Oct. 4, 1966 J. F. KING, JR., ETAL 3,276,065

TRAVELING CLEANER FOR TEXTILE MACHINES

Filed Nov. 19, 1964 5 Sheets-Sheet 1

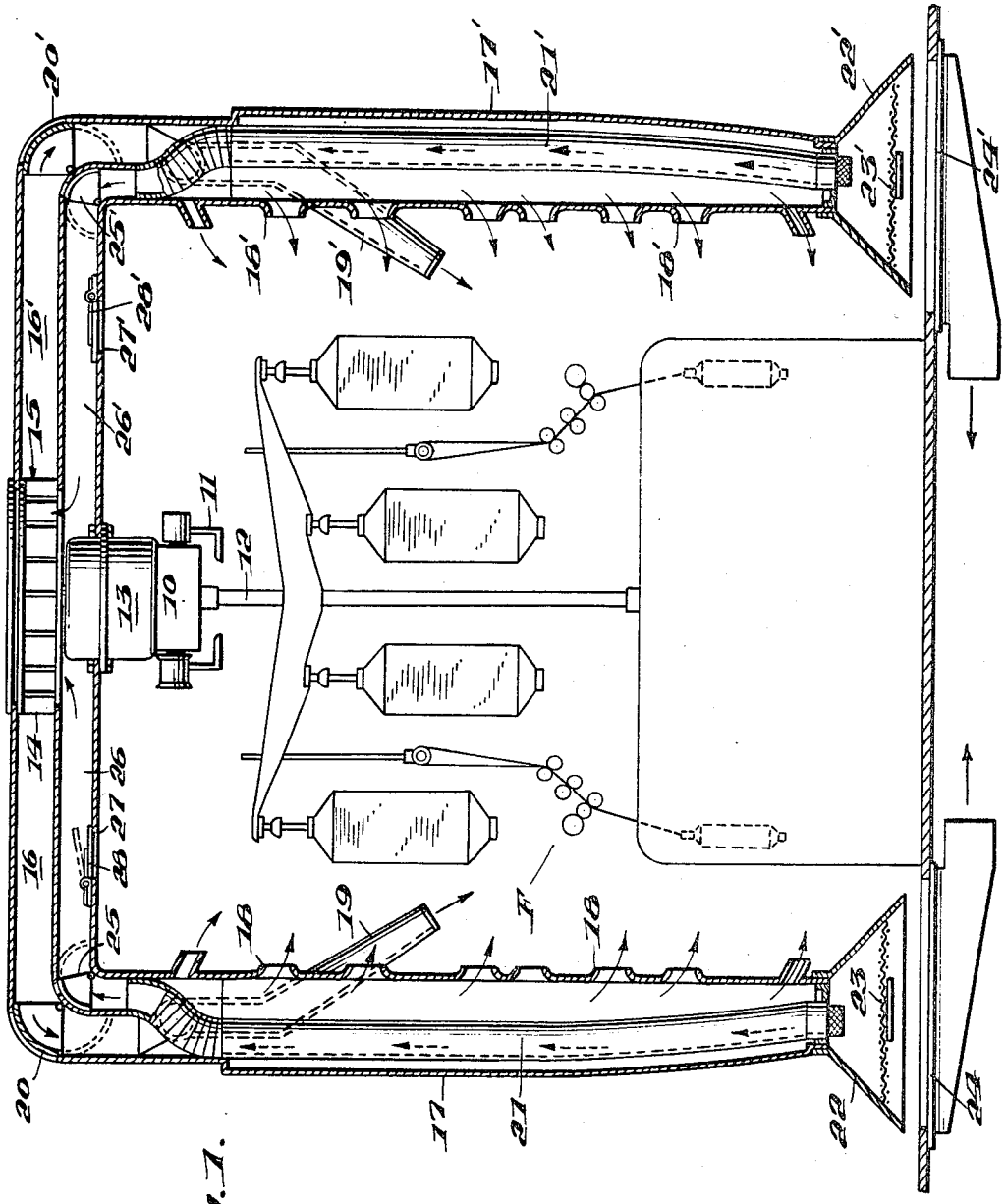

Fig. 1.

