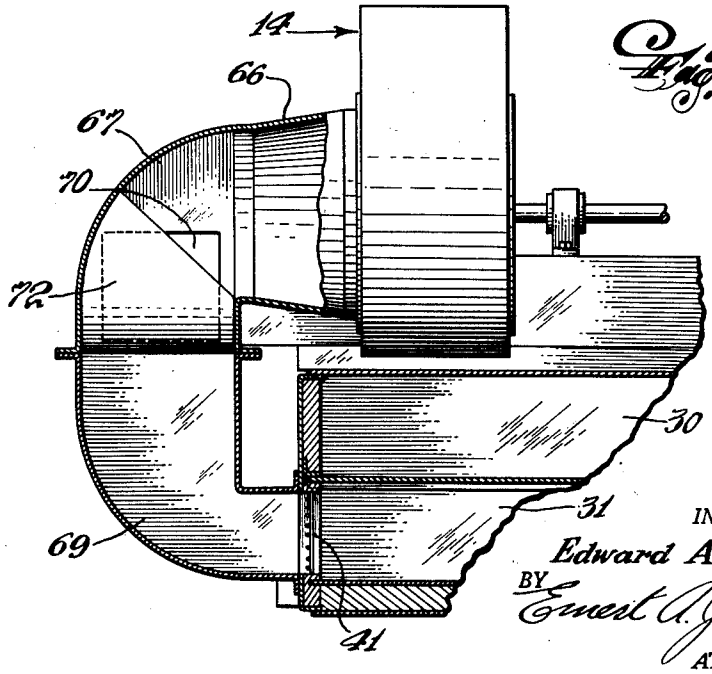


Fig. 5



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APPARATUS FOR DRYING YARN AND THE LIKE

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Fig. 6

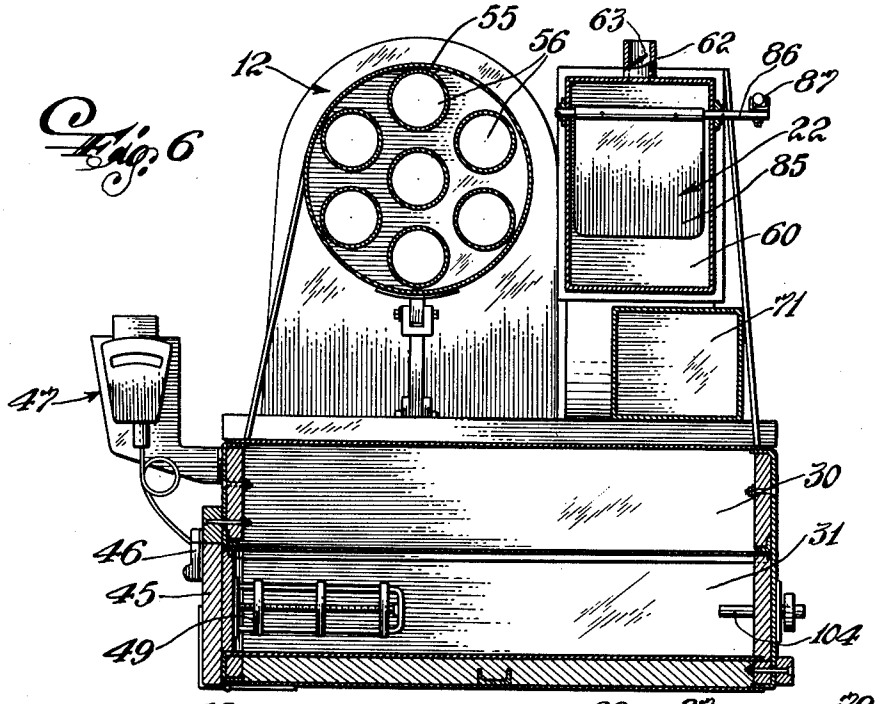
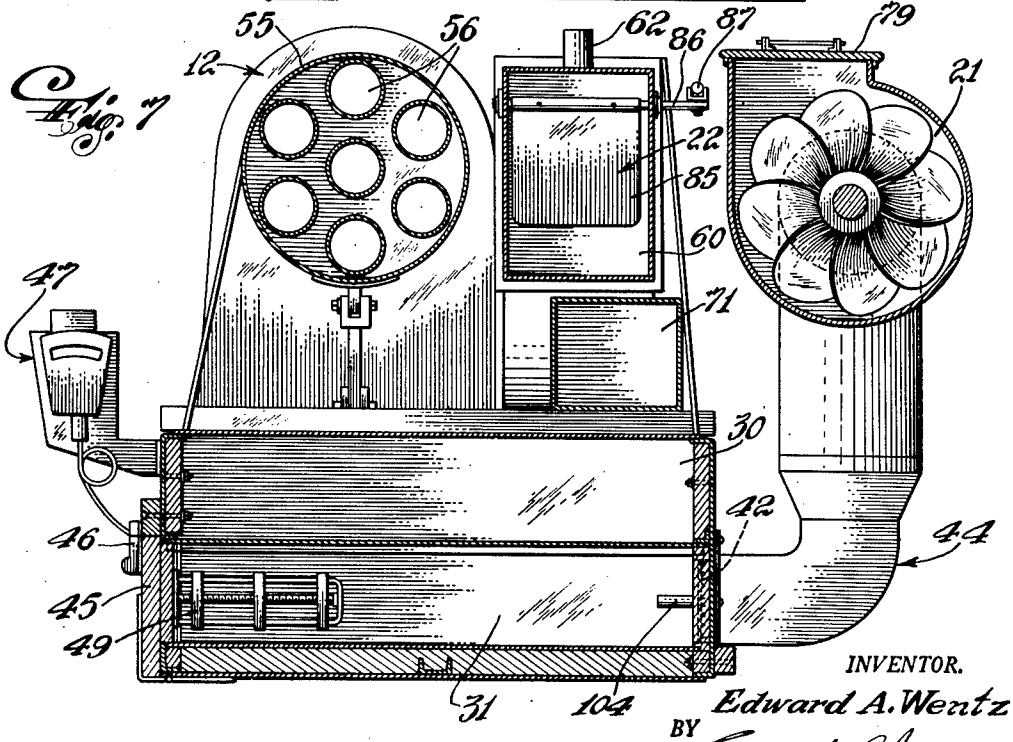


