Dec. 24, 1963 W. NAEGELI 3,115,000

PNEUMATIC CLEANING SYSTEM FOR RING SPINNING FRAMES

Filed Oct. 17, 1960 3 Sheets-Sheet 1

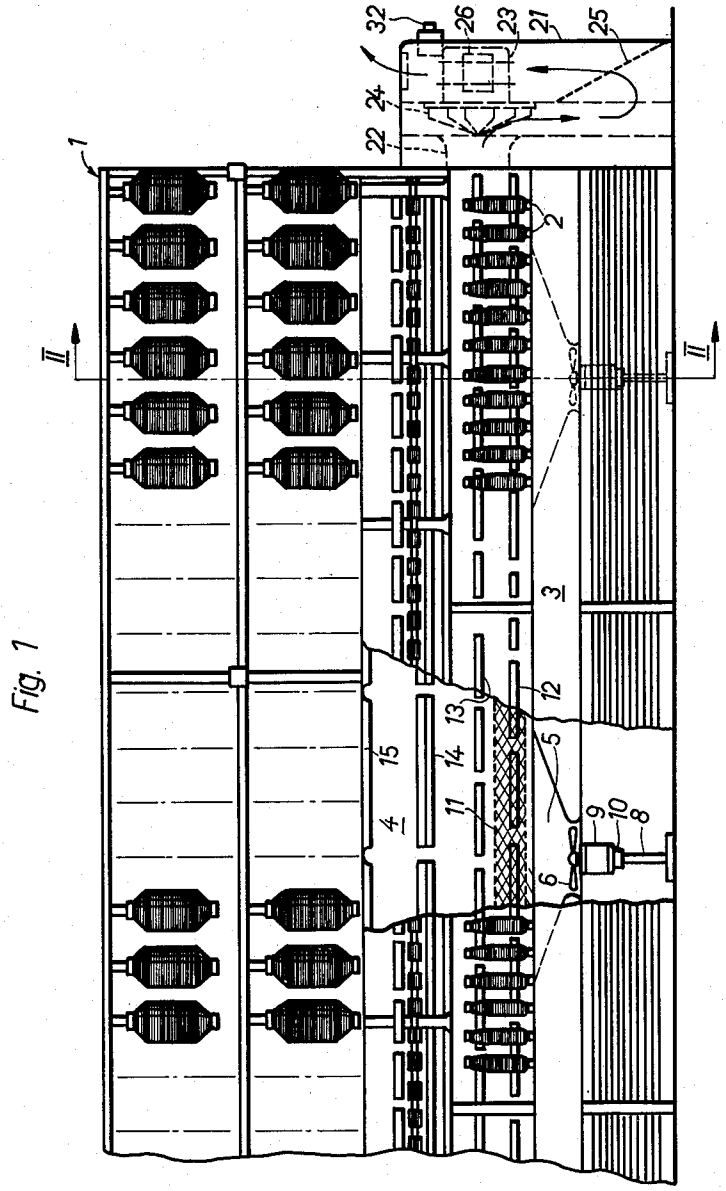

Fig. 1

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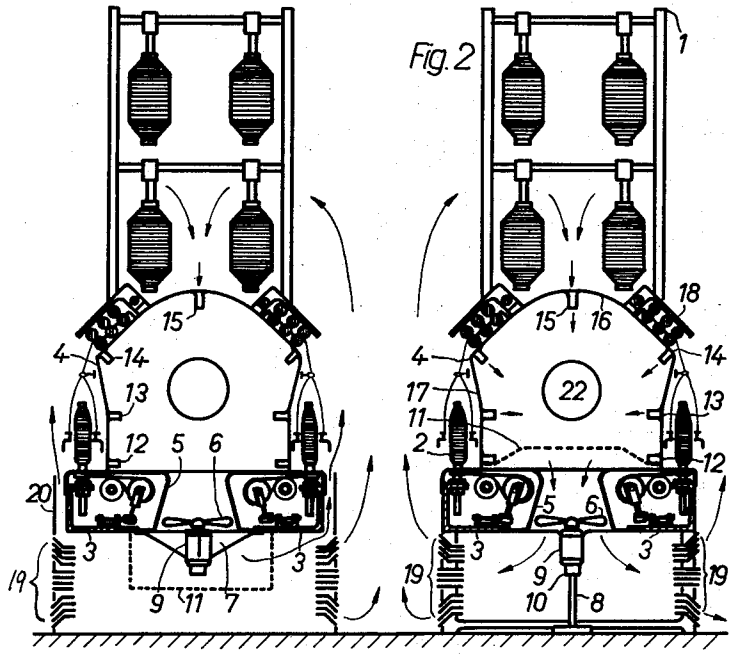