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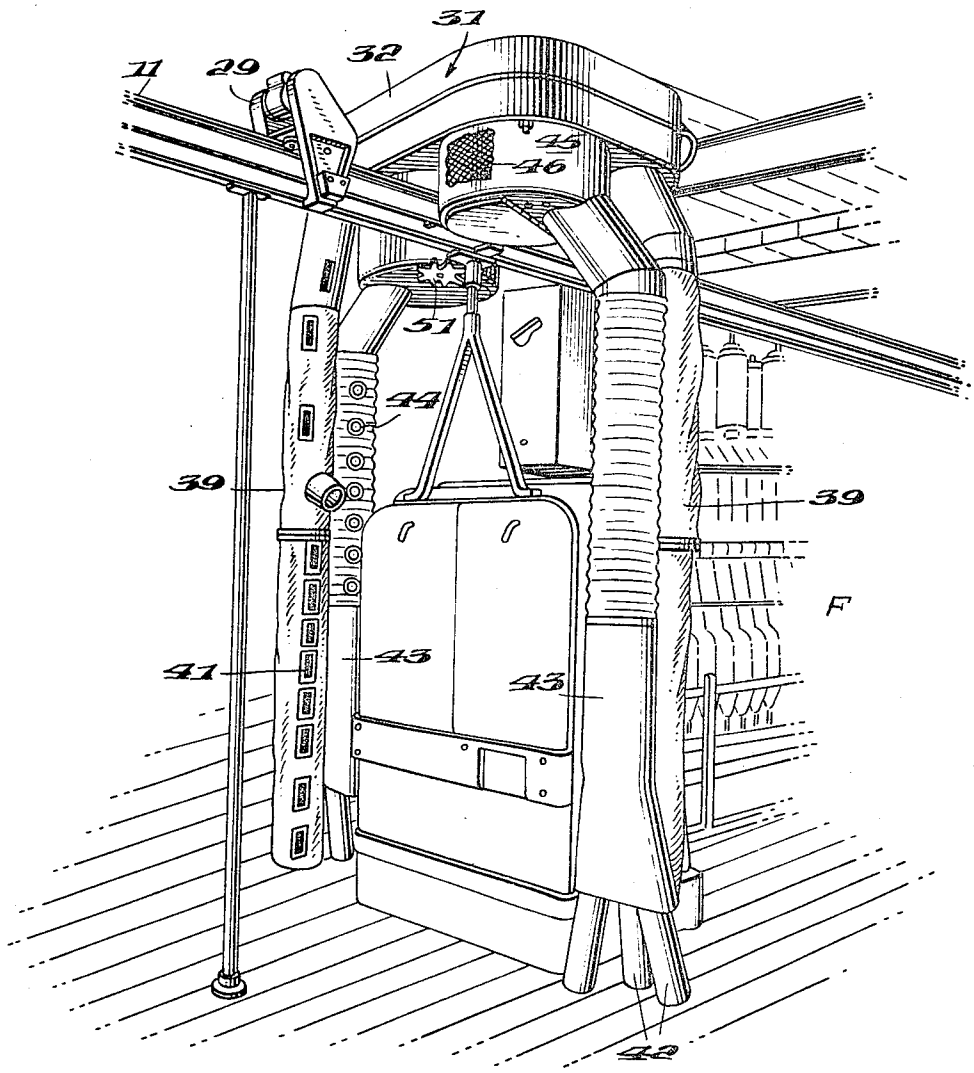
Fig. 2.



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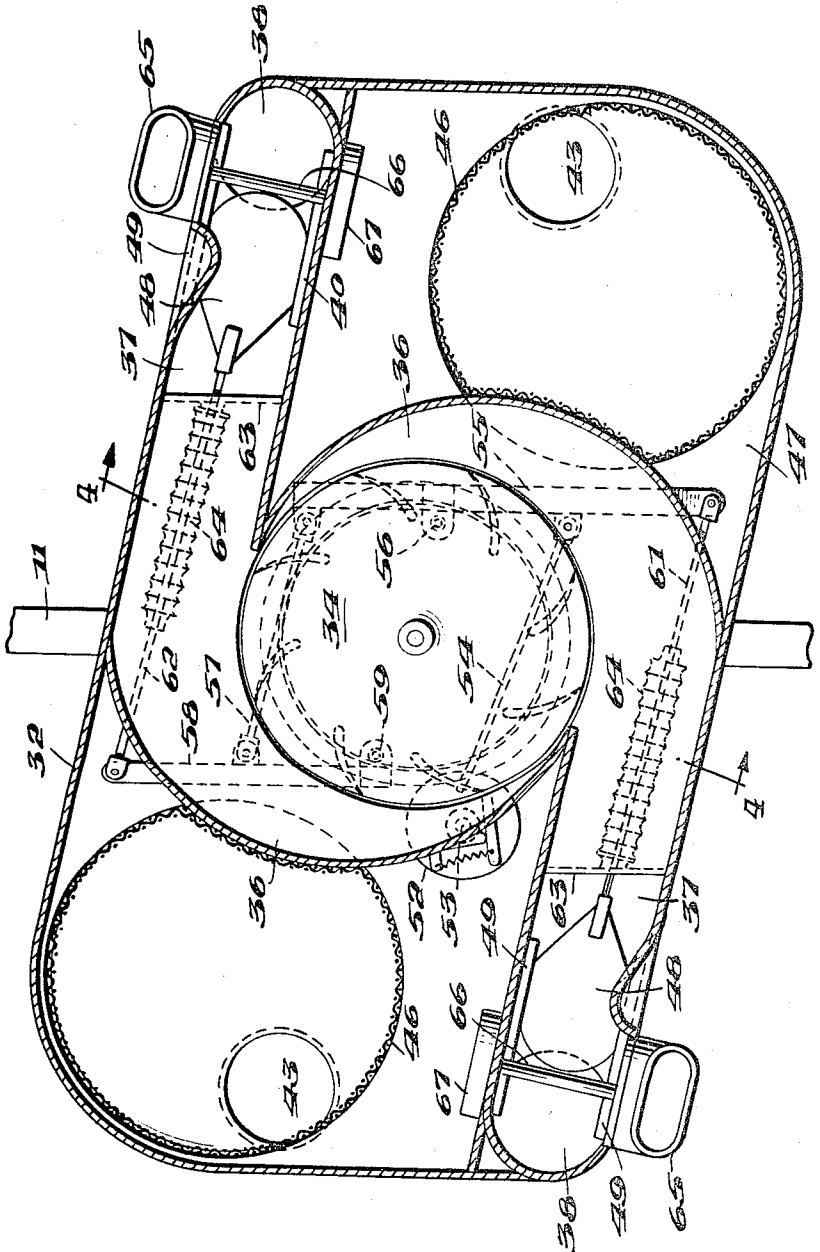

Fig. 3.