Fig. 7



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APPARATUS FOR DRYING YARN AND THE LIKE

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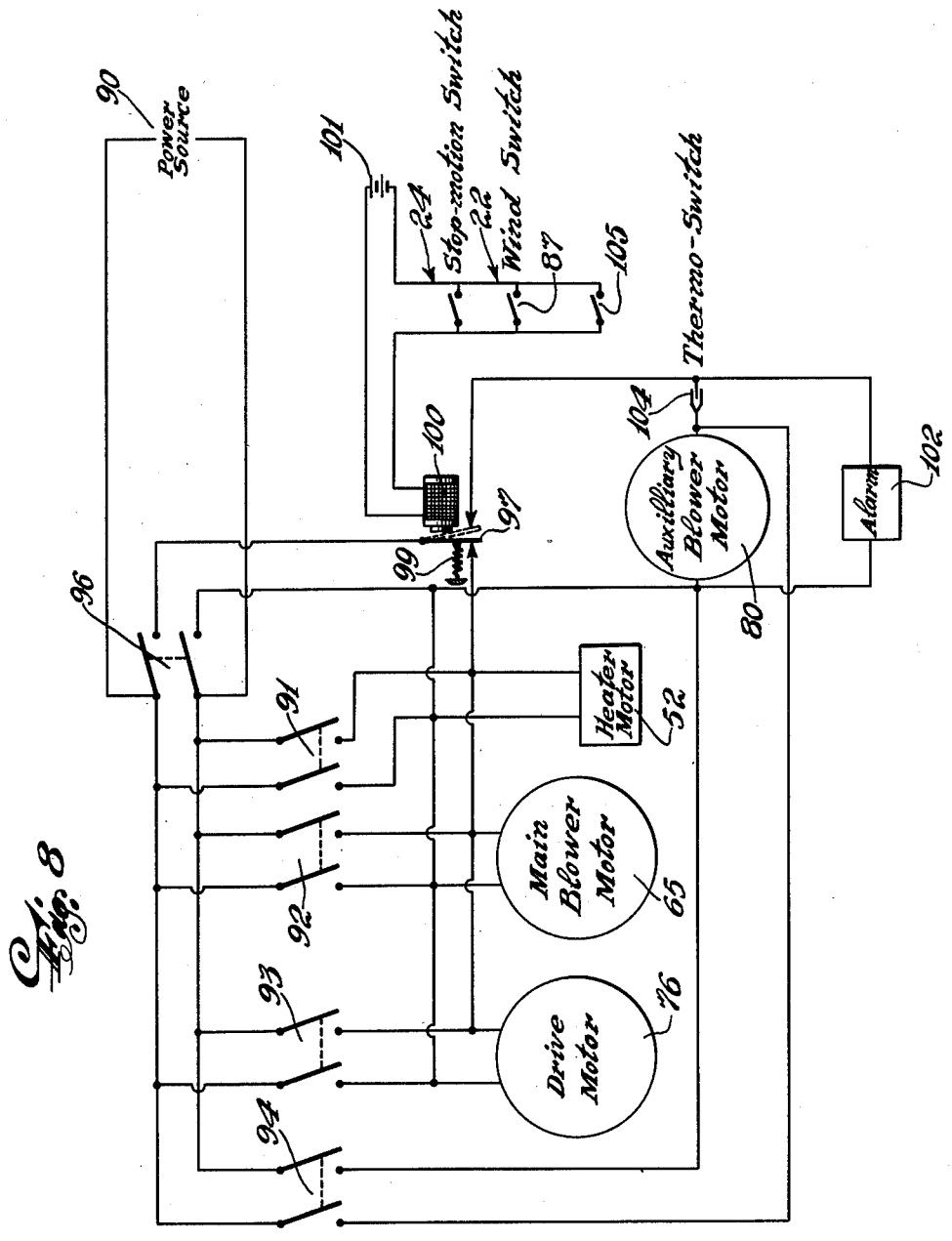


Fig. 8

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APPARATUS FOR DRYING YARN AND THE LIKE

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Application December 21, 1948, Serial No. 66,493

23 Claims. (Cl. 34—44)

1

The present invention relates to drying yarn and the like, and, more particularly, to such apparatus used in connection with yarn which is impregnated with a liquid containing a bonding agent, is stretched, is dried while stretched and is then wound to package the same.

Accordingly, an object of the invention is to provide improved apparatus of the foregoing character.

Another object is to provide such apparatus which is automatically controlled to prevent damage to the yarn.

Another object is to provide such apparatus which is rapid, efficient and economical in operation.

Another object is to provide such apparatus which is under the control of a common drive.