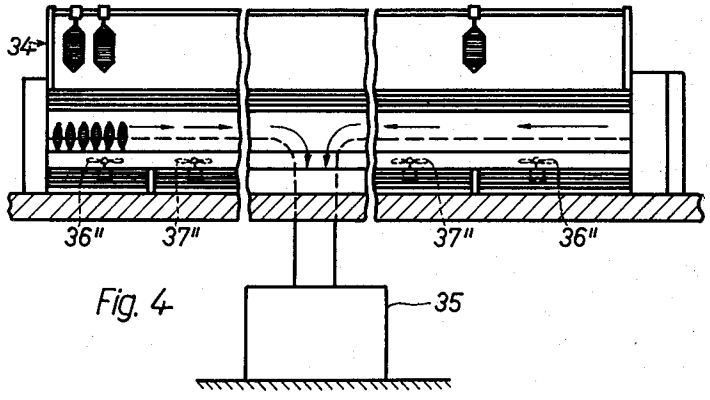

Fig. 4

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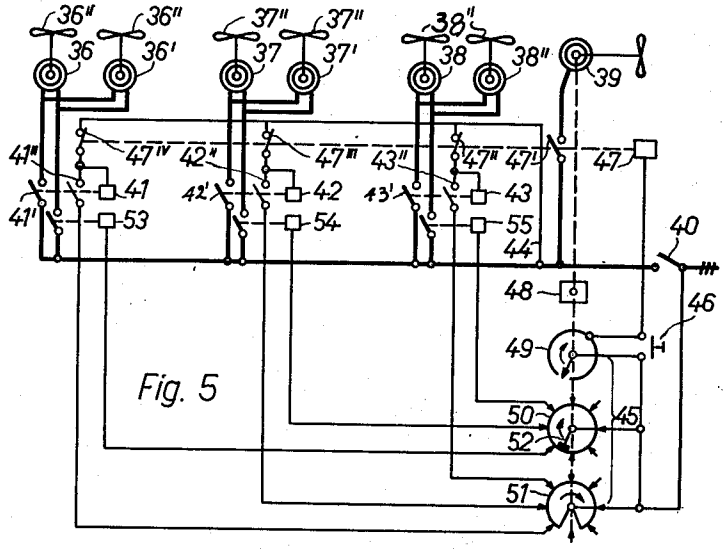