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Fig. 4.

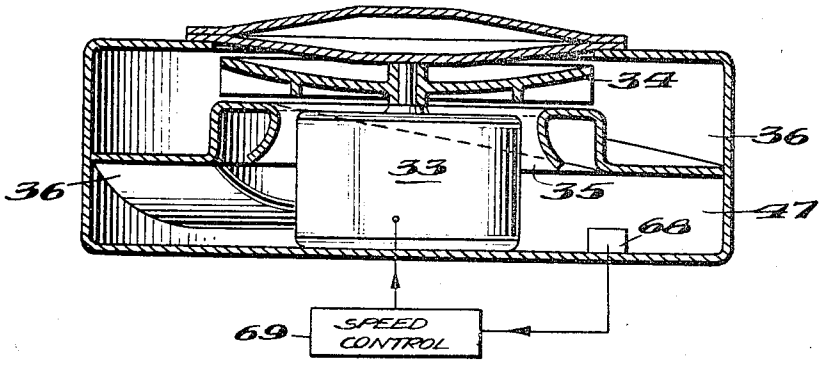

Fig. 6.

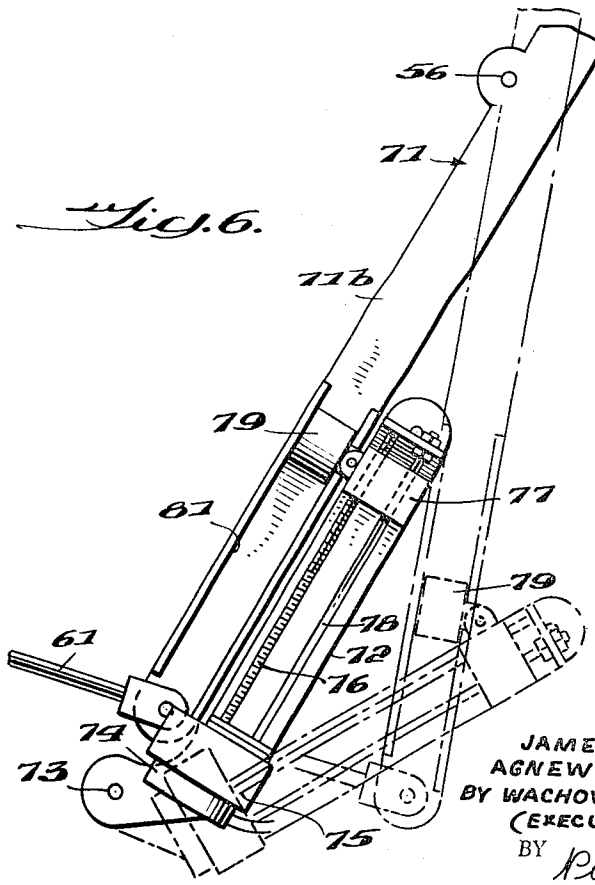

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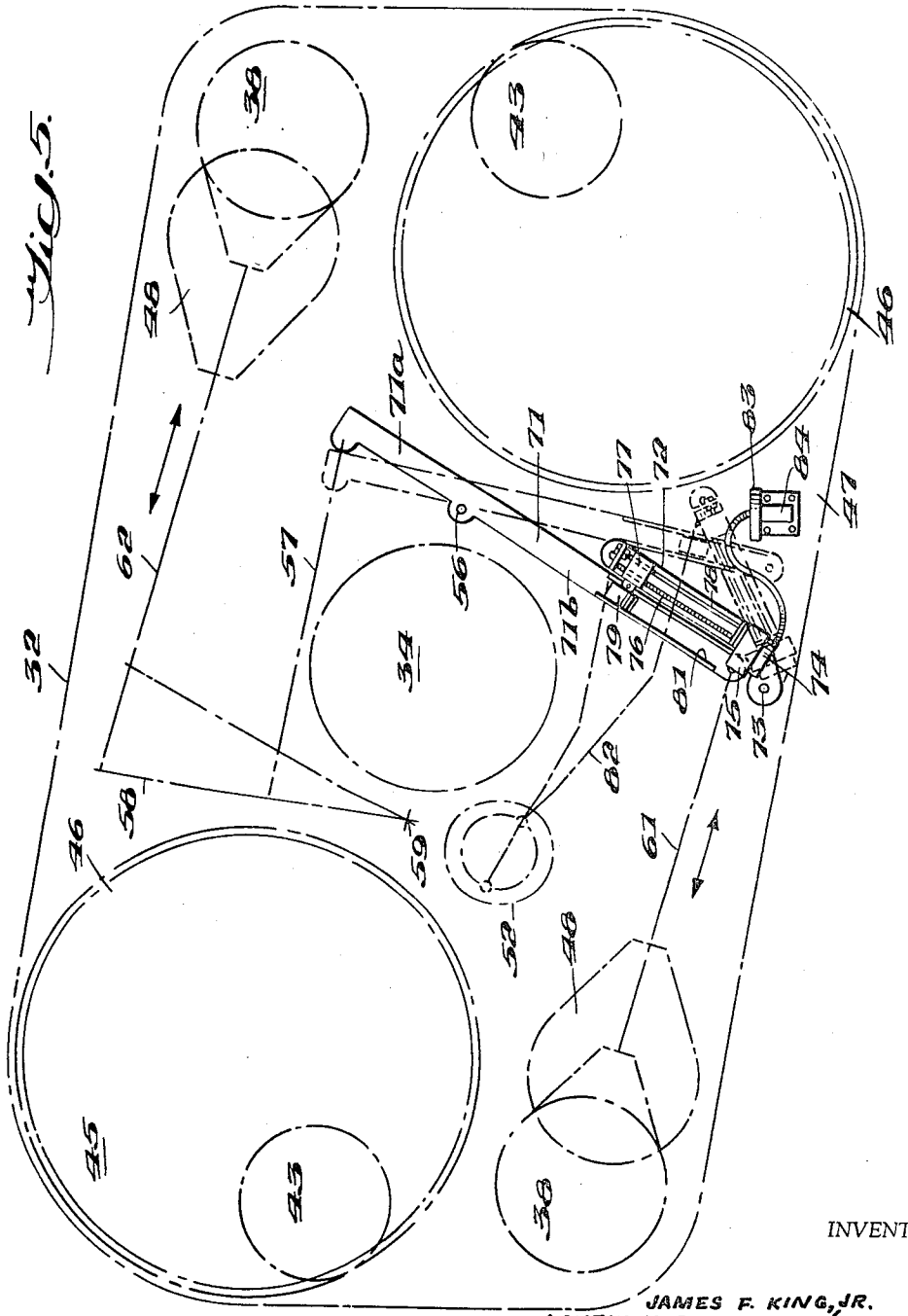
Fig. 5.