Another object is to provide such apparatus wherein breakage of the yarn and/or failure of the drying medium supply effects stoppage of the drive.

Another object is to provide such apparatus wherein the drying chamber is cooled upon stoppage of the drive to prevent overheating of the yarn.

Another object is to provide such apparatus wherein a heater, such as an oil burner, can be advantageously utilized.

Another object is to provide such apparatus wherein the supply of drying medium is utilized to produce optimum drying conditions.

A further object is to provide such apparatus with automatic safety devices which are reliable in operation.

A still further object is to provide apparatus for producing packages of yarn which are properly dried and protected against overheating or scorching.

Other and further objects of the invention will be obvious upon an understanding of the illustrative embodiment about to be described, or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

A preferred embodiment of the invention has been chosen for purposes of illustration and description, and is shown in the accompanying drawings, forming a part of the specification, wherein:

Figure 1 is a fragmentary side elevational view of apparatus in accordance with the invention, certain elements thereof being shown more or less schematically.

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Figure 2 is a fragmentary plan view of the machine shown in Figure 1.

Figure 3 is a framentary longitudinal sectional view of the drying chamber and the air circulating ducts connected thereto.

Figure 4 is an enlarged sectional view taken substantially along the line 4—4 on Figure 2, illustrating one of the duct connections for removing air from the drying chamber.

Figure 5 is an enlarged sectional view taken substantially along the line 5—5 on Figure 2, illustrating the ducts for removing air from the drying chamber and their connection to the intake of the main blower.

Figure 6 is an enlarged sectional view taken substantially along the line 6—6 on Figure 2, illustrating the indicating thermostat for the drying chamber and the wind switch for the duct delivering air to the heat exchanger.

Figure 7 is an enlarged sectional view taken substantially along the line 7—7 on Figure 2, illustrating the auxiliary blower and its connection to the drying chamber and a thermo-switch which controls its operation.

Figure 8 is a wiring diagram, illustrating a simplified control circuit for the apparatus.

Referring to the drawings in detail and more particularly to Figure 1 thereof, there is shown yarn drying apparatus generally comprising an elongate drying chamber 10 through which the yarn is advanced, a heater 11, a heat exchanger 12 connected to the heater, a main blower 14 connected for circulating the drying medium through the heat exchanger and the drying chamber, rolls 15, 16 and 17 for advancing the yarn through the drying chamber, a winder 19 for packaging the yarn passed through the drying chamber, and a drive 20 for operating the rolls and the winder.

The apparatus further comprises safety devices including an auxiliary blower 21 (Figure 2) for exhausting the drying chamber in the event of failure of the main blower which is detected by a wind switch 22 (Figure 6) or in the event of stoppage of the yarn advancing rolls upon the occurrence of a break in the yarn detected by a stop motion switch 24. As will be described hereinafter, the safety devices are arranged so that, when the auxiliary blower is rendered effective, the heater, main blower and drive are rendered ineffective.

The drying chamber

As shown in Figures 3 to 7, the drying chamber 10 is horizontally positioned and is of con-

siderable length, portions thereof not varying in essential details from the portions shown being broken away to facilitate illustration, and is generally rectangular in cross-section, having a width to pass side by side therethough a number of ends of yarn, for example fifty, although only three ends are shown for simplicity. The chamber is suitably heat insulated to fully utilize the drying effect of the heated drying medium and to prevent undue heating of the air ambient to the apparatus.

The drying chamber is divided into upper and lower sections 30 and 31 by a lengthwise extending partition 32 having cross-wise slits or louvers 33 therein at about the middle zone thereof for admitting drying medium from the upper section to the lower section. The flow of the drying medium from the upper section to the lower section is particularly advantageous because, in the event of stoppage of the main drive and the main blower, the hot drying medium in the upper section will not flow by convection into the lower section, whereby overheating of the yarn is prevented. The ends of the drying chamber are closed by vertical insulated walls 34, each having a pair of cross-wise extending slits 38 for facilitating advancing the ends of yarn into and out of the lower chamber section.

The upper section 30 of the drying chamber has an inlet opening 35 (Figure 2) connected to the heat exchanger outlet for receiving heated drying medium therefrom, and has a curved end wall 36 adjacent the opening and an inclined top wall 37 within the drying chamber proper which extends downwardly over the slits 33 to maintain uniform pressure of the drying medium.

The lower section 31 of the drying chamber has two drying medium outlet openings 40 and 41 in the side wall thereof, each adjacent to but spaced from one end of the chamber, which are connected to the intake of the main blower 14 as described hereinafter. A third outlet opening 42 is provided in the side wall at the middle zone of the chamber which is connected by a duct 44 (Figure 7) to the intake of the auxiliary blower 21.

In order to attain access to the lower section of the drying chamber to arrange the ends of yarn therein, repair breaks in the yarn and perform other operations, one side wall of the lower section comprises a series of removable closures such as door members 45 (Figure 1) hinged at their lower edges to the bottom wall of the chamber and removably locked in closed position by latch means 46 on the side wall of the upper chamber section.

As shown in Figure 6, an indicating thermostat 47 is mounted on the side of the drying chamber having its thermo-sensitive element 49 disposed in the lower chamber section, so that the temperature in the chamber can be observed.

The heater

The heater 11 comprises a combustion chamber 50 mounted on the drying chamber adjacent its right hand end, as shown in Figures 1, 2 and 4, and an oil burner 51 arranged to direct its flame into the combustion chamber.

