March 2 1943. D. P. SMITH 2,312,936

PORTABLE DRIER FOR USE WITH TUMBLING BARRELS

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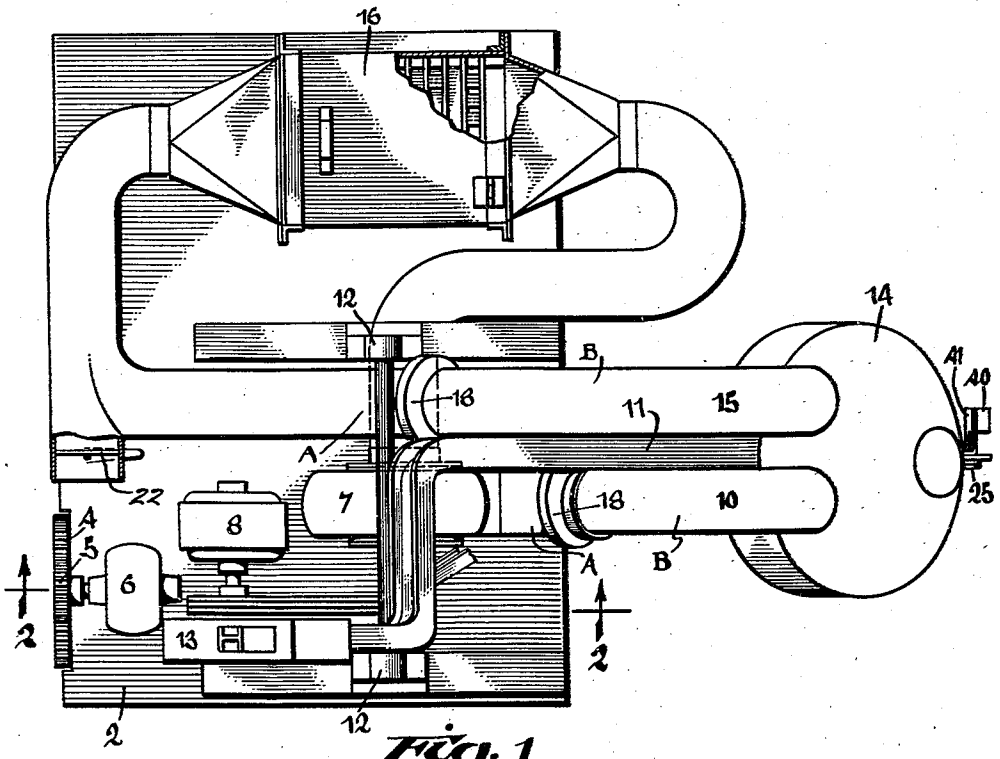