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United States Patent Office

3,276,065

Patented Oct. 4, 1966

3,276,065

TRAVELING CLEANER FOR TEXTILE MACHINES

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Filed Nov. 19, 1964, Ser. No. 412,871

8 Claims. (Cl. 15—312)

The present application, which is a continuation-in-part of our co-pending application, Serial No. 142,108 filed October 2, 1961, now abandoned relates to traveling cleaners for textile machines and more particularly to an improved cleaner apparatus constructed to travel on an overhead trackway located above one or more rows of machines for the purpose of blowing lint and other particulate matter from the machines and also collecting, through suction nozzles, similar matter which may tend to accumulate on the floor areas in the aisles between adjacent rows of machines.

In traveling cleaners of the general type described, lint and other particulate matter drawn up from the floor areas through one or more low pressure trunks by suction is led into a stripping screen from which the particulate matter is separated out of the air stream and held in a storage chamber. The cleansed air is then passed to the intake of a blower, usually one of the centrifugal type, and lint-free air discharged from the blower at a fairly high velocity is delivered into one or more depending high pressure trunks and discharged from a series of nozzles laterally inward against the side of the machine.

It has been found most important that the nozzles distributed along the high pressure trunks operate at the same static pressure and therefore deliver approximately the same volume of air independent of any change in the total amount of air normally handled by the blower when the traveling cleaner is operated under relatively lint-free conditions, i.e. with no lint accumulation in the storage receptacles and hence, a minimum of drop in air pressure across the lint stripping screens. However, with cleaner constructions heretofore proposed, this desired operating condition cannot be maintained due to progressive lint accumulation in the storage receptacles which makes is progressively more difficult to force air through the lint-stripping screens. This means that the blower handles less and less air as the lint accumulates and is thus no longer able to supply the high pressure trunks with a constant volume of air for clean-off purposes.

The primary object of the present invention is therefore to provide for maintaining adequate and uniform flow of air through the high pressure trunks under all conditions of operation thus assuring a high degree of machine cleaning at all times.

The desired result can be achieved according to the invention through various expedients all of which can be made responsive to a departure in static air pressure, either on the intake or discharge sides of the blower, from a suitable norm. If the control is placed on the inlet side of the blower between the air discharge side of the lint stripping screen and the blower inlet, the desired result can be attained by placing an automatically operating damper at such location, in accordance with the disclosure in the previously mentioned application Serial No. 142,108, the damper being spring loaded to a closed position and opened automatically as a function of the change in static pressure at the intake side of the blower.

Another expedient is to provide the blower with a variable speed motor and to control the motor speed and hence, also that of the blower as a function of the departure in air pressure, either at the blower inlet or outlet, from a selected norm so that the motor speed will increase with the accumulation of line in the storage chamber.

Still another expedient in accordance with the invention is to provide an adjustable damper at the entrance to the high pressure air discharge trunk and to control the damper opening as a function of the change in static pressure. In such arrangement air delivered from the pressure side of the blower running at a constant speed is always divided between the high pressure trunk and another outlet from the blower, preferably one or more ceiling cleaning nozzles, and constant air flow through the high pressure trunk is achieved by varying the distribution of air delivered from the blower such that as lint accumulates in the storage receptacle and reduces the total amount of air handled by the blower, the damper moves to a more open position thus to maintain the same amount of air flow into the high pressure trunk and simultaneously reduce the amount of air discharged from the ceiling cleaning nozzles.