The oil burner is of conventional construction, being provided with a motor driven blower unit 52 for supplying air to the combustion zone and a pump (not shown) under the control of the unit for feeding the oil to the combustion zone.

The heat exchanger

The heat exchanger is shown in Figures 1, 2, 6 and 7 and comprises an outer tube 55 extending lengthwise above the drying chamber at the middle zone thereof through which the drying medium is circulated, and a plurality of inner tubes 56 arranged within the tube 55. The inner tubes have one end thereof connected to the outlet of the combustion chamber and have the other end thereof connected to a stack 57 in the conventional manner whereby the combustion products are discharged after giving up heat to the drying medium.

The outer tube 55 has a side inlet at 58 (Figure 2) at its end adjacent the combustion chamber for receiving drying medium from the exhaust 59 of the main blower 14 by means of a conduit 60. The other end of the outer tube has an outlet connected to the opening 35 of the upper chamber section by a duct 61 (Figure 1) whereby the heated drying medium leaving the heat exchanger is introduced into the drying chamber. The conduit 60 may be provided with an outlet 62 (Figures 2 and 6) controlled by a valve 63 whereby a predetermined portion of the recirculated drying medium is bled to the atmosphere and fresh air is caused to be drawn into the system by way of the slits 38.

The main blower

As shown in Figures 1 and 2, the main blower 14 is located above the drying chamber adjacent the left hand end thereof. The blower is driven by a motor 65 and has an intake 66 (Figures 2 and 5) to which a manifold 67 is connected. As previously described, the exhaust 59 of the main blower is connected to the conduit 60.

The manifold 67 has an inlet opening 69 in fluid flow connection with the outlet opening 41 of the lower chamber section and has a second inlet opening 70 connected by a conduit 71 to the other outlet opening 40 of the lower chamber section (Figure 4). As shown in Figure 5, a baffle 72 is disposed in the manifold to divide the section of the blower at the intake substantially equally between the openings 69 and 70, whereby approximately the same volume of drying medium is removed from the drying chamber through the openings 40 and 41.

The yarn advancing rolls

Since the yarn preferably is passed through the drying chamber twice to dry the same, first in one direction towards the left and then in the opposite direction towards the right as viewed, the rolls 15, 16 and 17 are arranged accordingly (Figure 1). The roll 15 is located at the right hand end of the drying chamber and leads the yarn therein, the roll 16 is located at the left hand end and pulls the yarn from the chamber and leads it back in, and the roll 17 is located at the right hand end adjacent the roll 15 and pulls the yarn from the chamber.

The winder

The winder includes a plurality of spindles (not shown) for removably supporting package tubes, spools, or the like, the number of such spindles being several in excess of the number of ends of yarn treated to facilitate doffing, although only three packages 73 are shown for purposes of illustration. Rotation of the spindles is effected by a shaft 75 extending lengthwise along the apparatus below and at one side of the drying chamber (Figure 1).

The drive

A common drive for the rolls 15, 16 and 17 and

the winder enables the yarn to be passed through the drying chamber and to be wound into packages in synchronized relation. This drive comprises a motor **76**, and a variable drive **78** connected by suitable sprockets and chains (Figure 1) to the rolls **15** and **17** to effect rotation thereof and connected by suitable sprockets and chains to the right hand end of the shaft **75** to effect rotation thereof. The left hand end of the shaft **75** is connected by suitable sprockets and chains to the roll **16** to effect rotation thereof.

It will be appreciated that the ratios of the sprockets are such that the rolls and the shaft are rotated at predetermined interrelated speeds to enable the yarn to be packaged at the rate it is passed through the drying chamber. Also, the surface speeds of the rolls may be such that the yarn is subjected to a predetermined tension in passing through the drying chamber.

The safety devices

The safety devices include the auxiliary blower **21** for rapidly exhausting the drying chamber, the wind switch **22** for detecting failure of the main blower, and the stop motion switch **24** for detecting breakage of the yarn. As will be made apparent hereinafter, these devices cooperate together with other elements of the machine to prevent overheating or scorching of the yarn.

As previously mentioned, the auxiliary blower **21** has its intake connected to the lower chamber section outlet opening **42** by a duct **44**. The exhaust of the blower may be placed in communication with the atmosphere by a port or opening normally closed by a gravity operated flap valve **79**. A motor **80** (Figure 2) drives this blower.

The wind switch **22** comprises a vane **85** pivotally suspended in the conduit **60** (Figure 6) on a shaft **86** which operates a switch element **87** connected in a circuit about to be described. The switch is retained in open circuit position while the vane is deflected by drying medium passing through the conduit **60** and is moved into a closed circuit position when the vane moves to an approximately upright position due to the lack of flow of a predetermined volume of drying medium through the conduit **60**.

The stop-motion switch **24** is shown more or less schematically in Figures 1 and 2. This switch is of a conventional type wherein, while the yarn is tensioned, the switch is retained in open circuit position. Should tension in the yarn be diminished due to breakage or stoppage of the drive, the switch is allowed to move into a closed circuit position.

The wiring diagram

The arrangement and operation of safety devices will be more fully appreciated from the illustrative wiring diagram shown in Figure 8.

The heater motor **52**, the main blower motor **65**, the drive motor **76** and the auxiliary blower motor **80** are connected in parallel to a source of electrical power **90** and are adapted to be operated selectively during the threading or warming up cycles of the machine or for testing thereof under the control of switches **91**, **92**, **93** and **94**, respectively, for electrically connecting or disconnecting these motors.