Fig. 5

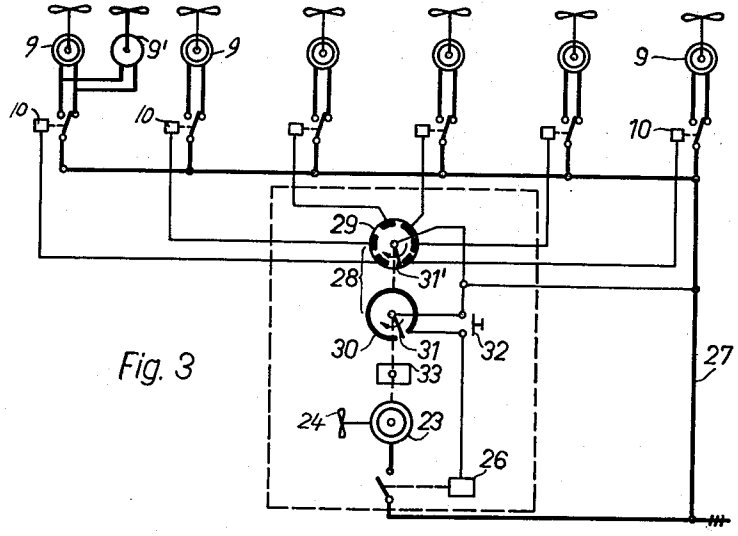

Fig. 3

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PNEUMATIC CLEANING SYSTEM FOR RING SPINNING FRAMES

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14 Claims. (Cl. 57—56)

The present invention relates to a pneumatic cleaning system for ring spinning frames.

Systems for removing threads and fly by suction are known wherein large volumes of air are circulated at small pressure drops and individual housings are placed in rows symmetrical with respect to the center plane of the spinning frame and adjacent to the creel. The housings are provided with symmetrical extensions having slot-like openings or suction nozzles adjacent to the drafting arrangements. The housings are tapered in the upward direction and are closed on top by a fan covered by a filter. This conventional system makes it necessary that the housings which are close to the vertical center plane of the machine be placed inside the creel and the system is suitable only for certain types of creels. Another disadvantage of the conventional system is the fact that the air flows in a downward direction in the spinning room and into the drafting arrangements without taking along the dust on the floor and that the dust carried along by the air current and not entering the suction nozzles drops to the floor or onto the spinning machine and is not removed.

It is an object of the present invention to provide an air suction system for removing fly and pieces of thread from a ring spinning frame which system avoids the shortcomings of conventional systems by providing a duct within the spinning machine and extending longitudinally thereof, the top portion of the duct being adjacent to the drawing arrangements and the lateral portions of the duct being adjacent to the spindles. A plurality of suction fans are provided in the lower part of the duct between the spindle rails for drawing air into the duct through inlet openings or suction nozzles provided at suitable locations. The fans discharge the air downward into a duct provided below the fans and having air outlet openings near the floor of the spinning room. Filters are provided either at the inlet or at the outlet of the fans. Dust is carried along by the air current which move outside of the machine from said outlet openings in an upward direction towards said inlet openings. This air current is particularly effective between two spinning machines equipped according to the invention and placed in parallel relation. Fly and dust will not drop to the floor between the machines and also heavy particles remain suspended in the air until they are seized by an air stream entering an inlet opening.

Since the air duct of the system according to the invention is laterally confined between the spindle rails and the air current flowing upwards adjacent to the sides of the duct sweeps over the spindle rails, the latter are effectively cooled. This is of particular importance if the spindles are driven by gears or are individually driven by a short belt running around one or more pulleys and if these drive means are completely enclosed.

Another advantage of the system according to the invention is the lack of pipes or extensions connecting the individual suction devices to the main suction chamber and causing considerable pressure drops. The duct forming part of the system according to the invention has a large cross section so that the air flows very slowly inside the duct and requires little fan power for its movement. The fly accumulated on the filters associated with the fans

is periodically removed by periodically reversing the direction of rotation of one fan after the other whereby a weak axial flow component is superimposed on the air current which normally moves in planes which are normal to the longitudinal axis of the duct. The weak axial current carries the fly and dust blown off the filters into a collector provided at the end or in the middle of the machine.

The novel features which are considered characteristic of the invention are set forth with particularity in the appended claims. The invention itself, however, and additional objects and advantages thereof will best be understood from the following description of embodiments thereof when read in connection with the accompanying drawing, wherein:

FIG. 1 is a diagrammatic side elevation of a spinning machine equipped according to the invention, with parts broken away.

FIG. 2 is a diagrammatic cross sectional view of two juxtaposed spinning machines, the section shown on the right side of FIG. 2 being made along line II—II in FIG. 1; the spinning machine shown on the left side of FIG. 2 including a modification of a detail of the spinning machine shown in FIG. 1 and on the right side of FIG. 2.

FIG. 3 is a wiring diagram for the motors driving the suction fans of a system according to the invention.