The foregoing as well as other objects and advantages inherent in the invention will become more apparent from the following description of several embodiments of the invention and from the accompanying drawings wherein:

FIG. 1 is a view in elevation, with certain parts shown in section, of one embodiment of the invention wherein any reduction in the total amount of air handled by the blower which would otherwise result from lint accumulation at the stripping screen associated with each side of the cleaner is prevented by providing an auxiliary damper controlled inlet between the atmosphere and the inlet side of the blower, this inlet being situated between the discharge side of each lint-stripping screen and the inlet side of the blower and being controlled automatically by the change in pressure drop across the screen to draw in make-up air from the outside and thus compensate the reduction in air flow through the suction trunk;

FIG. 2 is a view in perspective of another embodiment of the invention wherein substantially constant flow of air through the discharge trunks is maintained by varying the speed of the blower motor and hence, also the blower as a function of the change in static pressure caused by lint accumulation on the stripping screens;

FIG. 3 is a view in horizontal section through the overall housing of the cleaner according to FIG. 2;

FIG. 4 is a view in vertical section taken on line 4—4 of FIG. 3 and which also shows a block schematic of the speed control for the blower motor;

FIG. 5 is a view similar to FIG. 3 but showing a modified embodiment of the invention using a constant speed blower and wherein the desired uniform air flow through the high pressure discharge trunks is maintained by varying the degree to which damper plates uncover the air inlets to these trunks from the discharge side of the blower as a function of the change in static pressure; and

FIG. 6 is a view of the damper control components of FIG. 5 drawn to a larger scale.

With reference now to the embodiment of the invention shown in FIG. 1, the traveling cleaner is seen to be comprised of a carriage **10** which can be self-propelled along a trackway **11** which extends longitudinally along a row of textile working machines such as spinning frames indicated generally at F. Trackway **11** is conventional being supported at intervals on posts **12**. The details of the self-propelled carriage have not been included since they do not per se constitute any part of the present inventive concept. Moreover, various constructions for motorized carriages are already well known in the art. Electrified conductor rails, likewise conventional and hence, not shown, extend parallel with the trackway, and collector shoes on the carriage run in contact with these

rails so as to provide power for energizing the electric traction motor provided for the carriage.

Supported by the carriage is a blower motor **13** which drives the impeller **14** of a centrifugal blower **15** which is provided with dual outlets delivering high pressure air laterally outward through ducts **16, 16'**. These ducts are connected to the upper, inlet ends of high pressure trunks **17, 17'** depending along the sides of the row of spinning frames and which are provided with a series of vertically spaced discharge nozzles **18, 18'** for directing lint-free air laterally inward against the sides of the spinning frame to blow off practically all surface areas between the floor and creel. If desired, special elongated nozzles **19, 19'** can be provided to direct air obliquely downward against the drafting roll zone of the frame.

The upper, inlet ends to the high pressure trunks can be provided with dampers **20, 20'** which can be shifted from the open positions, as illustrated, to the closed positions as indicated in dashed lines in order to cut off air flow at points where cleaning is not dictated such as at wide alleys between machines along a row and at the turn around points for the cleaner at the end of a row.

Located within each of the high pressure discharge trunks **17, 17'** are low pressure suction trunks **21, 21'** which terminate at their lower ends within flared nozzles **22, 22'** provided with transversely extending stripping screens **23, 23'**. Lint laden air drawn upwardly from the floor adjacent the mouth of each nozzle is passed through the screen so as to strip off the lint and hold it against the under face of the screen. Screens **23, 23'** are set back from the mouths of the nozzles and the spaces represented by these set-backs constitute temporary storage chambers for the lint. In order to remove the lint from these storage chambers, floor outlets **24**, under suction, can be established along the path of the cleaner and lint can be transferred into these outlets each time the cleaner passes over them. To assist in the transfer, the upper end of each suction trunk is provided with a damper plate **25, 25'** movable from an open position to a closed position indicated by the broken lines so as to close off each suction trunk from the inlet to the blower. The upper ends of the suction trunks deliver cleansed air to inlet ducts **26, 26'** which lead to the inlet to the blower impeller **14**.

It will be evident that as lint accumulates on the stripping screens **23, 23'**, the latter will tend to clog the screen openings and hence, reduce the amount of air entering the inlet to the blower. Unless counter measures are taken, this reduction in the total amount of air handled by the blower will result in a diminution of the air discharged from the nozzles **18, 18'** and **19, 19'** and hence, a reduction in the cleaning efficiency of the machine.

In order to keep up the cleaning efficiency, means are provided for bringing in air to the blower inlet at the discharge side of the stripping screens. This is accomplished by means of spring loaded dampers **27, 27'** located in the inlet ducts **26, 26'**. These dampers are biased to their closed positions by springs **28, 28'** and open inwardly to admit make-up air from the exterior of the cleaner housing in the event that the normal air paths to the blower inlet through the stripping screens become blocked or partially blocked as a result of lint accumulation on the screens. This expedient thus assures adequate air delivery through the high pressure trunks at all times and thus maintains cleaning efficiency at an optimum.