The heater motor **52**, the main blower motor **65**, and the drive motor **76** are further connected in parallel to the source of power for concurrent operation during the normal operation of the machine by a switch **96**. This circuit is normally closed by a contact element **97** retained in such circuit closing position by a spring **99** and adapted to be moved into an open circuit position by a relay **100** arranged in a circuit for energization by a secondary power source **101** under the control of the wind switch **22** and the stop-motion switch **24**.

The auxiliary blower motor **80** is also adapted to be connected to the source of power through the switch **96**, but its connection for operation further depends upon operation of the relay responsive to closing of the switch **22** and/or **24** to move the contact element **97** into its emergency position as shown in broken lines. An alarm **102** is connected in parallel with the blower motor **80** in the emergency circuit to give a visible or audible indication that an emergency has arisen. Also, a thermo-responsive switch **104** located in the drying chamber may be connected in the auxiliary blower motor circuit to provide for energization of this motor when the temperature in the drying chamber is above a safe value and to shut off this motor after the temperature in the drying chamber has been reduced to a safe value.

In the following table the on or off condition of the motors during various conditions to which the machine may be subjected is indicated:

Condition	Main Blower	Aux. Blower	Heater	Drive
Testing	On or off [1]	On or off [1]	On or off [1]	On or off.[1]
Threading	Off	Off	Off	On.
Warm up	On	do	On	Off.
Normal operation	do	do	do	On.
Main Blower Failure		On	Off	Off.
Drive Failure	Off	do	do	

[1] Optional, under control of operator.

Operation of the apparatus

The apparatus is prepared for operation by testing the various motors to determine whether or not they are functioning properly and then manually operating the safety switches **22** and **24** to test the emergency circuit and the control of the motors thereby.

The switches **91** and **92** are closed to operate the heater and the main blower, respectively, whereby the drying chamber is warmed up.

With the switches **91**, **92**, **94** and **96** open, with the switch **93** closed to operate the drive, and with the doors **45** open, the apparatus is threaded by passing or pulling through by suitable means the leading ends of the yarn (which may have been impregnated or otherwise treated) so that they extend over the roll **15**, under the stop motion switch **24**, through the lower drying chamber section **31**, over the roll **16**, back again through the chamber over the roll **17** and to the winder where the leading end is secured to the package tube. The doors **45** are then closed.

The switches **91** and **92** are again closed and when the drying chamber has reached its proper operating temperature as is observed from the indicating thermostat **47**, the switch **96** is closed

to effect normal operation of the heater, the drive and the main blower and to condition the emergency circuit for operation. The switches 91 and 92 are opened thereby placing the various motors entirely under the control of the switch element 97 and the safety or emergency circuit. The yarn now is passed through the drying chamber and is packaged by the winder.

The heater causes hot gases to pass through the tubes 56 of the heat exchanger 12 to the stack 57 while the main blower forces air by way of the conduit 60 through the tube 55 in heat exchange relation with the tubes 56. The wind switch is tilted by the passage of air through the conduit 60. The heated air leaving the heat exchanger is introduced into the upper chamber section 30 and is distributed by way of the slits 33 in the partition to the lower section 31 to effect drying of the yarn. The spent air is removed from the lower section through the outlets 40 and 41 and is drawn into the intake of the main blower to complete its cycle of circulation.

If, during such normal operation, the main blower should fail, the wind switch vane 85 responds and effects closing of the switch element 87 whereby the solenoid 100 is energized and moves the contact element 97 to its broken line position (Figure 8). This cuts out the drive motor, the main blower motor and the heater motor, actuates the alarm and starts the auxiliary blower which quickly removes the heated air in the lower chamber section by way of the outlet 42 and to the atmosphere by way of the valve 79. When the temperature in the chamber has been reduced to a safe value, the switch 104 cuts out the auxiliary blower.

In this manner, the winding of the yarn is stopped to prevent improperly dried yarn from leaving the chamber while at the same time cooling the chamber quickly to prevent the yarn therein, during stoppage of the drive, from being scorched or otherwise damaged. To further facilitate this, the main drive may be provided with conventional braking means responsive to the de-energization of the main drive motor, and the main blower motor may be provided with similar braking means, such as a magnetic brake, whereby the main blower and its motor will not coast after de-energization of the motor and cause hot drying medium to be supplied after stoppage of the yarn. This feature is particularly desirable when the apparatus is utilized for treating yarns of the heat sensitive type.

In the event the drive should fail, the main blower and heater motors are cut out and the auxiliary blower motor is energized whereby the yarn in the drying chamber is protected against overheating while the drive motor is inactive. This may be accomplished by the closing of a switch 105 for energizing the solenoid 100, the switch 105 being under the control of torque responsive or relay means or the like (not shown) for detecting stoppage of the drive motor 76. It will be noted that the use of a common drive is highly advantageous, because movement of the yarn through the chamber and winding thereof ceases simultaneously, thereby preventing the winder from pulling stopped yarn in the chamber and causing breakage thereof, and prevents yarn from being advanced through the chamber and piled up in the event the winder has stopped. This is also highly advantageous because complete rethreading or the repair of numerous breaks in the yarn will not be necessitated.

Similarly, if an end of yarn should break, the stop-motion switch responds to the lack of tension therein and effects stoppage and cooling of the drying chamber in the afore-described manner, thereby preventing broken ends of yarn from snarling or otherwise tangling other yarn.

