April 22, 1969 H. J. GLEATON 3,440,097

METHODS FOR CLEANING LOOMS

Filed April 28, 1966 Sheet 1 of 3

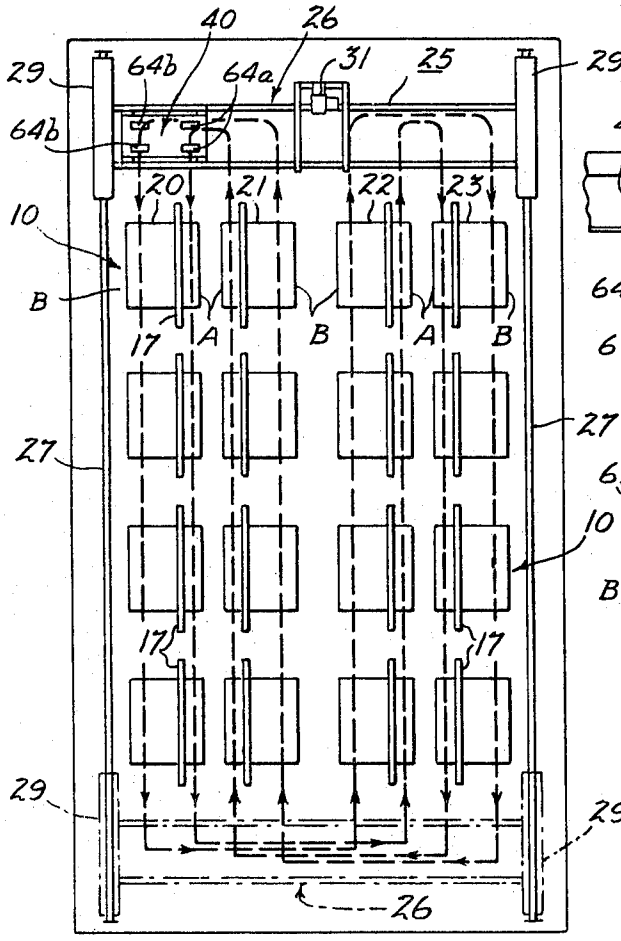


Fig. 1

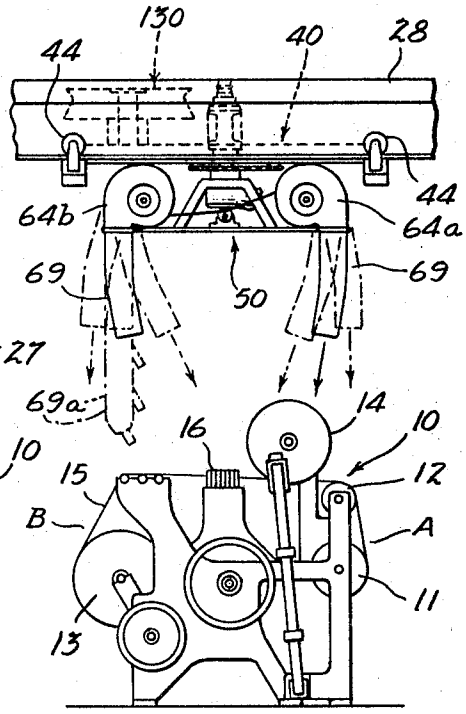