In the embodiment of the invention illustrated in FIGS. 2–4, the traveling cleaner is seen to be constituted by two structurally separate tractor and cleaner units **29, 31** coupled together to travel along the overhead rail structure **11**. The motorized tractor **29** is articulated to the cleaner unit **31** so as to pull or push the latter along the trackway. This general arrangement is described in greater detail and claimed in United States Letters Patent No. 3,245,103 granted April 12, 1966, granted on a co-

pending application Serial No. 315,515 filed October 11, 1963, in the name of James F. King, Jr., who is one of the joint inventors of the present application. The cleaner unit is comprised principally of a sheet metal housing structure **32** within which is mounted a blower motor **33** which drives a centrifugal blower **34** having a central intake **35** and diametrally opposed outlet scrolls **36**. Each outlet scroll is connected by ductwork **37** to a circular discharge opening **38** in the housing from which depends a high pressure trunk **39** provided with a vertically oriented series of spaced discharge nozzles **41** for blowing transversely inward against the sides of the spinning frame F so as to discharge any lint that may accumulate on the surfaces and cause it to be deposited on the floor where it can readily be sucked up by floor nozzles **42** attached to the lower ends of suction trunks **43**, one at each side of the cleaner, these suction trunks also including a series of vertically spaced intake nozzles **44** and being fastened at their upper ends to a lint storage canister **45** located beneath the general housing structure. Each lint storage canister includes a tub-like screen **46** into which the lint-laden air is discharged from the low pressure suction trunk. There the lint and other particulate matter is stripped from the air stream, and the cleansed air passes through the screen into the low pressure chamber portion **47** of housing **32** and thence to the blower intake **35**.

In order to enable one to cut off the discharge of air from the high pressure trunks against the sides of the spinning frame at any desired location along the cleaner path where discharge of air streams may not be desired, the cleaner is provided with a damper mechanism including a slidable damper plate **48** associated with the inlet **38** to each high pressure trunk. These damper plates are actuatable between their open and closed positions in guide channels **49** and are linked together for simultaneous operation by means of a linkage mechanism controlled by a four-lobed star wheel **51** depending from the cleaner structure and which is adapted to be rotated in increments of 90° by means of a pin secured at the desired position along the trackway. Rotation of this star wheel through 90° develops a 180° rotation of a crank plate **52** mounted upon shaft **53**.

A connecting rod **54** is pivotally connected at one end to crank plate **52** so that the plate can rotate beneath the connecting rod. Since each 90° displacement of star wheel **51** causes crank plate **52** to rotate through 180°, damper plates **48** are thus actuated to an open position or to a closed position. The damper plate actuating linkage itself is comprised of lever **55** pivotally mounted at **56** between its ends. At one side of this pivot, the other end of connecting rod **54** is connected to the lever, and at the other side of this pivot a second pivotally mounted connecting rod **57** extends from an end of lever **55** to an intermediate point on lever **58** which includes a pivot mounting **59** at one end. From the other end of lever **55** and similarly from the other end of lever **58**, pivotally mounted actuating rods **61, 62** extend to the damper plates **48**.

As shown in FIG. 3, each damper plate is supported at three points; at its rear by actuating rod **61** (**62**) and at each side by channel **49**. Since the linkage mechanism for actuating the damper plates is located within the low pressure side **47** of the overall housing structure **32**, i.e. exteriorly of the high pressure discharge scrolls **36**, a partition **63** must be provided in the housing structure for each damper unit, each such partition including an aperture through which the appertaining damper plate actuating rod passes and an elongated boot **64** surrounding the rod which functions as a sealing element between the high and low pressure chambers of the housing on opposite sides of the partitions.

In addition to the two high pressure discharge trunks **39** which depend from each side of the cleaner housing **32**, the latter is provided with an oscillatable ceiling clean-

ing nozzle 65 located adjacent the entrance to each high pressure discharge trunk and mounted on shaft 66 which is oscillated by a mechanism within casing 67. Thus the air delivered by each discharge scroll is distributed between a ceiling cleaner nozzle and the high pressure discharge trunk correlated therewith. When the damper plates 48 are in their closed position such as to shut off all air flow into the high pressure discharge trunks, all of the air delivered by the blower is discharged through the two ceiling cleaner nozzles.

In accordance with the inventive concept of the present application, adequate air flow is maintained through the high pressure discharge trunks 39, notwithstanding a reduction in the amount of air normally handled by the blower as lint accumulates in each collection chamber from the related suction trunk and cuts down on the rate at which air can be pulled through the stripping screen. In the embodiment of the invention illustrated in FIGS. 2–4, the desired result is effected by increasing the speed of blower 34 such as by increasing the speed of the electric motor 33 which drives it. This is effected by means of a static pressure measuring unit 68 and which is located, for example, within that part 47 of the overall housing structure between the discharge side of the lint-stripping screens and the intake plenum 35 of blower 34. As more and more lint accumulates within the screens 46 the static pressure across the blower increases and is detected by this pressure responsive unit which transmits the pressure change to a control device 69 which increases the speed of motor 33 accordingly so as to maintain the air discharged from the blower at the substantially constant volume desired. The control device 69 has been depicted by block schematic only since the particular overall speed-changing device associated with the variable speed motor will depend upon the particular type of motor utilized. If the motor is of the induction type, the desired result can be obtained by suitably changing the number of poles. If the motor is of the type wherein a change in motor speed can be effected by varying the armature or field current, then the desired result can be obtained by so arranging the control device that it will modulate the armature or field current. Since any of these various modes of speed control are well known in the art, the specific wiring details have been omitted in the interest of simplifying the disclosure.

A somewhat different type of control is illustrated in FIGS. 5 and 6. Here it will be seen that the desired uniform air flow through the high pressure discharge trunks is maintained by modulating the damper plates 48 to a more open position in accordance with the rise in static pressure across the blower 44. In the embodiment of FIGS. 2–4, it was explained that the damper plates are shifted only between a closed position and a predetermined open position. In the embodiment of the invention according to FIGS. 5 and 6, position-modulation of the damper plates is attained by modifying the linkage mechanism in accordance with the rise in static pressure across the blower.

