

July 9, 1968

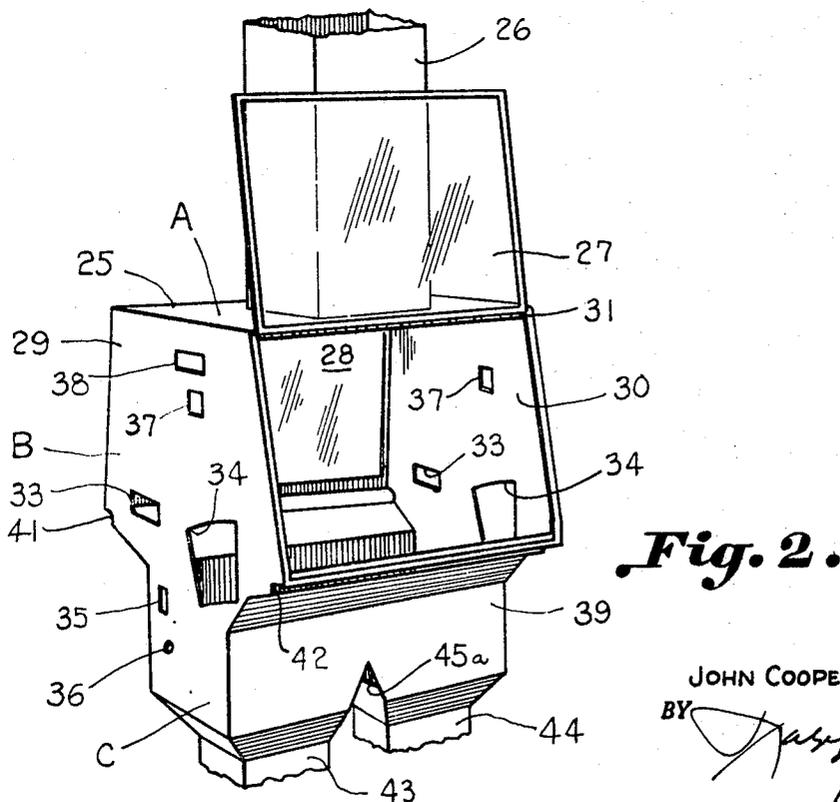
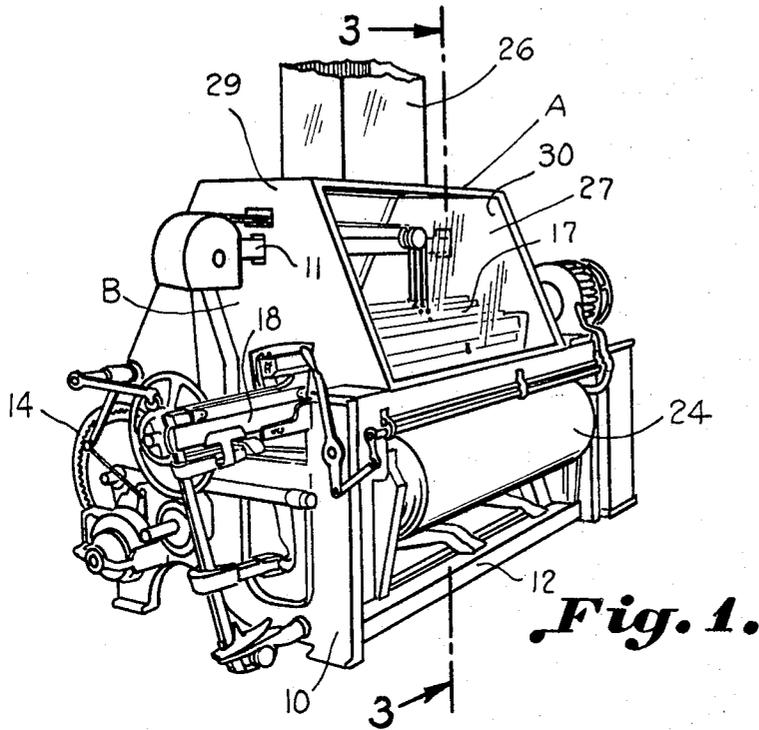
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3,391,528