Fig. 1

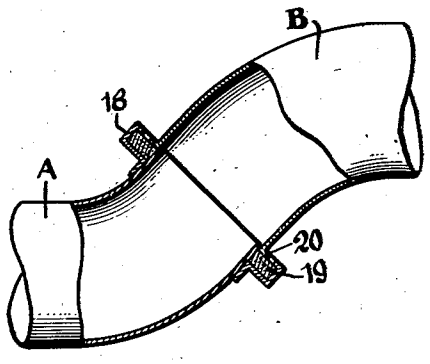


Fig. 4

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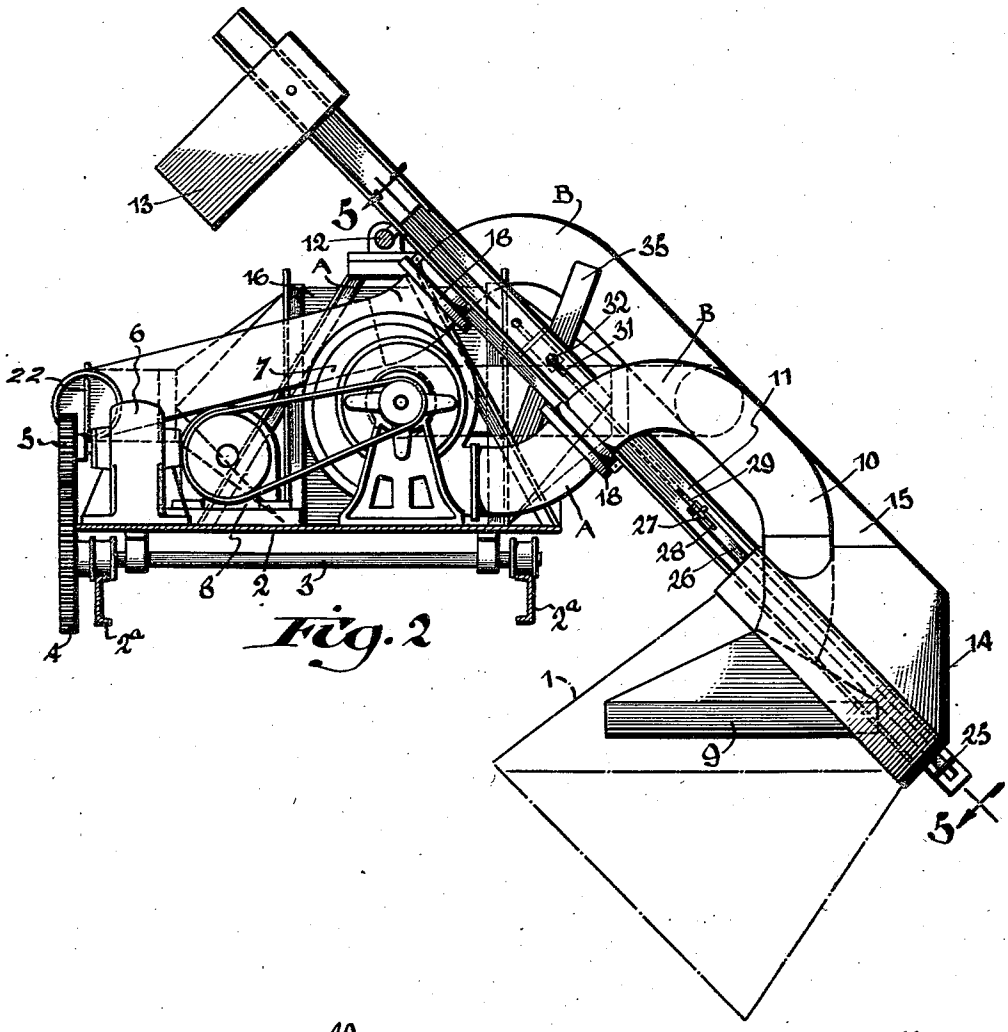