With reference now to FIGS. 5 and 6, it will be seen that lever 71 is similar to lever 55 and pivotally mounted between its ends so as to establish two lever arms 71*a*, 71*b*. The outer end of lever arm 71*a* is articulated to one end of connecting rod 57 and the other end of the latter is articulated to an intermediate point on lever 58 which is pivotally mounted at one end on pivot shaft 59. The other end of lever 58 is articulated to the actuating rod 62 that extends to one of the damper plates 48. The outer end of lever arm 71*b* is articulated to one end of the actuating rod 61 that extends to the other damper plate.

In order to modulate the effective stroke of the dampers, a servo mechanism is associated with lever 71. This servo mechanism is mounted on an elongated plate 72 located above lever 71 and pivotally mounted at one end thereof on a pivot shaft 73. The servo mechanism comprises a feed-back potentiometer 74 connected to an extension of the drive shaft of a reversible electric servo motor 75 mounted on plate 72. The drive shaft 76 of this motor is seen to extend for the full length of plate 72 and is threaded throughout in order to serve as a lead screw for a slide block 77 through which it is threaded. Slide block 77 is guided longitudinally along plate 72 by means of a rod 78 which extends through a bore provided in the slide block. Thus, as servo motor 75 is driven in one direction or the other, slide block 77 will be shifted along plate 72 as lead screw 76 is rotated. Connected to slide block 77 by an articulated joint is a roller type slide 79 which rides in a channel 81 provided along the longer lever arm 71*b* and hence, its position along the channel is determined by the position of slide block 77 of the servo mechanism.

The outer end of servo plate 72 is connected by an articulated joint to one end of connecting rod 82 and the other end of the latter is connected to crank plate 52 which is rotated through 180° from one position to another so as to shift the damper plates between their closed and open positions. Connecting rod 82 is thus always moved through a full stroke from one position to the other as indicated in FIGS. 5 and 6 pulling or pushing the pivotally mounted servo plate 72 with it. The angular displacement of servo plate 72 which is always the same is transmitted through roller 79 to channel 81 and hence, to lever arm 71*b* which, in turn transmits this movement to the actuating rods 61, 62 for the damper plates 48. The roller connection 79 between the servo plate 72 and the lever arm 71*b* by shifting longitudinally along the channel 81 produces a corresponding increase, or decrease, as the case may be, in effective length of lever arm 71*b*. When slide block 77 and roller 79 are in the positions depicted in the drawing, lever arm 71*b* will have its shortest effective length and hence, the dampers will move through their maximum stroke. Under this condition, operation will be essentially the same as though connecting rod 82 were tied directly but pivotally to lever 71*b* at a fixed distance from pivot shaft 56, as in the embodiment according to FIGS. 2–4. As slide block 77 and roller 79 are shifted towards the other end of servo plate 72 by servo motor 75, the damper stroke will be progressively decreased because of the inter-relationship between the servo plate 72 and lever arm 71*b* which will then progressively increase in its effective length and hence, undergo progressively smaller angular displacements for the always constant angular displacement of servo plate 72.

Servo motor 75 is operated on the well known force-balance principle from potentiometer 74 which, in turn, is caused to balance up with a controlling potentiometer 83 actuated directly by a static pressure responsive control unit 84, which is used to measure any particular function in the traveling cleaner related to a decrease in total air handled by the blower. In the illustrated embodiment, the pressure responsive control unit is placed in the low pressure part 47 of the cleaner housing 32 between the discharge side of the lint-stripping screens 46 and the intake to the blower, and hence, will measure the change in pressure drop across the screens. The control unit could also be placed in one of the high pressure discharge ducts of the blower so as to measure the change in velocity pressure of the air leaving the centrifugal blower.

When the traveling cleaner is free from lint accumulation i.e. there is no lint accumulation in the collection chambers defined by the interior of each tub-like screen 46 and thus handles a maximum amount of air, the static pressure control unit 84 causes servo motor 75 to retract slide block 77 and roller 79 towards the opposite end of servo plate 72 from that depicted so as to establish a minimum actuating stroke for the control dampers 48 and thereby maintain a maximum restriction of air flow downwardly through the high pressure discharge trunks 39 but which is considered adequate for cleaning off the machines. As lint begins to build up within the screens 46, blower 44 running at a constant speed will be subjected

to a higher operating pressure and the total air volume handled by the blower will be decreased. Static pressure control **84** is signalled by this increase in internal static pressure, and this in turn resets correspondingly master potentiometer **83**. This reset of potentiometer **83** temporarily unbalances the force-balance slave potentiometer unit **74** which causes servo motor **75** to operate and rotate lead screw **76** in such direction as to shift slide **77** and roller **79** to a new position of balance further removed from the pivotally mounted end of servo plate **72**. As previously explained, this action changes the pivotal relationship between lever arm **71***b* and servo plate **72** so as to effect a modulation of slide dampers **48** to a new and more open position proportional to the change in static pressure.

The control arrangement according to FIGS. 5 and 6 thus serves to progressively reduce the damper restriction across the openings **38** from the cleaner housing into the high pressure discharge trunks **39** as the supply of air through blower **44** is progressively reduced such as will maintain a relatively constant volume of air downwardly into the high pressure discharge trunks under all normal operating conditions and thereby maintain a satisfactory velocity of clean-off air from the nozzles of these trunks directed towards the sides of the textile machines.