AIR HANDLING AND CLEANING APPARATUS FOR MACHINES

Filed Dec. 3, 1965

4 Sheets-Sheet 1



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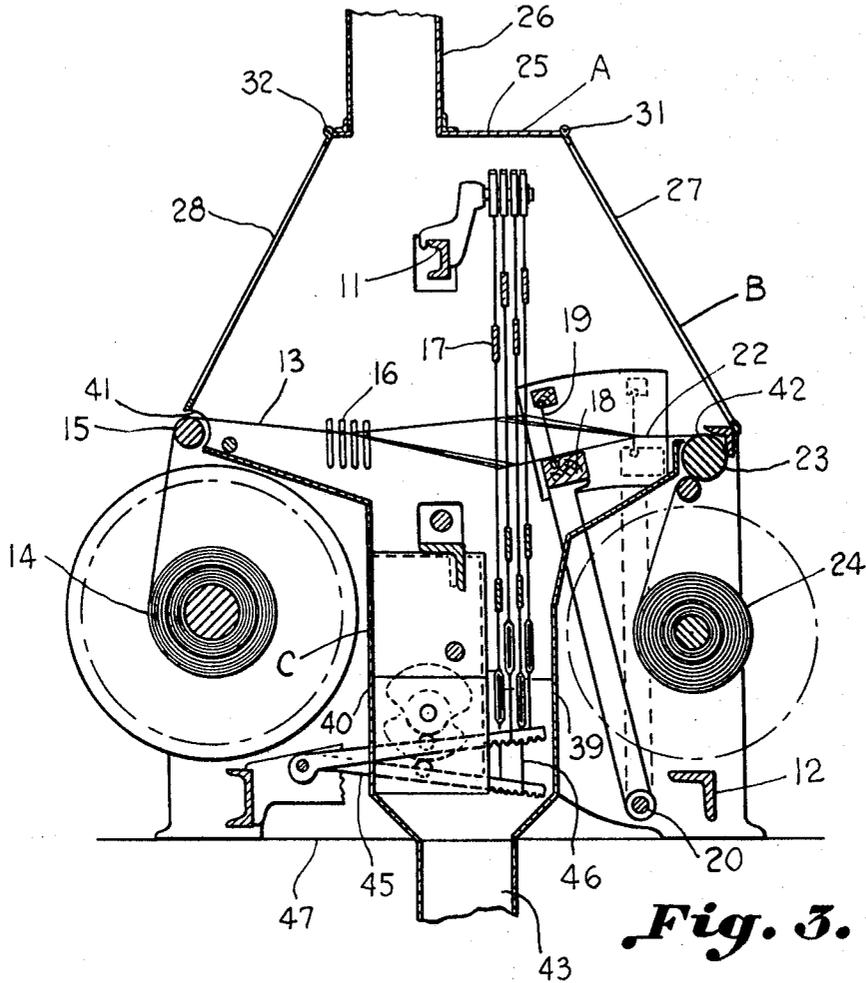


Fig. 3.

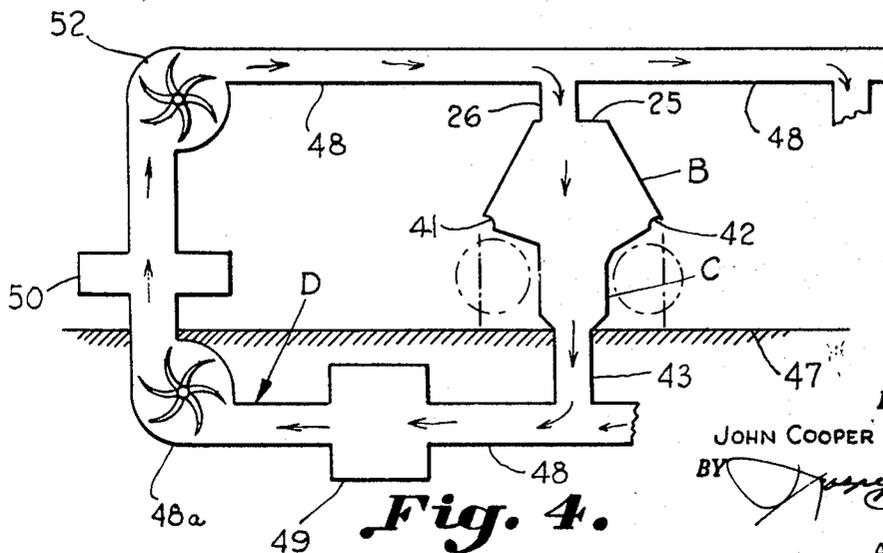


Fig. 4.