Fig. 2

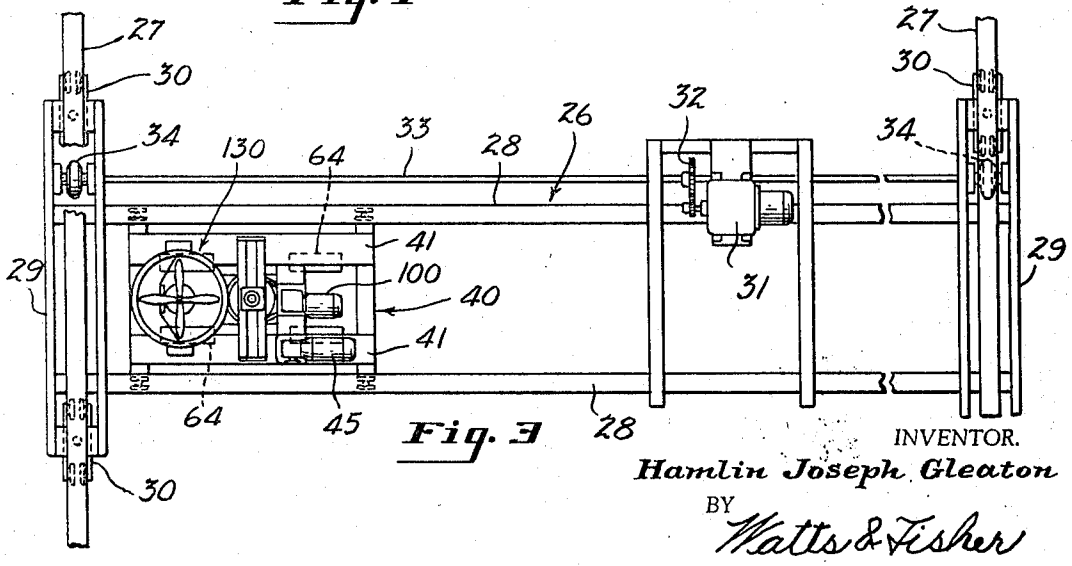


Fig. 3

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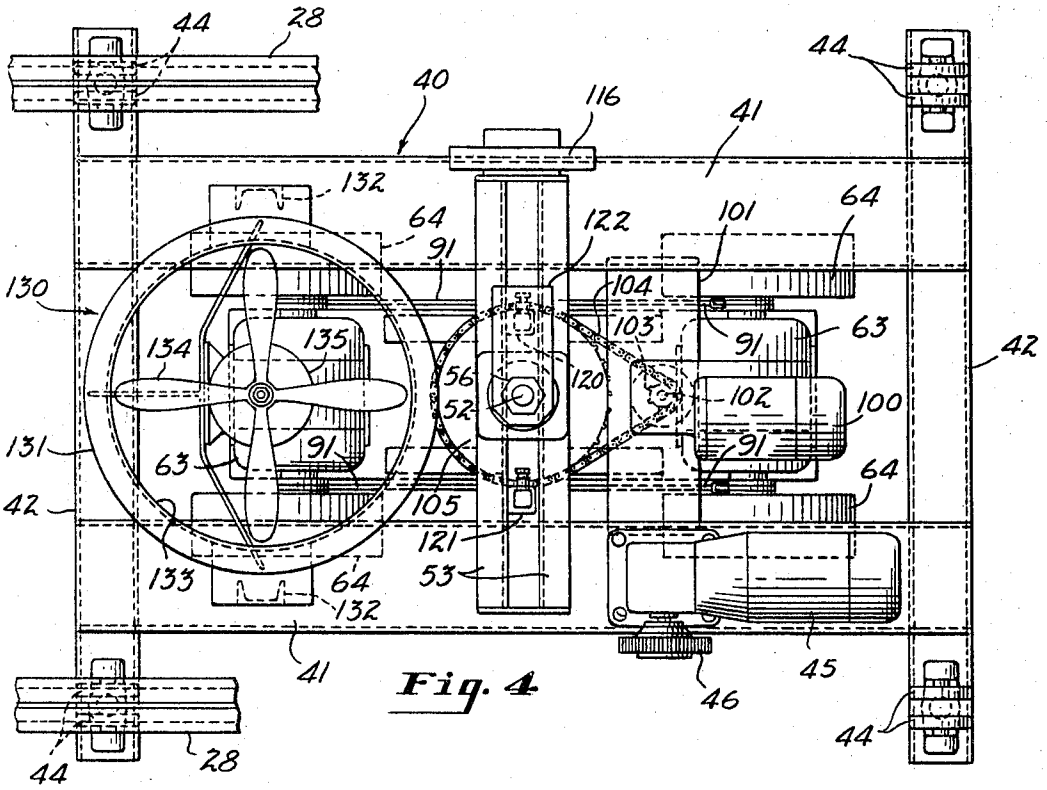