While the apparatus has been illustrated and described in connection with drying ends of yarn, it will be understood that the same may be utilized advantageously for drying strips, sheets or webs, and that the apparatus could be readily modified for steam treating such yarns, strips, sheets or webs while utilizing the advantages of the present invention.

From the foregoing description, it will be seen that the present invention provides improved apparatus for drying or otherwise treating ends of yarn and the like which embodies safety devices serving to prevent damage of the material being treated or the apparatus.

As various changes may be made in the form, construction and arrangement of the parts herein, without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be understood that all matter herein is to be interpreted as illustrative and not in any limiting sense.

It is also to be understood that the following claims are intended to cover all the generic and specific features of the invention herein described, and all statements of the scope of the invention, which, as a matter of language, might be said to fall therebetween.

I claim:

1. In apparatus for drying yarn and the like, the combination of a drying chamber, means for advancing yarn through said chamber, means for supplying a drying medium to said chamber including a blower, normally ineffective means including an auxiliary blower for supplying a purging medium to said chamber, and means responsive to the breakage of the yarn for rendering said auxiliary blower effective and for rendering said yarn advancing means ineffective.

2. In apparatus for drying yarn and the like, the combination of a drying chamber, means for advancing yarn through said chamber, means for supplying a drying medium to said chamber including a blower, normally ineffective means including an auxiliary blower for supplying a purging medium to said chamber, and means responsive to the breakage of the yarn for rendering said auxiliary blower effective and for rendering said yarn advancing means and said drying medium supplying means ineffective.

3. In apparatus for drying yarn and the like, the combination of a drying chamber, means for advancing yarn through said chamber, means for supplying a drying medium to said chamber, normally ineffective means for supplying a purging medium to said chamber, means responsive to the breakage of the yarn for rendering said purging medium supplying means effective and for rendering said yarn advancing means and said drying medium supplying means ineffective, and means responsive to the failure of said drying medium supplying means for rendering said yarn advancing means ineffective independently of said breakage responsive means.

4. In apparatus for drying yarn and the like, the combination of a drying chamber having an opening at each end, means for advancing yarn through said chamber, a heat exchanger, a blower connected with said heat exchanger and said chamber for circulating air through said heat

exchanger and said chamber, a normally idle auxiliary blower connected to said chamber for exhausting the same and for introducing cold air into said chamber through said end openings, and means responsive to the failure of air being circulated for rendering said auxiliary blower effective and said yarn advancing means ineffective.

5. In apparatus for drying yarn and the like, the combination of a drying chamber having an opening at each end, means for advancing yarn through said chamber, a heat exchanger, a blower connected with said heat exchanger and said chamber for circulating air through said heat exchanger and said chamber, a normally idle auxiliary blower connected to said chamber for exhausting the same and for introducing cold air into said chamber through said end openings, and means responsive to the breakage of the yarn for rendering said auxiliary blower effective and said yarn advancing means and said first mentioned blower ineffective.

6. In apparatus for drying yarn and the like, the combination of a drying chamber having an opening at each end, means for advancing yarn through said chamber, means for winding the yarn advanced through said chamber, common drive means for operating said advancing and said winding means, a heat exchanger, a blower connected with said heat exchanger and said chamber for circulating air through said heat exchanger and said chamber, a normally idle auxiliary blower connected to said chamber for exhausting the same and for introducing cold air into said chamber through said end openings, and means responsive to the breakage of yarn for rendering said auxiliary blower effective and said drive means and said first mentioned blower ineffective.

7. In apparatus for drying yarn and the like, the combination of a drying chamber having an opening at each end, means for advancing yarn through said chamber, means for winding the yarn advanced through said chamber, common drive means for operating said advancing and said winding means, a heat exchanger, a blower connected with said heat exchanger and said chamber for circulating air through said heat exchanger and said chamber, a normally idle auxiliary blower connected to said chamber for exhausting the same and for introducing cold air into said chamber through said end openings, and means responsive to the failure of air being circulated for rendering said auxiliary blower effective and said drive means ineffective.

8. In apparatus for drying yarn and the like, the combination of an elongate drying chamber, a lengthwise extending partition in said chamber dividing said chamber into upper and lower sections and having louvers therein for establishing fluid flow communication between said upper and lower sections, said lower section having an opening at each end, means for advancing yarn through said lower chamber section, means connected for supplying a drying medium to said upper section and for removing the medium from said lower section adjacent each end thereof, and means connected at about the middle of said lower section and operated independently of said last mentioned means for exhausting said lower section and introducing cold air through said end openings.

9. In apparatus for drying yarn and the like, the combination of an elongate drying chamber, a lengthwise extending partition in said chamber dividing said chamber into upper and lower sections and having louvers therein for establishing fluid flow communication between said upper and lower sections, means for advancing yarn through said lower chamber section, a source of heat at the exterior of one end of said chamber, a blower at the exterior of the other end of said chamber, heat conducting means extending along the exterior of said chamber substantially from end to end having one end connected to said source of heat and having an exhaust opening at the other end, a conduit in heat exchange relation with said heat conducting means having one end connected in fluid flow communication to said upper section, a duct connecting the other end of said conduit and the exhaust of said blower in fluid flow communication, a duct connecting the intake of said blower and said lower chamber section adjacent the blower end of said chamber in fluid flow communication, a duct connecting the intake of said blower and said lower chamber section adjacent said heater end in fluid flow communication, and an auxiliary blower having its intake connected with said lower chamber section at about the middle thereof.