Fig. 2

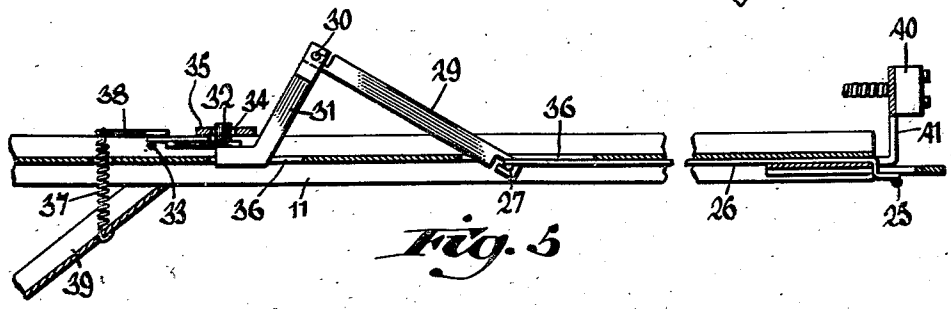


Fig. 5

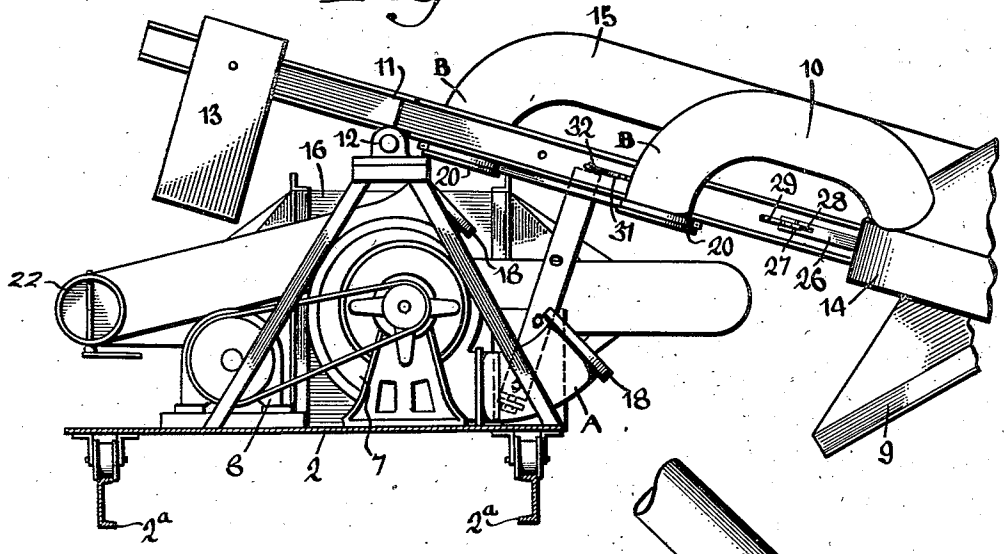
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Fig. 3



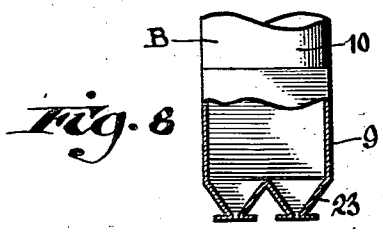


Fig. 8

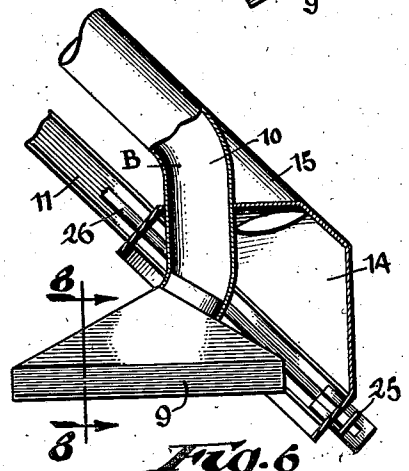


Fig. 6

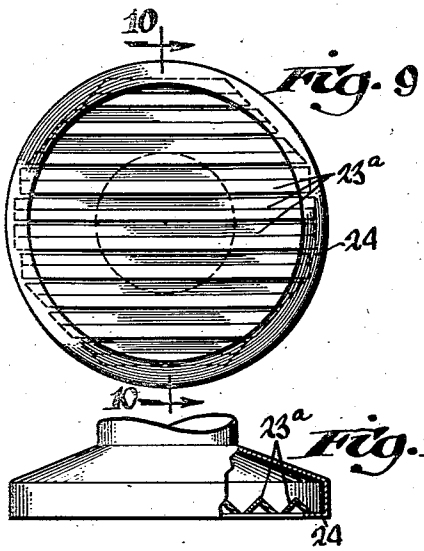


Fig. 9

Fig. 10

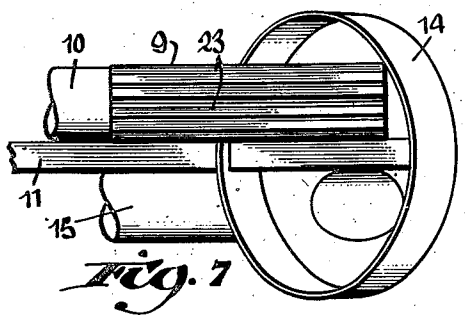


Fig. 7

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Patented Mar. 2, 1943

2,312,936

UNITED STATES PATENT OFFICE

2,312,936

PORTABLE DRIER FOR USE WITH TUMBLING BARRELS

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Application January 5, 1942, Serial No. 425,659