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4 Sheets-Sheet 3

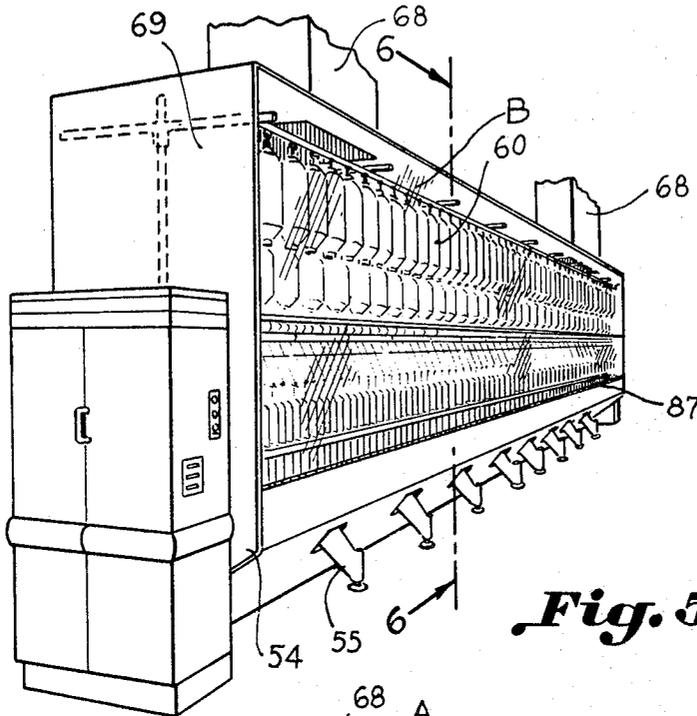


Fig. 5.

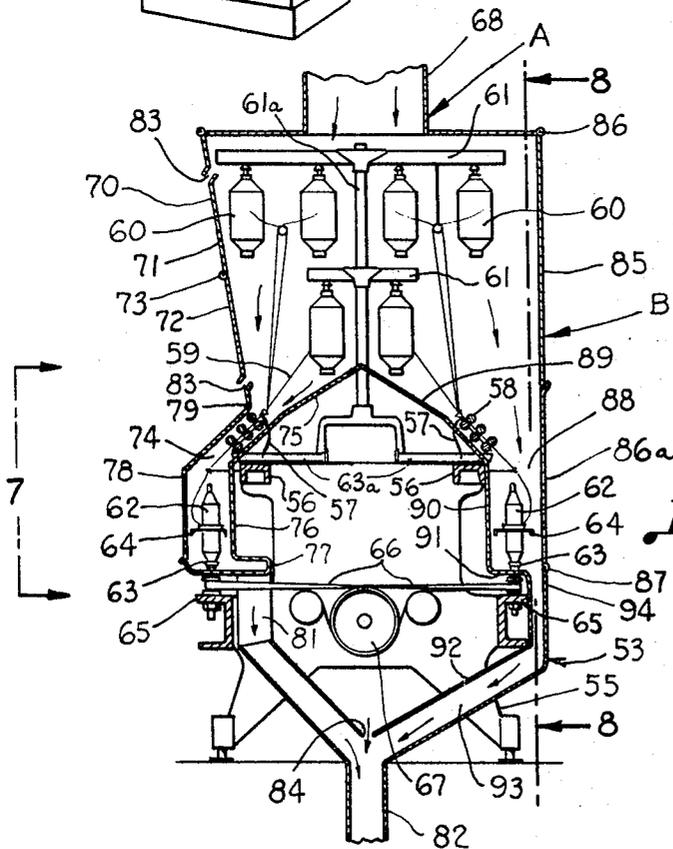
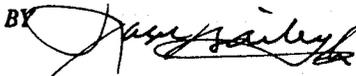


Fig. 6.

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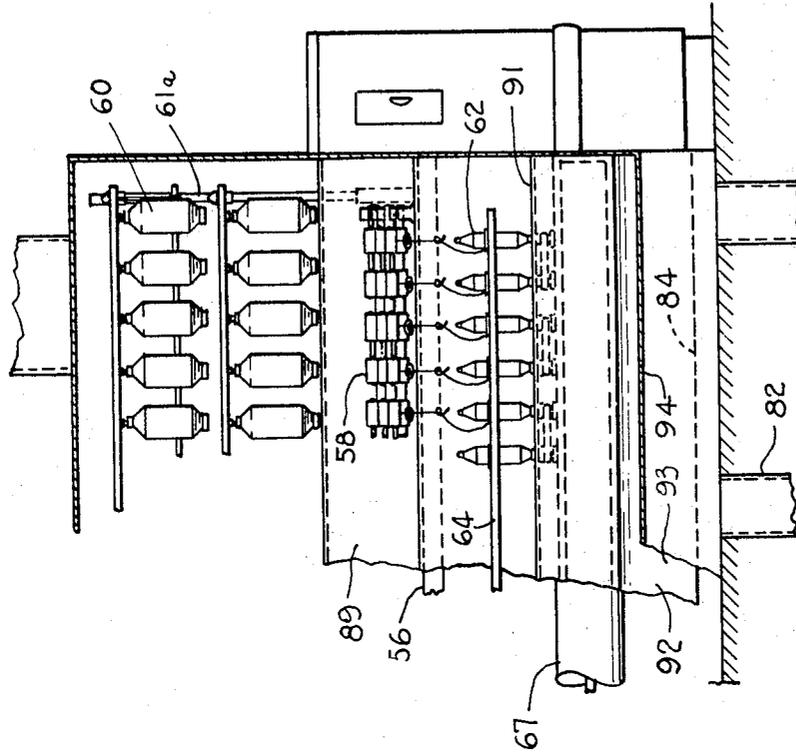