FIG. 4 is a diagrammatic side elevation of a spinning machine equipped with a modified air-cleaning system.

FIG. 5 is a wiring diagram for the motors driving the fans of the system shown in FIG. 4.

Referring more particularly to the drawing, numeral 1 designates a ring spinning machine having two parallel and spaced spindle rails 3 supporting the drive for spindles 2 and a housing or air duct 4. The cross sectional configuration of the latter is symmetric to the vertical longitudinal center plane of the machine. The bottom of the duct 4 is provided with a plurality of spaced apertures 5 arranged between the spindle rails 3 and along the vertical center plane of the machine. A suction fan 6 is arranged in each aperture 5 for drawing air out of the duct 4 in downward direction. Each fan 6 is driven by a motor 9 which is either hung by supports 7 on the spindle rails 3, as shown on the left side in FIG. 2, or which is supported by an upright 8 standing on the floor of the spinning room, as shown on the right side of FIG. 2. The direction of rotation of each motor 9 can be reversed by pole reversal, a relay 10 being mounted on each motor. In the machine shown in FIG. 1 and on the right side of FIG. 2, a filter 11 covers the top of the apertures 5 to retain fly, dust, broken threads, etc. Narrow horizontal slots 12 are provided in the lateral walls of the duct 4 adjacent to the spindle rail and horizontal slots 13 are provided above the slots 12 and adjacent to the ring rail. Suction slots 14 are provided in the duct 4 in the neighborhood of the delivery rollers of drafting arrangements 18. Other air intake slots 15 are provided in the central top portion 16 of the duct 4. In order to avoid provision of special channels for suction nozzles adjacent to the spindles 2 which channels would cause a pressure drop, the lateral walls 17 of the duct 4 are placed adjacent to the spindles 2. For the same reason, the top wall of the duct 4 is placed adjacent to the drafting arrangements 18 and forms the bottom thereof. A plurality of horizontal guide baffles 19 is provided on either side of the machine below the spindle rails. An upper group of these baffles is bent upward and a lower group of the baffles is bent downward to give the air delivered by the fans 6 the desired direction which is indicated by arrows in FIG. 2. In the modification shown on the left side of FIG. 2 a vertical baffle 20 is provided laterally of and spaced from each spindle rail

3 to form a nozzle discharging air from the space below the spindle rails in an upward direction close to the sides of the spinning machine.

A suction box 21 is provided at the right end of the machine shown in FIG. 1, the suction box being connected to the duct 4 by an inlet 22. The suction box 21 contains a motor 23 driving a suction fan 24 for drawing air out of the duct 4 and through a filter 25 into the spinning room whenever desired. The motor 23 is provided with a relay 26. As will be described later, the dust collected on the filters in the duct 4 may be removed into the aforedescribed suction box 21. Alternatively, the dust collected on the filters 11 may be conducted into a central collecting chamber which also will be described later.

FIG. 3 illustrates an electric wiring diagram for the motors 9. A power line 27 is connected to the motors 9 and 23 through relays 10 and 26. In the position of the relays 10 shown in FIG. 3 the motors are set for fast forward running operation whereby the air is drawn out of the duct 4 in downward direction in FIGS. 1 and 2. Actuation of the relay 10 to throw the switches shown in FIG. 3 to the left causes reversal of the direction of rotation of the motors 9 and operation at relatively slow speed. Energization of the relays 10 is controlled by a rotary switch 28 having contacts 29 individually connected to the relays 10 and a wiper 31' connected to the power line 27 and adapted to make contact with the contacts 29. The contacts 29 may have different angular extensions. The rotary switch 28 has a second, part circular contact 30 and a wiper 31 cooperating therewith and also connected to the power line 27. The switch 30, 31 is arranged in parallel relation to a push-button switch 32 for connecting the relay 26 of the motor 23 to the power line. The rotary switch 28 is driven through a reducing gear 33 by the motor 23. Instead of providing a relay 10 for each motor 9, a single relay may control the operation of a plurality of motors, as shown on the left side of FIG. 3 where one relay 10 controls a group of motors 9 and 9'.