2 Claims. (Cl. 34—131)

This invention relates to improvements in portable drying apparatus particularly for use in connection with tumbling barrels or centrifugal types of machines in which the work is deposited in a rotative barrel or drum, and an exemplification thereof is made in connection with a tumbling barrel which may be classified of the vertical type, having the barrel opening at the top.

The drying apparatus of the present invention primarily is adapted for drying the work while within the barrel after it has received the necessary treatment for which a tumbling barrel conventionally is employed, thereby eliminating the necessity of employing separate or auxiliary drying ovens or chambers, and the handling of the work incident to effecting a drying thereof.

The drying apparatus as a unit is translatable upon a track or runway for independently and selectively serving a plurality of tumbling barrel units, adapted the apparatus to be moved into cooperation with a tumbler unit when the work therein has been processed or treated and reaches a stage for drying. As an example, it may be assumed that four conventional tumbling barrel units are arranged in an aligned row and necessary spacing of the machines therebetween, the work in each operating for periods or stages for administering, first, an acid bath treatment for cleansing; second, a period for clear or fresh water rinsing; then drying without removal of the work from the barrel; and finally as a rest period for removal of the work and barrel replenishing.

The tumbling barrel preferably is of a type in which the liquid contents can be supplied and removed without removal of the work, the liquid usually being drained from the base end of the barrel. Therefore, an operator with the use of four tumbling barrel units may, at the same time, have one tumbling barrel administering the acid treatment, a second rinsing, a third drying, and a fourth at rest for emptying and replenishing, with the drying apparatus transferable to each when the drying period is in order, thereby effecting a material saving in time, cost and handling of the work over the prevailing methods.

An object of the invention is to provide a portable air blast dryer unit for application over the open head end of a conventional tumbling barrel for injecting or administering a blast of heated air into the barrel onto the contents or articles therein while the barrel is rotating, and for a return of the air discharge from the barrel back to the source of delivery for reheating and recirculation, materially increasing the utility of the tumbling barrel and expediting operations.

Another object is to provide a transportable unit for the delivery of high velocity heated air directly into a conventional tumbling barrel while the barrel continues in operation for effecting an immediate drying of the articles while intact in the barrel after a liquid cleansing treatment thereof, and adapted for selectively serving a plurality or gang stationed tumbling barrels.

Another object is to provide a simple and efficient method for drying articles within a tumbling barrel after the liquid contents used in a treatment of the articles have been drained from the barrel, which consists in applying a hood as a closure over the feed opening of the barrel, and while the barrel is in rotation, discharge a blast of heated air therein through a nozzle incorporated with the hood and having an air source duct through the hood for making a conductor connection with the air supply source for reheating and recirculation of the air.

Further objects and advantages of the invention will be more fully set forth in the description of the drawings, in which:

Figure 1 is a top plan view of the improved portable drying apparatus.

Figure 2 is a sectional view taken on line 2—2, Figure 1, illustrating the machine with the radial arm in its downward operating position with the hood over the mouth of a tumbling barrel for drying the contents thereof.

Figure 3 is a view similar to Figure 2 showing the arm swung upwardly in its non-operating position.

Figure 4 is an enlarged fragmentary sectional view detailing the union between the stationary and movable conduit sections of the radial arm.

Figure 5 is a sectional view through the radial arm taken on line 5—5, Figure 2, detailing the latch mechanism for maintaining the radial arm in either its raised or lowered position.

Figure 6 is a fragmentary sectional view detailing the hood and blower nozzle assembly.

Figure 7 is a bottom plan view further illustrating the hood and blower structure.