10. In apparatus for drying yarn and the like, the combination of an elongate drying chamber, a lengthwise extending partition in said chamber dividing said chamber into upper and lower sections and having louvers therein for establishing fluid flow communication between said upper and lower sections, means for advancing yarn through said lower chamber section, a source of heat at the exterior of one end of said chamber, a blower at the exterior of the other end of said chamber, heat conducting means extending along the exterior of said chamber substantially from end to end having one end connected to said source of heat and having an exhaust opening at the other end, a conduit in heat exchange relation with said heat conducting means having one end connected in fluid flow communication to said upper section, a duct connecting the other end of said conduit and the exhaust of said blower in fluid flow communication, a duct connecting the intake of said blower and said lower chamber section adjacent the blower end of said chamber in fluid flow communication, a duct connecting the intake of said blower and said lower chamber section adjacent said heater end in fluid flow communication, and flow controlling means associated with the intake of said blower for balancing the flow from the ends of said lower chamber section to said blower intake.

11. In apparatus for drying yarn and the like, the combination of an elongate drying chamber, a lengthwise extending partition in said chamber dividing said chamber into upper and lower sections and having louvers therein for establishing fluid flow communication between said upper and lower sections, means for advancing yarn through said lower chamber section, a source of heat at the exterior of one end of said chamber, a blower at the exterior of the other end of said chamber, heat conducting means extending along the exterior of said chamber substantially from end to end having one end connected to said source of heat and having an exhaust opening at the other end, a conduit in heat exchange relation with said heat conducting means having one end connected in fluid flow communication to said upper section, a duct connecting the other end of said conduit and the exhaust of said blower in fluid flow communication, a wind responsive element in said duct, means associated

with said element for rendering said yarn advancing means ineffective upon failure of the blower, and a duct connecting the intake of said blower and said lower chamber section adjacent the blower end of said chamber in fluid flow communication.

12. In apparatus for drying yarn and the like, the combination of an elongate drying chamber, a lengthwise extending partition in said chamber dividing said chamber into upper and lower sections and having louvers therein for establishing fluid flow communication between said upper and lower sections, means for advancing yarn through said lower chamber section, a source of heat at the exterior of one end of said chamber, a blower at the exterior of the other end of said chamber, heat conducting means extending along the exterior of said chamber substantially from end to end having one end connected to said source of heat and having an exhaust opening at the other end, a conduit in heat exchange relation with said heat conducting means having the blower end connected in fluid flow communication to said upper section, a duct connecting the heat source end of said conduit and the exhaust of said blower in fluid flow communication, a duct connecting the intake of said blower and said lower chamber section adjacent the blower end and the heat source end of said chamber in fluid flow communication, an auxiliary blower having its intake connected in fluid flow communication with said lower chamber section at substantially the middle thereof, and means including a wind responsive element in said first mentioned duct for rendering said auxiliary blower operative upon failure of said first mentioned blower to thereby cause said auxiliary blower to exhaust said chamber.

13. In apparatus for drying yarn and the like, the combination of an elongate drying chamber, a lengthwise extending partition in said chamber dividing said chamber into upper and lower sections and having louvers therein for establishing fluid flow communication between said upper and lower sections, means for advancing yarn through said lower chamber section, a source of heat at the exterior of one end of said chamber, a blower at the exterior of the other end of said chamber, heat conducting means extending along the exterior of said chamber substantially from end to end having one end connected to said source of heat and having an exhaust opening at the other end, a conduit in heat exchange relation with said heat conducting means having one end connected in fluid flow communication to said upper section, a duct connecting the other end of said conduit and the exhaust of said blower in fluid flow communication, a wind responsive element in said duct, means associated with said element for rendering said yarn advancing means ineffective upon failure of the blower, a duct connecting the intake of said blower and said lower chamber section adjacent the blower end of said chamber in fluid flow communication, an auxiliary blower having its intake connected in fluid flow communication with said lower chamber section at substantially the middle thereof, and means associated with said wind responsive element for rendering said auxiliary blower operative upon failure of said first mentioned blower to thereby cause said auxiliary blower to exhaust said chamber.

14. In apparatus for drying yarn and the like, the combination of an elongate drying chamber having openings at each end for a plurality of ends of yarn, a roll at one end of said chamber for delivering yarn to said chamber, a second roll at the other end of said chamber for removing the yarn from said chamber and delivering it again to said chamber, a third roll at the first mentioned end of said chamber for again removing the yarn from said chamber, a plurality of winders extending along said chamber at the exterior thereof for winding the yarn removed from said chamber by said third roll, a shaft extending from one end to the other end of said chamber for operating said winders, a drive connection between said second roll and said shaft, common drive means for effecting rotation of said first and third rolls and said shaft, and stop motion means between said first roll and said chamber for rendering said drive ineffective upon breakage of the yarn.

15. In apparatus for drying yarn and the like, the combination of an elongate drying chamber having openings at each end for a plurality of ends of yarn, means for supplying a drying medium to said chamber, a roll at one end of said chamber for delivering yarn to said chamber, a second roll at the other end of said chamber for removing the yarn from said chamber and delivering it again to said chamber, a third roll at the first mentioned end of said chamber for again removing the yarn from said chamber, a plurality of winders extending along said chamber at the exterior thereof for winding the yarn removed from said chamber by said third roll, a shaft extending from one end to the other end of said chamber for operating said winders, a drive connection between said second roll and said shaft, common drive means for effecting rotation of said first and third rolls and said shaft, and means for rendering said drive ineffective upon failure of said drying medium supplying means.