Fig. 7.

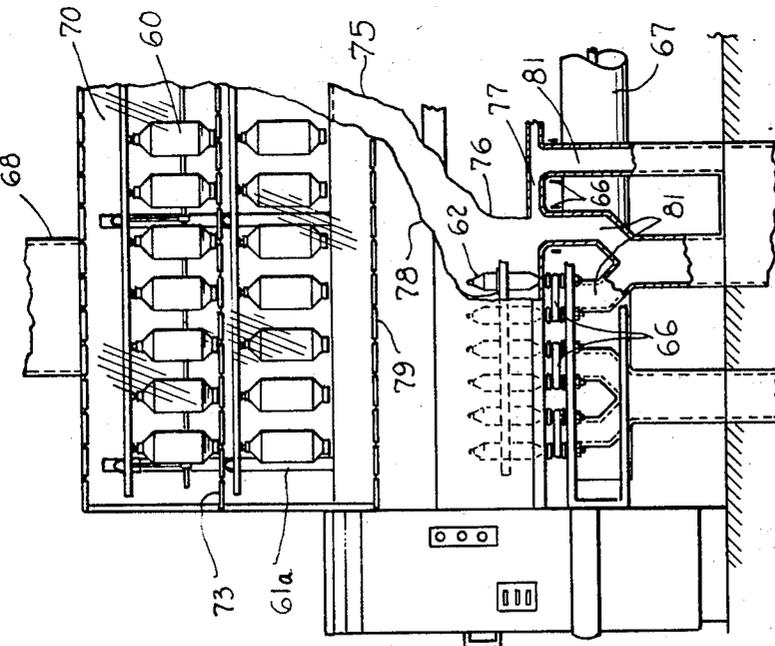


Fig. 8.

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3,391,528
**AIR HANDLING AND CLEANING APPARATUS
 FOR MACHINES**

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 1 Claim. (Cl. 57—56)

ABSTRACT OF THE DISCLOSURE

An apparatus for textile machinery which encloses the working instrumentalities of the machine where lint is normally produced and collects so as to clean such from the machines. Conditioned air is supplied to the apparatus and is concentrated at points on the machine where lint is generally produced in order to dislodge the lint therefrom and to condition the strands of material with humidity and temperature so as to improve the strand manipulating operation.

This invention relates to an apparatus for controlling the environmental conditions in which machines are operated, as well as for cleaning foreign matter and lint accumulations from textile machinery.

As is well known, many different types of cleaning devices have been provided for textile machinery to maintain the machinery and surrounding room free from foreign matter such as lint and fly. It is important that the machines be free from foreign matter in order to produce high quality cloth yarn or sliver. If no cleaning system were used, lint particles would accumulate and be picked up by the passages of yarn, sliver, etc., thus forming gouts or wads. These gouts or wads tend to catch on certain parts of the machinery and cause breakage of the caught textile strands with consequent stoppage of the machine. Furthermore, even if these wads or gouts did not cause breakage of the strands but passed through the machinery and were woven or knitted into the fabric, they would cause imperfections in the fabric.

Heretofore, various means have been attempted to reduce the amount of fly in the air and the lint settling on various surfaces. One device incorporates a travelling blower system which blows air directly onto the fiber manipulating machinery. Such a system has not proven satisfactory since the blower merely scatters the lint and other particles, and contaminates the air in the room in which the machinery is located. Furthermore, the dust, lint, and other particles, which are removed from the machinery may ultimately settle upon the yarn. The lint is ultimately swept up off the floor and sold as waste. Waste has a value and the cleaner the waste, the higher the value. It can be seen that if the waste is blown over the floor where oil has accumulated from the machines, or dirt from foot traffic, it will be contaminated and have a lower value.

One attempt to confine the foreign matter and lint contemplates using an induction draft system beneath the machinery. Such has not proven satisfactory since it is not practical to use induction fans which are large enough to pull the lint off the machine parts. This is especially true where filters have to be used with the induction draft system to remove the lint.