Figure 8 is a sectional view taken on line 8—8, Figure 6, further detailing the blower nozzle.

Figure 9 is a bottom plan view of the modified blower nozzle construction.

Figure 10 is a sectional view taken on line 10—10, Figure 9.

The drying apparatus in general preferably constitutes a transportable unit consisting of a carriage equipped for travel upon an elevated track or runway and conveyed by an electric motor-driven transmission. The carriage sustains an electric motor-driven rotary or centrifugal type of blower, an electrically heated heater chamber in conduit connection with the intake of the blower and a swinging counterbalanced conduit carrying radial arm. The outer end of the arm carries a hood for capping the open end of the tumbler barrel and serves as an intake for an air return in communication with a conduit on the arm connecting with the heater chamber, and a nozzle within the hood and projected for delivery or discharge of heated air into the barrel and connected with the delivery conduit carried by the arm in connection with the discharge or outlet of the blower. The swing of the arm in one direction normally elevates the hood and nozzle to a normal position away from the barrel, and in a lowered position, caps the open end of the tumbling barrel for cooperation therewith.

When the intake is in a position over the barrel, which ordinarily operates at an angle of about 45°, the nozzle is also in a position to blast air into the barrel over the parts as the barrel rotates. The air is drawn through the intake hood and taken back along the operating arm to the heating chamber for a heating or reheating and is fed directly to the intake of the blower; thus, a 100% recirculation is obtained which reduces the cost of heating the air to a minimum.

Referring to the drawings, 1 indicates in diagram the rotating tumbling barrel of a conventional type of tumbler unit usually in its active position, being disposed and operates at an angle of about 45° with the opening therein at the top, and is arranged to be moved to a downward tilting position to unload or dump its contents or work.

The bottom of the tumbling barrel, for some types of machines, is equipped with a drain outlet for a drainage and discharge of the liquid or fluid used in treating the work, which is drained previous to tilting the barrel for dumping or discharging the work.

As the tumbling barrel is of conventional type, illustration thereof in detail, other than the diagrammatical illustration incorporated in the drawings, is herein omitted, as its design and detail of construction form no part of the present invention.

Referring to Figures 1, 2 and 3 of the drawings, 2 indicates a carriage in the form of a plate, its underside carrying wheels or rollers each riding a rail of an elevated track or runway 2a for transportably sustaining the drying apparatus. In the present instance, a pair of track-riding drive wheels relatively for the opposite sides of the carriage are fixed upon a cross shaft or axle 3 having a gear 4 fixed upon one end of the shaft. The gear 4 is in mesh with a gear 5 fixed to the armature or driven shaft of an electric motor 6.

A high volume blower 7 is mounted upon the carriage driven by V belts connecting with an electric motor 8 mounted upon the carriage. The motor transmission drives the blower at an appropriate speed to maintain a high static pressure at the discharge of the nozzle. The blower discharge is in connection with a nozzle 9 through a conduit or conductor 10 carried by a radial arm 11. The radial arm 11, as a hinged lever, is pivotally supported upon a journal bracket or fulcrum 12 fixed upon the carriage. The rear end of the radial arm 11 extends beyond the arm fulcrum and carries a counter-weight 13. The forward end of the radial arm sustains a hood 14 through the dome of which the nozzle 9 is projected.

The base portion of the hood is of cylindrical form and of a diameter to loosely telescope over the cap or cover the open end of the tumbling barrel without hindrance to barrel rotation. The dome portion of the hood connects and communicates with an air return conduit or conductor 15 mounted upon the radial arm and is in communication with a heater chamber 16 mounted upon the carriage 1. The heater chamber 16 is disposed adjacent the blower and is in communication with the intake of the blower.

When the radial arm is lowered to position the hood over the open end of the tumbling barrel, the nozzle within the hood is also in a position to blast air into the barrel over the parts contained therein as the barrel rotates. The air is drawn from the barrel through the hood and returned to the heater chamber for reheating to be again fed directly to the intake of the blower for redistribution into the barrel. A recirculation of the air reduces the heating cost to a minimum.