Fig. 4

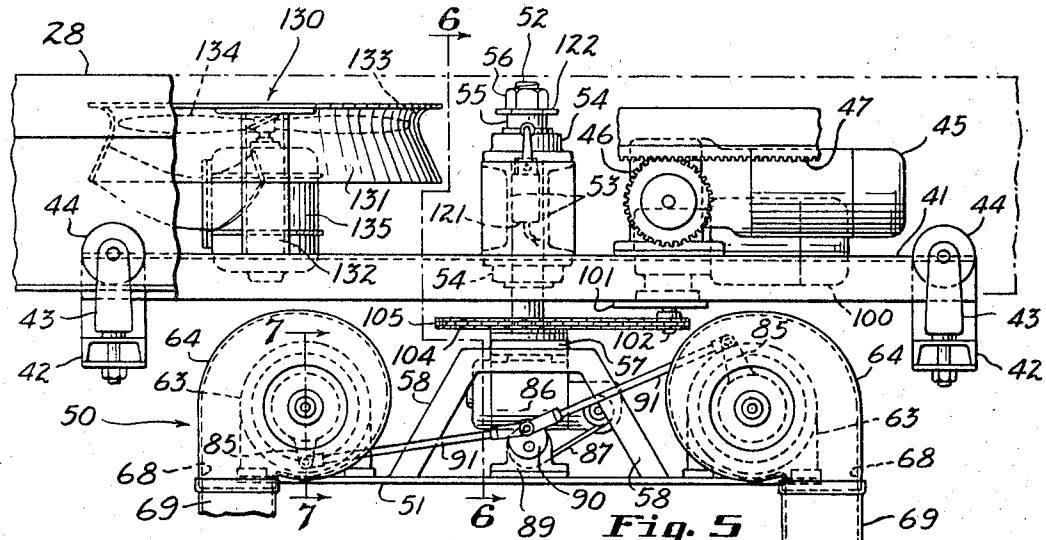


Fig. 5

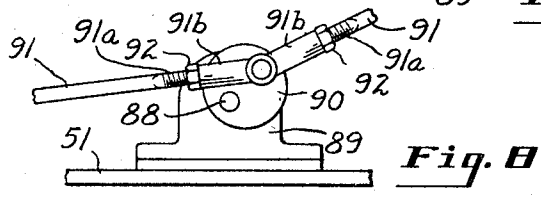


Fig. 8

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METHODS FOR CLEANING LOOMS

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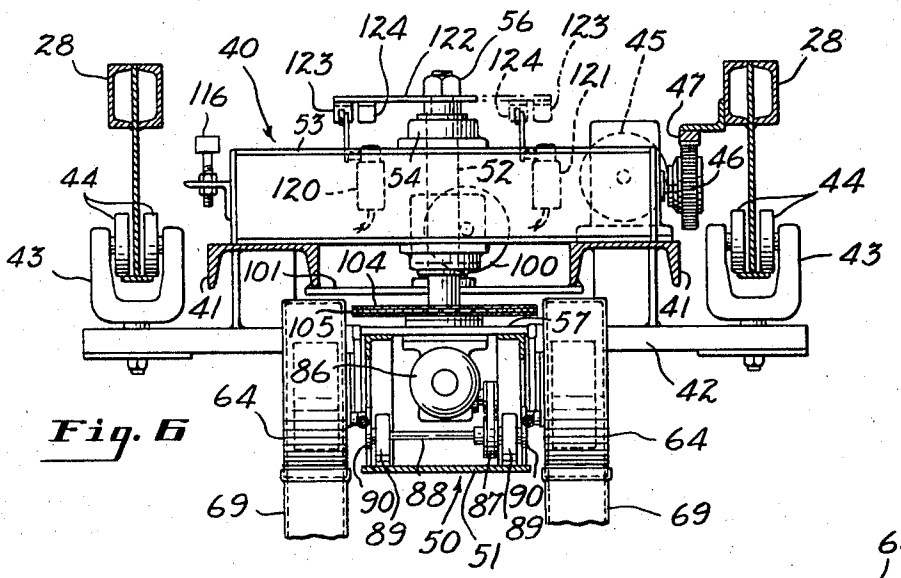