It has also been found that some yarn manipulating operations can best be accomplished at a certain temperature and humidity. Sometimes, the desired temperatures and humidity is not the most comfortable for the employees or the most economical. Thus, it is not desirable to maintain the entire room, where the machines are located, at the desired operating temperature and humidity.

Accordingly, it is an object of this invention to provide an apparatus for collecting lint and foreign matter from machines.

It is another object of the subject invention to provide an apparatus which improves the control of the temperature and humidity in the immediate vicinity of yarn manipulating mechanism of textile machinery.

Still another object of the subject invention is to provide an apparatus which encloses a textile machine to restrict lint and fly to the immediate vicinity of the machine and utilizes a controlled path of air flow to draw the lint and fly from the apparatus.

A further object of the invention is to provide an apparatus which utilizes both a direct draft of air and induction draft to maintain textile machinery free from lint and fly.

Still another important object of the present invention is to concentrate the flow of properly conditioned air on the areas of textile material in the various textile machines where the maintenance of properly conditioned air is of most importance to the efficiency of the operation of the machine and manipulation of the textile material.

It is another important object of the present invention to provide a device for collecting high quality waste fiber where it is initially dislodged from a strand so that it does not become contaminated by outside dust, floor dirt, machine oil, etc.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings forming a part thereof, wherein an example of the invention is shown and wherein:

FIGURE 1 is a perspective view illustrating an air handling and lint collection apparatus constructed in accordance with the present invention mounted in operative position on a loom,

FIGURE 2 is a perspective view illustrating the air handling and lint collection device of FIGURE 1 removed from the loom,

FIGURE 3 is a transverse sectional view taken along line 3—3 of FIGURE 1,

FIGURE 4 is a diagrammatic view illustrating the air handling and lint collection apparatus connected to a waste removal and air-conditioning system of a textile mill,

FIGURE 5 is a perspective view illustrating an air handling and lint collection apparatus constructed in accordance with the present invention mounted in an operative position on a spinning frame,

FIGURE 6 is a transverse sectional view taken along line 6—6 of FIGURE 5,

FIGURE 7 is a sectional side elevation taken along line 7—7 of FIGURE 6 with parts of the spinning frame removed, and

FIGURE 8 is a sectional side elevation taken along line 8—8 of FIGURE 6 with parts of the spinning frame removed.

Referring more particularly to the drawings, an air handling and lint collection apparatus, constructed in accordance with the present invention, is illustrated in FIGURE 1 enclosing a conventional loom.

A hood A is carried over the loom enclosing an upper portion of the loom. The hood A has an opening therein for receiving air. An air input means is connected to the opening in said hood for supplying air thereto. A central chamber B is attached to the hood. The central chamber B encloses working instrumentalities of the loom at points where lint normally is dislodged, and collects, in substantial quantities. A base enclosure C encloses a bottom portion of the machinery. The base enclosure is connected to the central chamber B for receiving accumulated lint

from the central chamber. A suction and collecting unit D (FIGURE 4) is connected to the base enclosure C for creating a negative pressure which aids in drawing the lint from the apparatus. Thus, the apparatus encloses the machinery and the flow of air passing therethrough maintains the machinery substantially free from lint and fly.

The loom illustrated in FIGURES 1 and 3 is a conventional loom consisting of side frames 10, the usual arch 11, and front girt 12. Warp yarn 13 is illustrated in FIGURE 3 as coming off warp beam 14 and passing over the whip roll 15, through the drop wires 16 and the harnesses 17 which form the shed for weaving. During the weaving operation the lay 18 with reed 19 oscillates horizontally about a pivot point 20 near the lower part of the loom. When the reed 19 is adjacent the harnesses 17, a shuttle or other means, depending on the loom being used, is passed through the shed placing a filling yarn between separated layers of warp yarn. When the lay 18 is moved to the right to the position shown in broken lines, the reed packs or beats up the filling yarn tight against the edge of cloth 22, thus adding one more cross thread to the cloth 22. The cloth 22 passes over the take-up roll 23 and is rolled on the cloth roll 24.

In such an operation action of the draw bars, the motion and action of the harnesses of the warp yarn, and the motion of the lay and reed along the warp yarn and against the cloth edge during the weaving operation cause fibers to be dislodged. These fibers or lint are sometimes woven into the cloth, which causes imperfections and reduces the value of the cloth. One of the purposes of the subject invention is to move the dislodged lint away from the yarn and cloth immediately and to collect the lint and foreign matter before such can be woven into the cloth. In order to accomplish such a feat an air handling and lint collection apparatus is constructed in accordance with the present invention to enclose a portion of the loom. This portion of the loom includes most of the areas where lint and fly would normally be dislodged during the weaving operation.