The heater chamber 16 preferably is electrically heated, having a plurality of grids disposed therein, each grid composed of a plurality of strip heating elements vertically disposed and relatively in a row at an appropriate spacing apart. As shown in Figure 1, the air inlet and outlet to and from the heater chamber are arranged at relative opposite ends of the chamber with the heating elements disposed within the heater chamber intervening the inlet and outlet openings or ends. It is obvious, however, that other methods of heating, as by gas, may be employed.

The air conducting conduit for both supply from the blower to the nozzle and from the hood to the heater chamber is preferably subdivided into relative movable and stationary sections with the movable sections carried by the radial arm and arranged to break joint with the stationary sections upon elevating the arm from an operative position with the barrel to a normally inactive position above and away from the barrel, as shown in Figures 3 and 4.

As shown, the break joints for the stationary and movable conduit sections are disposed in a radial line with the fulcrum or pivotal axis of the arm and, therefore, also serve as stops to limit the descent of the arm. The structure eliminates the use of intermediate flexible connections and also permits the use of the radial arm with its hood and nozzle to be utilized as a transportable unit independent of the blower and heater elements for connection with branch terminal conductor fittings of stationary air supply and return conductors in plants equipped with a pressure heated air system.

The break joint ends of the stationary conductor sections, A, of the pressure delivery and return conductors are each provided with a collar 18 exterior of and fixed to the end of the pipe or conduit and therewith provide an annular channel for seating or socketing a packet ring 19 having an outer side exposed for engagement with the flange 20 of a movable conductor section, B.

The stationary return conduit section, A, slightly in advance of its entry into the heating chamber, is provided with a branch elbow or Y fitting to provide an intake section tangential to the return course, having a control damper or wing valve 22 therein for obtaining a regulatable control of the influx of auxiliary air, the influx of room air reducing the humidity in the system. The damper is adapted to be locked in any adjustable control position.

As shown in Figure 6, the nozzle 9 is representative of a scalene triangle in side elevation with the intake at the upper side of the shorter angle and its circumference meeting with the apex tangentially thereto for connection with the movable delivery conductor section, B. The base or discharge of the nozzle, when in an operative position within an inclined tumbling barrel, is substantially in a horizontal plane. The nozzle discharge is formed of a plurality of adjoining V channels 23—23 extending longitudinally of the base of the nozzle, each having a longitudinal port or slot through the apex of the channel for administering spray blasts of the heated air downwardly against the contents or parts within the barrel for drying.

Figures 9 and 10 disclose a modified form of nozzle of circular contour provided with a series or plurality of V channels 23^a—23^a arranged parallel to a diametrical line through the nozzle, the ends of the channels secured to a circular flange 24 of the body of the nozzle. The nozzle is positioned to project slightly beyond the base of the hood and approximately centrally thereof and of reduced diameter to provide an annular space between the nozzle and hood for a return flow of the air through the hood back to the heater chamber.

The type and construction of nozzle may be variously modified as may be best suitable for the specific kind of parts to be dried, the several forms shown being merely selective and from which highly advantageous and beneficial results have been obtained.

A latching apparatus is provided on the arm 11 in order to positively lock the arm in either its raised or lowered position, as shown in Figures 2 and 3. The mechanism, as detailed in Figure 5, comprises a hand hold 25 in the form of a pin disposed at the outer end of the operating arm 11 exterior of the hood 14. The pin is secured preferably by welding to the outer end of a link 26 lying adjacent the web of the I-beam 11. The opposite end of the link 26 has a cross pin 27 secured thereto similar to the hand hold 25, the link 26 being bifurcated adjacent the pin, as at 28, to receive the end of a connecting link 29. The link 29 has one end hooked over the pin 27 and its opposite end hooked over a pin 30 secured in the bifurcated end of a bell crank lever 31, carrying a latch pin 32. The opposite end of the bell crank lever is mounted upon a hinge pin 33 having its ends pivotally engaged in the opposite flanges of the I-beam 11.