We claim:

1. In a traveling cleaner for textile machines arranged to travel along a trackway positioned above and extending longitudinally along a row of such machines in a work room, the combination comprising a traveling support structure, a blower unit mounted on said support structure, an air intake trunk extending downwardly from said support structure and connected at its upper end to the intake side of said blower unit for sucking in lint and similar particulate matter, screen means interposed in the air flow path preceding the intake side of said blower unit for stripping out the particulate matter entrained in the air sucked into said intake trunk, an air discharge trunk extending downwardly from said support and connected at its upper end to the discharge side of said blower unit, said air discharge trunk being provided with a plurality of outlets for discharging cleansed air laterally inward against the side of said machine, a damper member located at the upper end of said air discharge trunk for controlling the flow of air into said trunk from said blower unit, means for actuating said damper member to a preselected open position and means responsive to an increase in static pressure across said blower unit caused by partial clogging of said screen means due to accumulation of particulate matter thereon for shifting said damper member to a more open position to thereby maintain a substantially uniform flow of air through said air discharge trunk.

2. A traveling cleaner as defined in claim **1** wherein said means for actuating said damper member to a preselected open position is comprised of a mechanical linkage including a pivotally mounted actuating lever connected to said damper member, and said means responsive to an increase in static pressure across said blower unit is comprised of a pressure-responsive servo motor mechanism operable to shift the angular position of said actuating lever about its pivot and hence also the position of said damper plate.

3. A traveling cleaner as defined in claim **1** wherein said means for actuating said damper member to a preselected open position is comprised of a mechanical linkage connected thereto, and said means responsive to an increase in static pressure across said blower unit is comprised of a pressure-responsive servo motor mechanism operable to modify the stroke of said mechanical linkage such as will shift said damper to its more open position.

4. In a traveling cleaner for textile machines arranged to travel along a trackway positioned above and extending longitudinally along a row of such machines in a work room, the combination comprising a traveling support structure, a blower unit mounted on said support structure, an air intake trunk extending downwardly from said support structure and connected at its upper end to the intake side of said blower unit for sucking in lint and similar particulate matter, screen means interposed in the air flow path preceding the intake side of said blower unit for stripping out the particulate matter entrained in the air sucked into said intake trunk, an air discharge trunk extending downwardly from said support and provided with a plurality of openings for discharging cleansed air laterally inward against the side of said machine, the air delivered from said discharge side of said blower unit being divided between a principal outlet constituted by said air discharge trunk and an auxiliary outlet such as a ceiling cleaning nozzle, and means responsive to an increase in static pressure across said blower unit caused by partial clogging of said screen means due to accumulation of particulate matter thereon for modifying the ratio of said division of the air delivered from the discharge side of said blower unit such that the amount of air entering said air discharge trunk remains substantially constant notwithstanding a drop in the amount of air handled by said blower unit caused by clogging of said screen means.

5. A traveling cleaner as defined in claimed **4** wherein said means for modifying the ratio of said division of the air delivered from the discharge side of said blower unit in response to an increase in static pressure across said blower unit is comprised of an adjustable damper member controlling air flow through one of said outlets.

6. A traveling cleaner as defined in claim **5** wherein said adjustable damper member is provided for said air discharge trunk and said adjustable damper is shifted to a more open position upon an increase in static pressure across said blower unit.

7. In a traveling cleaner for textile machines arranged to travel along a trackway positioned above and extending longitudinally along a row of such machines in a work room, the combination comprising a traveling support structure, a blower unit mounted on said support structure, an air intake trunk extending downwardly from said support structure and connected at its upper end to the intake side of said blower unit for sucking in lint and similar particulate matter, screen means interposed in the air flow path preceding the intake side of said blower unit for stripping out the particulate matter entrained in the air sucked into said intake trunk, an air discharge trunk extending downwardly from said support and connected at its upper end to the discharge side of said blower unit, said air discharge trunk being provided with a plurality of outlets for discharging cleansed air laterally inward against the side of said machine, a damper member located at the upper end of said air discharge trunk for controlling the flow of air into said trunk from said blower unit, means for actuating said damper member to a preselected open position, pressure sensing means located at the discharge side of said blower unit, and means controlled by said pressure sensing means in accordance with a change in pressure to effect a corresponding change in the open position of said damper member to maintain a substantially uniform flow of air through said outlets of said discharge trunk.

8. In a traveling cleaner for textile machines arranged to travel along a trackway positioned above and extending longitudinally along a row of such machines in a work room, the combination comprising a traveling support structure, a blower unit mounted on said support structure, an air intake trunk extending downwardly from said support structure and connected at its upper end to the intake side of said blower unit for sucking in lint and similar particulate matter, screen means interposed in the air flow path preceding the intake side of said blower unit for stripping out the particulate matter entrained in the air sucked into said intake trunk, an air discharge trunk extending downwardly from said support

and provided with a plurality of openings for discharging cleansed air laterally inward against the side of said machine, the air delivered from said discharge side of said blower unit being divided between a principal outlet constituted by said air discharge trunk and an auxiliary outlet such as a ceiling cleaning nozzle, pressure sensing means located at the discharge side of said blower unit, and means controlled by said pressure sensing means in accordance with a change in pressure to effect a corresponding modification in the ratio of said division of the air delivered from the discharge side of said blower unit to maintain a substantially uniform flow of air through said openings in said air discharge trunk.

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