The apparatus includes a hood A which is carried over the loom and encloses an upper portion of the loom. The hood has a top 25 with an opening therein for receiving an air duct 26.

A central chamber B is attached to the hood A and encloses the working instrumentalities of the loom at points where lint normally is dislodged and collects in substantial quantities. The central chamber B includes front and rear walls 27 and 28, which are joined by side walls 29 and 30. The walls of the central chamber B are integral with the hood. The front and rear walls 27 and 28 are constructed of transparent material so that the weaving operation is visible. In order to provide access to the machinery, parts of the front and rear walls 27 and 28 are carried on hinges 31 and 32 mounted on the hood. Hinges may also be placed in the medial portion of the front and rear walls so that they can be folded thereabout, as well as pivoted on the hinges 31 and 32. Other type access panels could be used, such as hinged or removable doors, instead of the hinged walls 27 and 28.

The side walls 29 and 30 have openings therein for permitting laterally extending portions of the loom to extend beyond the apparatus. If it is desirable, the side walls can be positioned beyond the laterally extending portions of the loom and no holes would be necessary. Normally, the holes in the side walls are not objectionable since a direct draft of air and an induction draft are both connected to the apparatus. In the side wall 29 openings are cut for drop bar 33, lay 34, crank shaft 35, cam shaft 36, frame arch 37, and harness drive 38. On some looms it may be necessary for the side walls to project outwardly in the medial portion so as to accommodate the harnesses.

A base enclosure C encloses a bottom portion of the machinery. The base enclosure is connected to the central chamber B for receiving, confining and transmitting

accumulated lint from the central chamber. The base enclosure C includes front and rear walls 39 and 40, which joins the side walls 29 and 30. The front and rear walls 39 and 40 taper inwardly so that base enclosure C is located between the warp roll 14 and the cloth roll 24. A longitudinal slot 41 is provided between rear wall 28 of the central chamber B and the rear wall 40 of the base enclosure permitting the whip roll 15 to feed the warp yarn into the loom. A longitudinal slot 42 is provided between the front wall 27 of the central chamber B and the front wall 39 of the base enclosure for permitting the cloth 22 to pass through after the weaving operation to be taken up on the cloth roll 24. The longitudinal slot 42 is located adjacent the take-up roll 23.

The walls of the base enclosure C terminate in a pair of ducts 43 and 44 which straddle treadle 45. An opening 45a is provided in ducts permitting jack straps 46 to pass therethrough to be attached to a jack stick. The pair of ducts 43 and 44 isolate the treadle from the waste or lint being removed from the loom. Thus, oil drippings and the like from the treadle 45 do not contaminate the waste. The ducts 43 and 44 extend through the floor 47 of the mill and connects to the suction, cleaning, and air-conditioning system D which creates a negative pressure in the base enclosure for drawing the lint from the apparatus (FIGURE 4).

The suction and air-conditioning cleaning system D consists of a network of ducts 48 which connect an air-conditioning and a cleaning system to a plurality of looms. A return air fan 48a draws the air and lint from the loom through a filter 49 which removes most of the lint from the air. The air then passes through an air washer 50 which removes from the air the finer particles which pass through the filter and which reconditions the air so that it possesses the desired temperature and humidity. The reconditioned air passes from the air washer 50 through a blower 52 which blows the air into the hood A of the apparatus. It is noted that there is a positive pressure at the hood A and a negative pressure at the base enclosure C. The combination of the two with the pull of gravity causes the lint and foreign matter to be drawn into the collecting and cleaning unit D. The number of looms that can be connected to the collecting, cleaning, and air-conditioning unit is governed by the size of the air-conditioning device 50 and the fans.

The entire air handling and lint collecting apparatus may be constructed of sheet metal save those surfaces through which observation is desirable, such as front and rear walls 27 and 28, and such surfaces as needed for light transmittal. The apparatus is provided with adequate braces (not shown) to support the structure on the loom. If the apparatus is to be installed on machines already assembled, it may be necessary to assemble the apparatus in a plurality of parts and connect the parts together with bolts or the like.

While the invention is illustrated in FIGURES 1 through 4 as enclosing a loom, it can be associated with many different machines, such as spinning frames, as illustrated in FIGURES 5 through 8.