Fig. 6

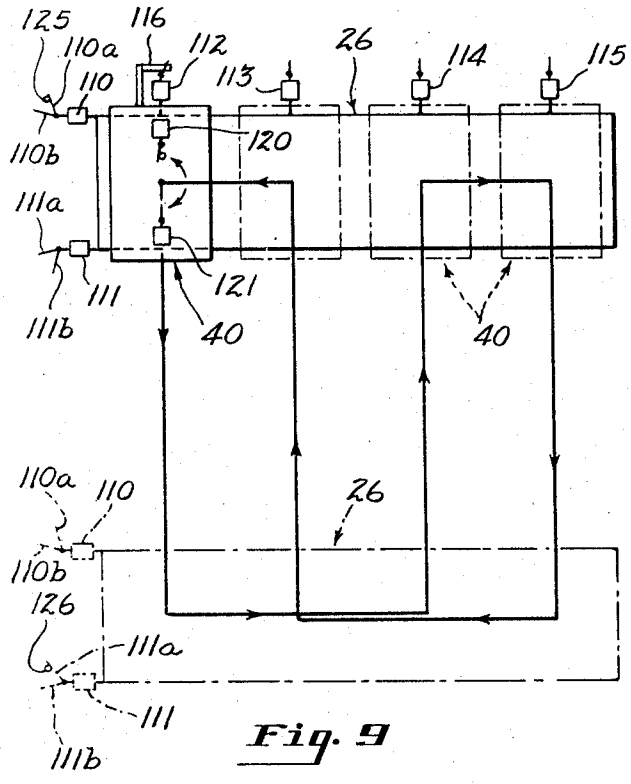


Fig. 9

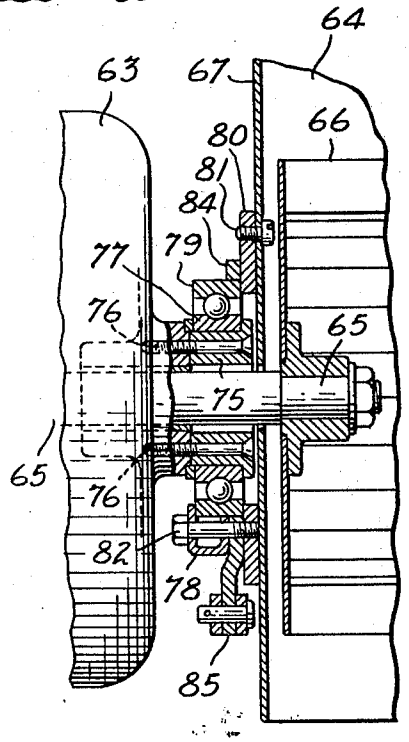


Fig. 7

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METHODS FOR CLEANING LOOMS

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Int. Cl. B08b 5/00
U.S. Cl. 134—37 4 Claims

This invention relates generally to the art of cleaning, and more specifically to new methods for removing lint from looms and the like.

Various types of apparatus have been used in the past for removing lint from looms. A typical apparatus of the prior art was comprised of a crane which extended over and was movable along a plurality of rows of looms. A loom cleaner unit including an air blower was mounted on the crane bridges for movement transversely of the rows of looms between the ends of the crane. In operation the loom cleaner unit was sequentially indexed along the crane bridges to bring the unit over each row of looms and the crane was propelled along the runway to clean the looms in each row. This operation of running the crane back and forth on its runway and periodically indexing the loom cleaner unit on the crane to position the unit over each row of looms resulted in each of the several rows being cleaned.

In recent years new types of looms, such as the shuttleless loom, have been made available together with associated devices, such as automatic filling batteries and the like. These new looms and associated devices require a delicate but thorough cleaning operation. In carrying out the cleaning operation, certain areas of any loom may require a higher velocity and a higher volume air than another area of the same loom. The apparatus of the prior art described above was not adapted to perform a completely satisfactory operation and could frequently cause damage to the loom areas over which the cleaner unit was moved.

In a typical arrangement of a weave room, the looms in adjacent rows are disposed back-to-back and front-to-front. The purpose of this arrangement is to facilitate removal or replacement of the warp beams and cloth rolls in the looms of adjacent rows. For example, it is desirable to provide a relatively wide aisle extending along the backs of the looms in adjacent rows in order to facilitate handling of the warp beams from the looms of those rows. When sequentially cleaning the several rows of looms with the conventional apparatus described above, an air blower of the cleaner unit was moved over the backs of the looms in one row and then over the fronts of the oppositely placed looms in an adjacent row. This movement of the same air blower over different relative loom areas is unsatisfactory when the loom areas require different volumes and velocities of air for the most effective cleaning operation. This is because an air blower adjusted to provide the high velocities and volumes of air desired for certain areas of the looms can often cause damage when moved over different relative loom areas.

The purpose of the present invention is to overcome the disadvantage pointed out above in connection with the conventional apparatus and to provide a new loom cleaning method which obtains a more satisfactory cleaning operation than in the past. In particular, it is a purpose of this invention to provide a new method and cleaning apparatus in which the individual air nozzles of the cleaner unit are always moved over the same relative areas of the looms in each of a plurality of rows. The volume and velocity of the air discharged from selected nozzles can be differently adjusted to obtain a delicate and thorough cleaning of specified areas of a loom. Since the nozzles always move over the same relative areas of the looms, it is possible to generate the volumes and velocities of air required satisfactorily to clean each specific area of a loom without fear of damaging areas of the looms in a new row when the unit is indexed on the crane.