The latch pin 32, when the arm 11 is in its lowered position as shown in Figure 2, registers with an aperture 34 formed in a stationary locking rail 35 secured to the base 2 of the drying apparatus. When the arm 11 is in its raised position, as shown in Figure 3, the pin 32 projects across the upper edge of the rail to lock the arm in its elevated position.

The latch pin is disengaged by manual actuation of the hand hold 25, drawing the links 26 and 29 forwardly and causing the bell crank lever 31 to swing in an arc, carrying the latch pin out of engagement with the rail 35. The I-beam 11 includes slotted portions 36—36 providing clearance for operation of the link 29 and bell crank lever 31 respectively. The mechanism is normally urged in latching position by means of a tension spring 37 extending through an aperture in the web of the I-beam 11, the spring having one end engaged over a pin 38 welded or otherwise secured to the bell crank lever, the opposite hooked end of the spring being engaged through an aperture in a diagonal brace channel 39.

An electrical control switch 40 is likewise carried upon the outer end of the arm 11 adjacent the latch handle 25. The switch is secured upon an angular bracket 41 secured to the I-beam 11 and may serve as a centralized control for the blower motor, heating chamber and the driving motor 6 for translating the apparatus.

The apparatus, as separate and apart from the present invention and therefore not disclosed herein, is provided with an electric control system operated through control buttons or electric circuit control devices for the operation of the blower and carriage translating motor located on the hood or handle end of the radial arm convenient to the operator. A complete set of safety controls are also installed to automatically take care of conditions which may arise; for example, if the operator should attempt to lift the operating arm without turning off the blower, it would automatically disconnect itself to prevent overloading motor. If the arm is in an operating position with the hood over the drum or barrel, the circuit to the propelling motor is automatically disconnected so that the apparatus cannot be moved until the hood is taken off of the barrel.

A set of limit switches is supplied to be mounted on the runway and connected in series with the tilting mechanism control on the barrel so that if the drying apparatus is in position, it is impossible to change the angle of the barrel.

A circuit breaker is also provided for the electric heating units within the heating chamber so that they cannot be in operation unless the blower is running.

Automatic temperature controls are also installed for the heaters. The entire system, as far as the air piping is concerned, is properly insulated to prevent heat loss.

Having described the invention, I claim:

1. A transportable apparatus for a nozzle delivery of a blast of heated air into a conventional tumbling barrel, comprising: a portable support, a blower and a heater chamber, carried by said support, a conduit interconnecting said blower and said heater chamber, a radial arm pivoted upon said portable support, a hood on the forward end of the radial arm providing a closure for the open end of the barrel, a conduit interconnecting said hood and said heater chamber, a nozzle fixed to said arm within the confines of the hood and a conduit interconnecting said nozzle and said blower, the swing of the arm adapted to alternately bring the hood into or out of operation with said tumbling barrel.

2. A transportable apparatus for a nozzle delivery of a blast of heated air into a conventional tumbling barrel, comprising: a portable support, a blower and a heater chamber, carried by said support, a conduit interconnecting said blower and said heater chamber, a radial arm

pivoted upon said support, a hood on the forward end of the radial arm providing a closure for an open end of the barrel, a conduit connecting said hood with the heater chamber for a return course of the air discharged into the barrel, a nozzle within and unitary with the hood, a conduit connecting the nozzle with the blower, the swing of the arm adapted to alternately bring the hood and nozzle into and out of operation with said tumbling barrel, said conduits each respectively constituting a rigid stationary section carried by said support and a rigid movable section mounted upon said arm the stationary and movable conduit sections each respectively having an intermediate, separable union for coupling of the sections when the hood is moved to its cooperative position with the tumbling barrel and uncoupling the sections when the hood is moved away from the barrel.

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