The spinning frame illustrated in FIGURES 5 through 8 is a conventional spinning frame with an air handling and lint collection apparatus mounted thereon. The spinning machine comprises a frame broadly designated at 53, which includes head-end frame member 54 and a foot-end frame member. Intermediate upright frame members or samsons 55, which support beams 56, are located between head-end and foot-end frame members. The beams 56 support spaced roll stands 57, which in turn, support the usual drafting rolls 58. The drafting rolls 58 draw roving or other textile strands 59 from roving packages 60 carried by a creel 61 supported by a vertical post 61a mounted on the frame 55. As strands 59 are drafted by rolls 58 they pass downwardly to and are wound about bobbins or yarn carriers 62 supported on spindles 63. The spinning frame is equipped with a conventional broken-

end collection system which includes tubular members 63a located adjacent to the drafting rolls 58. However, it is to be noted that an apparatus constructed in accordance with the invention may operate with or without machines having a collection system. A vertical traversing ring rail 64, which carries the usual rings and travelers for winding yarn on the bobbins 62 is associated with the machine. Spindles 63 are suitably supported by a spindle rail 65 carried by the frame 55. The spindles 63 are driven by tape members 66, which in turn, are driven by a centrally disposed rotating cylinder 67. The parts of the spinning machine, heretofore, described are conventional and are described only for environmental purposes. The spinning frame is enclosed in an air handling and lint removal apparatus. FIGURES 5 through 8 illustrate two different methods in which the apparatus can be mounted on the spinning frame. One method is illustrated enclosing the left-hand side of the spinning frame in FIGURES 6 and 7. Another method is illustrated enclosing the right-hand side of the spinning frame of FIGURE 6.

Both methods contemplate using a hood A over the spinning frame. The hood has a plurality of openings therein for receiving air ducts 68. The air ducts 68 are connected to a similar air-conditioning system as illustrated in FIGURE 4 of the drawings.

A central chamber B is attached to the hood. The central chamber encloses the working instrumentalities of the spinning frame. The central chamber is formed of a front-end wall 69 and a rear-end wall. A transparent side panel 70 is positioned between the front-end wall and the rear-end wall. The side panel 70 may be formed of one or more access panels 71 and 72. These panels may be joined by a hinge 73 or by a sliding lap joint, etc. The hinge can be reinforced and attached to the front-end and rear-end walls. The panel 70 tapers inwardly to a point above the drafting rolls. Air passing over the roving spindles is directed into a duct 74 which encloses the drafting rolls 58 and the bobbin 62. The inner wall 75 of the duct 74 extends from the vertical post 61a downwardly and outwardly adjacent the inner drafting rolls. At the base of the drafting rolls the inner wall has a vertical portion 76 which extends downwardly adjacent the inner surface of the bobbin 62 and terminates in a horizontal duct 77. The outer wall of the duct 74 is a plurality of hinged access panels 78 having the shape of an obtuse angle which fits closely adjacent the outer layer of drafting rolls 58 and the outer surface of the bobbin 62. The panel 78 is supported by a hinge 79 or by other suitable means, permitting the panel to be pivoted thereabout for providing access to the bobbins 62 and the drafting rolls 58. The outer wall of the duct 74 also terminates in the horizontal duct 77.

The horizontal duct 77 extends the length of the spinning frame and receives lint drawn from around the drafting rolls 58 and the bobbins 62. The base of the horizontal duct 77 has openings therein for permitting the spindles 63 to extend therethrough. The horizontal duct 77 has holes therein for receiving vertical ducts 81. The vertical ducts are positioned between the tapes 66 and extend downwardly connecting with a central air return duct 82. The central duct feeds the air and lint into a suction and collecting unit such as illustrated in FIGURE 4.

Relief openings 83 and 84 may be provided in the walls of the air handling apparatus. The relief openings 83 nearest the supply duct 68 would normally allow a flow of air from within the enclosure out into the room. The relief opening 84 located near the return air duct 82 would normally allow air to be sucked into the return air duct from the room. These relief openings could be fixed, or if found necessary, could be equipped with dampers of the usual type which would allow air to pass only in the desired direction and at a given time.

The air handling and lint collection apparatus illustrated in FIGURES 6 and 7 operates in a manner

similar to the apparatus previously described in connection with the loom. Air is fed into the apparatus and takes the path illustrated by the arrows. Air is supplied to the apparatus through duct 68 under a positive pressure. A suction or negative pressure is applied to the air return duct 82. Thus, the air on the left-hand side of the spinning frame, as illustrated in FIGURE 6, passes over the roving packages 60 collecting loose lint and fly. The velocity of the flow of air increases as it is confined to the duct 74. Thus, the fast moving air adjacent the drafting rolls 58 and the bobbin 62 tends to pick up any dislodged loose lint or foreign matter. It is also noted that the conditioned air is concentrated on the drafting rolls 58 and the bobbin 62. The air is drawn from duct 74 into the horizontal duct 77 from which it flows through the vertical ducts 81 into the air return duct 82. The air is filtered to remove the lint and reconditioned prior to recirculating it back through the air handling and lint removing apparatus.