The electric control operates as follows:

When cleaning of the filters 11 and removal of accumulated dust, etc., is desired, the relay 26 of the motor 23 in the suction box 21 is energized by depressing the switch 32, for starting the motor 23. Since the motor 23 rotates the wiper 31, the latter closes the switch 31, 30 so that the switch 32 can be released. The wiper 31', also rotated by the motor 23, simultaneously makes contact with a contact 29 and energizes the relay 10 of one of the motors 9, or group of motors 9, 9' which is farthest away from the suction box 21. This causes reversal of the direction of and slow speed rotation of the respective motor or motors. When the wiper 31' leaves the contact 29 the respective relay 10 is deenergized and the respective motor or motors once more rotate at high speed in the forward direction. When the wiper 31' passes over the next following contact 29 the relay 10 of the motor 9 which is closer to the suction box 21 than the previously reversed motor is energized and the motor to which the second relay is connected is reversed and operated at slow speed. This goes on until the motor 9 which is closest to the suction box 21 is reversed. When the wiper 31' has passed the last contact 29 all motors 9 and 9' operate at fast forward speed. At the same time the wiper 31 has left the contact 30 so that the relay 26 is deenergized and the suction motor 23 in the box 21 is stopped.

Cleaning of the filters 11 is effected as follows:

The motor 23 for the fan 24 in the suction box 21 is started so that the relay 10 of the fan motor which is farthest away from the suction box 21 is actuated by the switch 28 to reverse the direction of rotation and the speed of this motor so that the impurities deposited on the filter 11 are lifted therefrom. Vacuum is still maintained in the duct 4 by the other suction fans and the suction box 21 so that the impurities blown by the reversed fan into the duct travel either directly into the aperture 22 of the suction box 21, or resettle on the filter of the next following fan in the direction towards the suction box 21. Thereupon the switch 28 reverses the motor of the fan next to the previously reversed motor in the direction towards the suction box 21 so that the fly and dust settled on the second filter is lifted and travels towards the suction box 21. After a predetermined period, the motor for the third fan is reversed, and so on. When the last fan which is closest to the suction box 21 has been reversed, the entire filter is cleaned and the impurities are transferred to the filter 25 of the suction box 21.

FIG. 4 shows a modified arrangement of a spinning machine 34 wherein a suction box 35 corresponding to the suction box 21 in FIG. 1 is located below the center of the spinning machine. Fly, etc., is removed from the filters in the duct 4 by reversing the motors for the outermost fans 36'' and thereupon reversing the motors for the fans 37'' which are next to the fans 36'' and closer to the inlet of the suction box 35.

FIG. 5 shows an electric wiring diagram suitable for operating the motors of the machine shown in FIG. 4. Upon closing of a main switch 40 all relays 41, 42, 43 controlling motor groups 36, 36' for the fans 36'', motors 37, 37' for the fans 37'' and motors 38, 38' for fans 38'', not shown in FIG. 4, are connected through a conduit 44 to a source of current supply and energized whereby main switches 41', 42', 43' and auxiliary switches 41'', 42'', 43'' are closed. This causes starting of the motors 36, 36', 37, 37' and 38, 38' and connection of a rotary control switch 45 to the relays 41–43. This is the situation during normal operating conditions during spinning. If it is desired to clean the air filters, a push-button switch 46 is closed to energize a relay 47 of the motor 39 in the suction box 35, closing a switch 47' and starting the motor 39. The latter drives three contact discs 49, 50, 51 of the rotary switch 45 through a speed-reducing gear 48. The switch of which the disc 49 forms part is arranged in parallel relation to the switch 46 and the latter can be released as soon as the switch including the disc 49 is closed. When the relay 47 is energized switches 47^{IV}, 47^{III} and 47^{II} which are in series relation to the switches 41'', 42'' and 43'', respectively, are opened. The relays 41, 42 and 43 are now energized through the switch including the disc 51. When this switch is opened the relay 41 is deenergized and the motors 36 and 36' are stopped. Shortly after the motors 36 and 36' have been stopped, a wiper 52 is passed by a contact on the disc 50 for energizing a relay 53 reversing the direction of rotation of the motors 36 and 36'. When the contact on the disc 50 leaves the wiper 52 the motors 36 and 36' are stopped once more. Thereupon the switch of which the disc 51 forms part deenergizes the relay 42, stopping the motors 37 and 37' and operation of the latter takes the same course as in the case of the motors 36, 36'. This goes on until also the motors 38, 38' have been reversed. Thereupon the disc 49 deenergizes the relay 47 so that the switch 47' is opened for stopping the motor 39 and the switches 47^{IV}, 47^{III} and 47^{II} are closed for connecting the relays 41, 42 and 43 to the conduit 44.