16. In apparatus for drying yarn and the like, the combination of an elongate drying chamber having openings at each end for a plurality of ends of yarn, a roll at one end of said chamber for delivering yarn to said chamber, a second roll at the other end of said chamber for removing the yarn from said chamber and delivering it again to said chamber, a third roll at the first mentioned end of said chamber for again removing the yarn from said chamber, a plurality of winders extending along said chamber at the exterior thereof for winding the yarn removed from said chamber by said third roll, a shaft extending from one end to the other end of said chamber for operating said winders, a drive connection between said second roll and said shaft, common drive means for effecting rotation of said first and third rolls and said shaft, stop motion means between said first roll and said chamber for rendering said drive ineffective upon breakage of the yarn, and means for exhausting said chamber rendered effective simultaneously when said drive is rendered ineffective.

17. In apparatus for drying yarn and the like, the combination of an elongate drying chamber having openings at each end for a plurality of strands of yarn, means for supplying a drying medium to said chamber, a roll at one end of said chamber for delivering yarn to said chamber, a second roll at the other end of said chamber for removing the yarn from said chamber and delivering it again to said chamber, a third roll at the first mentioned end of said chamber for again removing the yarn from said chamber,

a plurality of winders extending along said chamber at the exterior thereof for winding the yarn removed from said chamber by said third roll, a shaft extending from one end to the other end of said chamber for operating said winders, a drive connection between said second roll and said shaft, common drive means for effecting rotation of said first and third rolls and said shaft, means for rendering said drive ineffective upon failure of said drying medium supplying means, and means for exhausting said chamber rendered effective simultaneously when said drive is rendered ineffective.

18. In apparatus for drying yarn and the like, the combination of a drying chamber having an opening at each end, means for advancing yarn through said chamber, a heat exchanger, a source of heat for said heat exchanger, a blower connected with said heat exchanger and said chamber for circulating air through said heat exchanger and said chamber, a normally idle auxiliary blower connected to said chamber for exhausting the same and for introducing cold air into said chamber through said end openings, and means responsive to the failure of air being circulated for rendering said auxiliary blower effective and said yarn advancing means and said heat source ineffective.

19. In apparatus for drying yarn and the like, the combination of a drying chamber having an opening at each end, means for advancing yarn through said chamber, a heat exchanger, a source of heat for said heat exchanger, a blower connected with said heat exchanger and said chamber for circulating air through said heat exchanger and said chamber, a normally idle auxiliary blower connected to said chamber for exchausting the same and for introducing cold air into said chamber through said end openings, and means responsive to the breakage of the yarn for rendering said auxiliary blower effective and said yarn advancing means, said heat source and said first mentioned blower ineffective.

20. In apparatus for drying yarn and the like, the combination of a drying chamber, means for advancing yarn through said chamber, means for supplying a drying medium to said chamber, means responsive to the breakage of the yarn for rendering said yarn advancing means and said drying medium supplying means ineffective, and means responsive to the failure of said drying medium supplying means for rendering said yarn advancing means ineffective independently of said breakage responsive means.

21. In apparatus for drying yarn and the like, the combination of an elongate drying chamber, means including rolls for introducing the yarn into, advancing it through and removing it from said chamber, means for supplying a drying medium to said chamber, a winder adjacent said chamber for winding the yarn removed therefrom, a common drive for said winder and said rolls, and means including a flow responsive element for rendering said drive ineffective upon failure of said drying medium supplying means.

22. In apparatus for drying yarn and the like, the combination of an elongate drying chamber, rolls for advancing the yarn through said chamber and removing it therefrom, a winder adjacent said chamber for winding the yarn removed from said chamber, a common drive for said winder and said rolls, stop motion means for rendering said drive ineffective upon breakage of the yarn, and means including a flow responsive element for rendering said drive ineffective upon failure of said drying medium supplying means independently of said breakage responsive means.

23. In apparatus for drying yarn and the like, the combination of an elongate drying chamber, a lengthwise extending partition in said chamber dividing said chamber into upper and lower sections and having louvers therein for establishing fluid flow communication between said upper and lower sections, means for advancing yarn through said lower chamber section, a source of heat, a blower, heat conducting means having one end connected to said source of heat and having an exhaust opening at the other end, a conduit in heat exchange relation with said heat conducting means having one end connected in fluid flow communication to said upper section, a duct connecting the other end of said conduit and the exhaust of said blower in fluid flow communication, a duct connecting the intake of said blower and said lower chamber section adjacent one end of said chamber in fluid flow communication, a duct connecting the intake of said blower and said lower chamber section adjacent its other end in fluid flow communication, and flow controlling means associated with the intake of said blower for balancing the flow from the ends of said lower chamber section to said blower intake.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
Re. 20,712	Harris	May 3, 1938
1,209,696	Gaumont	Dec. 26, 1916
1,623,611	Alexander et al.	Apr. 5, 1927
1,860,887	Buysse	May 31, 1932
2,024,079	Whiting	Dec. 10, 1935
2,127,956	Helmer	Aug. 23, 1938
2,128,697	Ettl	Aug. 30, 1938
2,268,986	Hess et al.	Jan. 6, 1942
2,288,129	Feldhausen et al.	June 30, 1942
2,297,314	Offen	Sept. 29, 1942
2,304,685	Franklin	Dec. 8, 1942
2,318,511	McAllister	May 4, 1943
2,397,091	Davis	Mar. 26, 1946