The right-hand side of the spinning frame of FIGURES 6 and 8 illustrate another method of enclosing the spinning frame. A plurality of side panels 85 are connected to the hood A by hinges 86 permitting them to be opened. Lower panels 86a fit adjacent the upper panels 85. The lower panels are carried on longitudinal hinges 87 and can be pivoted thereabout. Vertical panels 85 and 86a may be installed as vertically counterbalanced panels, or as horizontally sliding units, or by any other suitable means. Air passing over the roving packages 60 is directed into a longitudinal duct 88. The inner wall 89 of the duct 88 extends from the vertical post 61a downwardly and outwardly adjacent the inner drafting rolls. At the base of the drafting rolls the inner wall has a vertical portion 90 which extends downwardly adjacent the inner surface of the bobbin 62 and terminates in a horizontal outwardly extending flange 91. There are openings in the inner wall 89 through which the space roll stands 56 project to support the drafting rolls. The flange 91 has openings therein permitting the spindles 63 to extend therethrough. The free-end of the flange 91 is joined by an inner wall 92 of a duct 93 which communicates with the return duct 82. An outer wall 94 of the duct 93 has one edge connected to the lower panel 86a and a lower edge connected to the return duct 82. The outer wall 94 has closely fitting openings through which the frame members 55 extend.

The air handling system illustrated on the right-hand side of the spinning frame illustrated in FIGURES 6 and 8 operates in a similar manner as the structure of the left-hand side. The air coming in the apparatus from duct 68 is under pressure. The air is directed over the drafting rolls 58 and the bobbin 62 by means of the duct 88. The air and lint collected passes through the passageway adjacent outerwall 94, the duct 93, and into the return duct 82.

The outer walls of the air handling and lint removal apparatus are constructed of transparent material so that the working mechanisms of the spinning frame are visible. The hood or other surfaces may be transparent for admitting light. It can be seen that the duct arrangements of the apparatus confine the lint and keeps it from flying out into the room. It can also be seen that the conditioned air is concentrated in the space adjacent to the textile material. Thus, the temperature and humidity of the air passing through the apparatus may be different from that in the room where the machines are located. When the apparatus is mounted on some machines, it may be desirable to provide lights within the apparatus to illuminate the working instrumentalities.

While a preferred embodiment of the invention has been described using specific terms, such description is for illustrative purposes only, and it is to be understood that changes and variations may be made without departing from the spirit or scope of the following claim.

What is claimed is:

1. In a spinning frame comprising a first series of spindles for supporting packages of filamentary material

such as roving, a second series of spindles located below said first series of spindles, means for supporting and driving said second series of spindles for the formation of yarn packages thereon, the improvement comprising: an apparatus for cleaning lint and other light material from the spinning frame, said apparatus including; a hood carried over said spinning frame and extending downwardly adjacent the first series of spindles carrying said packages of filamentary material, said hood having an air inlet; an air-conditioning source coupled to said air inlet for supplying conditioned air to said air inlet and into said hood; ducts communicating with said hood for directing a concentrated flow of conditioned air over said second series of spindles for removing lint from thereabout; at least one said duct being formed by an inner wall member including one planar section which is substantially parallel to a section of said hood adjacent the tops of said second series of spindles for concentrating the flow of air to increase its velocity therethrough; a base enclosure communicating with said ducts for receiving the lint from said ducts; a suction and collecting unit connected to said base enclosure for creating a negative pressure for aiding

in drawing lint from the apparatus; whereby the flow of air passing through the apparatus causes the lint to be directed into the collecting unit thus maintaining the spinning frame substantially free from such, and whereby the conditioned air is directed to the spaces immediately surrounding the textile strands being processed.

References Cited

UNITED STATES PATENTS

10	2,140,420	12/1938	Eaddy	57—56
	2,421,135	5/1947	Walter et al.	139—1
	3,073,106	1/1963	Tsuzuki	57—56
	3,146,572	9/1964	Keyser	57—1
15	3,311,135	3/1967	Maguire et al.	15—301

FOREIGN PATENTS

	1,385,540	12/1964	France.
	1,127,536	4/1962	Germany.
20	FRANK J. COHEN, <i>Primary Examiner.</i>		
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