I claim:

1. A pneumatic cleaning system for ring spinning machines having two parallel spindle rails individually supporting a row of spindles and a plurality of drafting arrangements placed above said spindle rails, said system comprising an air duct adjacent to and extending longitudinally of said spindle rails, said duct being placed between said spindles and having lateral walls adjacent to the spindles and having a top wall placed beneath and adjoining said drafting arrangements, said lateral walls and said top wall of said duct having air inlet openings for directly receiving air from the outside, said duct having a bottom wall having a row of spaced air outlets

placed longitudinally of the machine and between the spindle rails, and a rotary fan located in each of said air outlets for drawing air through said openings into said duct.

2. A method of removing threads and fly by suction from a ring spinning machine having two parallel spindle rails, each rail supporting a row of spindles, and a plurality of drafting arrangements placed above said spindle rails, the method comprising creating a downwardly directed air current extending inside of the spinning machine from said drafting arrangements and between said spindle rails, and laterally discharging the air forming said current beneath and outside of said spindle rails from the longitudinal sides of the spinning machine to the outside of the spinning machine.

3. A method as defined in claim 2 wherein said current is created by individually and simultaneously accelerating the air in a downward direction at a plurality of localities spaced longitudinally of the spindle rails.

4. A method according to claim 3 wherein the air is filtered at each of said localities through filters individually disposed thereat.

5. A pneumatic cleaning system for a ring spinning machine having two parallel spindle rails individually supporting a row of spindles, and a plurality of drafting arrangements placed above said spindle rails, said system comprising an air duct adjacent to and extending longitudinally of said spindle rails, said duct being placed between said spindles and having lateral walls adjacent to the spindles and having a top wall placed beneath said drafting arrangements, said lateral walls and said top wall of said duct having air inlet openings, said duct having a bottom wall having a row of spaced air outlets connected thereto and placed longitudinally of the machine and between the spindle rails, a rotary fan located within each of said air outlets for drawing air through said openings into said duct, and air passage means placed beneath said air duct and longitudinally of the spinning machine for receiving air from said fans, said air passage means having air outlets placed below the longitudinal sides of the spinning machine for laterally discharging the air alongside and below the spinning machine to the outside of the spinning machine.

6. A pneumatic cleaning system as defined in claim 5 wherein said air outlets of said air passage means include guide plates for downwardly directing the air leaving said air passage means.

7. A pneumatic cleaning system for a ring spinning machine having two parallel spindle rails individually supporting a row of spindles, and a plurality of drafting arrangements placed above said spindle rails, said system comprising an air duct adjacent to and extending longitudinally of said spindle rails, said duct being placed between said spindles and having lateral walls adjacent to the spindles and having a top wall placed beneath said drafting arrangements, said lateral walls and said top wall of said duct having air inlet openings, said duct having a bottom wall having a row of spaced air outlets connected thereto and placed longitudinally of the machine and between the spindle rails, a rotary fan located within each of said air outlets for drawing air through said openings into said duct, and drive means for individually driving said fans, said drive means being individually reversible for reversing the direction of the air current produced by said fans.

8. A pneumatic cleaning system for a ring spinning machine having two parallel spindle rails individually supporting a row of spindles, and a plurality of drafting arrangements placed above said spindle rails, said system comprising an air duct adjacent to and extending longitudinally of said spindle rails, said duct being placed between said spindles and having lateral walls adjacent to the spindles and having a top wall placed beneath said drafting arrangements, said lateral walls and said top wall of said duct having air inlet openings, said duct having a bottom wall having a row of spaced air outlets connected thereto and placed longitudinally of the machine and between the spindle rails, a rotary fan located within each of said air outlets for drawing air through said openings into said duct, drive means for driving said fans, and reversing means individually connected to groups of said drive means for reversing the direction of the air current produced by the fans driven by the respective group of drive means.

9. A pneumatic cleaning system for a ring spinning machine having two parallel spindle rails individually supporting a row of spindles, and a plurality of drafting arrangements placed above said spindle rails, said system comprising an air duct adjacent to and extending longitudinally of said spindle rails, said duct being placed between said spindles and having lateral walls adjacent to the spindles and having a top wall placed beneath said drafting arrangements, said lateral walls and said top wall of said duct having air inlet openings, said duct having a bottom wall having a row of spaced air outlets connected thereto and placed longitudinally of the machine and between the spindle rails, a rotary fan located within each of said air outlets for drawing air through said openings into said duct, drive means for individually driving said fans, reversing means individually connected to said drive means, and control means connected to said reversing means for periodically actuating said reversing means in a predetermined sequence whereby one after another of said drive means is reversed during predetermined consecutive periods of time.

10. A pneumatic cleaning system for a ring spinning machine having two parallel spindle rails individually supporting a row of spindles, and a plurality of drafting arrangements placed above said spindle rails, said system comprising an air duct adjacent to and extending longitudinally of said spindle rails, said duct being placed between said spindles and having lateral walls adjacent to the spindles and having a top wall placed beneath said drafting arrangements, said lateral walls and said top wall of said duct having air inlet openings, said duct having a bottom wall having a row of spaced air outlets connected thereto and placed longitudinally of the machine and between the spindle rails, a rotary fan located within each of said air outlets for drawing air through said openings into said duct, drive means for driving said fans, reversing means connected to said drive means for selectively reversing the direction of the air currents produced by the fans driven by the respective drive means, and means connected to said air duct for producing an air current moving longitudinally of said duct.

11. A pneumatic cleaning system as defined in claim 1 wherein said spindle rails form part of said duct.

12. A pneumatic cleaning system as defined in claim 1 including an air filter placed adjacent to each of said fans and across the air current produced by the respective fan.

13. A method of removing threads and fly by suction from a ring spinning machine having two parallel spindle rails, each rail supporting a row of spindles, and a plurality of drafting arrangements placed above said spindle rails, the methods comprising:

creating a downwardly directed air current extending inside of the spinning machine from said drafting arrangements and between said spindle rails,

laterally discharging the air forming said current below said spindle rails from the longitudinal sides of the spinning machine to the outside thereof, and

creating an upward air current along the sides of the spinning machine for returning the discharged air between the spindles and at said drafting arrangements to said downwardly directed air current.

14. A method of removing threads and fly by suction from a ring spinning machine having two parallel spindle rails, each rail supporting a row of spindles, and a plurality of drafting arrangements placed above said spindle rails, the method comprising:

creating a downwardly directed air current inside of the spinning machine at a plurality of localities spaced longitudinally of the spindle rails, the air current extending from said drafting arrangements and between said spindle rails,

passing the air at each of said localities through filters disposed thereat,

laterally discharging the filtered air beneath and outside of the spindle rails from the longitudinal sides of the spinning machine to the outside of the spinning machine,

temporarily reversing the air current at selected ones of said localities for cleaning the respective filters, and

simultaneously creating an air current inside and longitudinally of the spinning machine and filtering and

discharging the air of said last mentioned air current to the outside of the spinning machine for removing the fly removed from said filters.

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