The method of the present invention in its preferred embodiment employs an apparatus comprised of a crane movable on a runway over and along a plurality of rows of looms. At least one carriage is movable on the crane bridges and is adapted sequentially to be indexed into alignment with several of the rows of looms. The carriage is provided with a blower unit which may include two or more sets of air blowers. Two sets of blowers are spaced from each other as to be moved through parallel zones of travel when the crane is propelled along its runway. The blower unit is selectively rotatable on the carriage in order to reverse the relative locations of the travel zones of the sets of blowers.

One set of blowers may be adjusted to obtain the desired volumes and velocities of air necessary to clean one specific area of the loom, for example, the front of the loom. Another set of blowers may be adjusted to clean the backs of the looms. When the carriage is indexed on the crane between two rows of looms oriented in opposite directions, the blower unit is rotated in order to maintain the correct relationship of the sets of blowers to the fronts and backs of the looms in the new row.

Other advantages and a fuller understanding of the invention will be had from the following detailed description when taken in conjunction with the accompanying drawings.

In the drawings:

FIGURE 1 is a schematic plan view showing the loom cleaning apparatus of this invention disposed in operative position over a plurality of rows of looms;

FIGURE 2 is a side elevational view of the apparatus of FIG. 1 in operative position over a loom;

FIGURE 3 is a top plan view of the apparatus of FIG. 1;

FIGURE 4 is an enlarged, top plan view of a portion of the apparatus of FIG. 1;

FIGURE 5 is an end elevational view of the apparatus of FIG. 4;

FIGURE 6 is a view taken on the line 6—6 of FIG. 5;

FIGURE 7 is a view taken on the line 7—7 of FIG. 5;

FIGURE 8 is an enlarged view of a portion of the apparatus shown in FIG. 5; and

FIGURE 9 is a schematic plan view illustrating the control arrangement and one possible manner of operating a preferred embodiment of the apparatus.

Referring now to the drawings, and to FIG. 2 in particular, there is shown a typical loom **10**. The loom **10** may be of any type and, for purposes of disclosing the present invention, is illustrated as including a cloth roll **11** and a breast roll **12** mounted at the front A of the machine, a warp beam **13** mounted at the back B of the machine, and a suitable filling supply **14**. The warp yarns **15** extend from the warp beam **13** through the drop wires **16** and the heddles (not shown) of the loom to the cloth roll **11**. The arches of the looms are designated by reference numeral **17** in FIG. 1.

FIGURE 1 shows a portion or bay of a weave room in which the looms are arranged in a plurality of rows **20–23**. It will be seen that the looms in rows **20, 21** are positioned so that the front portions A are adjacent to each other and that the looms in rows **20, 23** are similarly positioned. Thus arranged, the backs B of the looms in adjacent rows **21, 22** are separated by a relatively wide warp aisle, while the backs of the looms in rows **20, 23** are respectively at the left and right sides of those rows. It will be understood that in a weave room there may be

many rows of looms arranged as shown in FIG. 1 so that the backs of the looms in adjacent rows are separated by the wide aisles. As previously mentioned, this arrangement of the looms is frequently used because it facilitates the handling of the loaded warp beams **13** to the several rows of looms by a crane hoist or other means. The width of the aisles between the rows of looms is not limiting of the invention, however, and in some arrangements the weavers aisles between the fronts of the looms may be wider than the warp aisles.

The loom cleaning apparatus of this invention is generally designated in FIG. 1 by reference numeral **25**. The apparatus **25** is comprised of an overhead crane **26** which extends across the several rows **20–23** of the looms. The crane **26** is mounted for travel lengthwise of the rows on a runway formed by rails **27**. The rails **27** can be supported in any suitable manner, such as by hangers (not shown) which depend from overhead beams (also not shown) of the weave room, by columns of the weave room, or by the floor or the like.

As shown most clearly in FIG. 3, the crane **26** is comprised of side beams or bridges **28** and end trucks **29** which are connected to the ends of the bridges. The end trucks **29** are suspended below the rails **27** by trolleys **30** which include wheels running on the lower flanges of the runway rails **27**. A reversible drive motor **31** is carried on top of the crane **26** and is connected by a chain **32** to a sprocket on a crane drive shaft **33**. Traction wheels **34** are connected to the ends of the drive shaft **33** in engagement with the undersurfaces of the rails **27**. Actuation of the reversible motor **31** serves to rotate the drive shaft **33** and thereby propel the crane **26** from one end of the crane runway to the other over the looms **10**.

As is conventional, electrical energy for the crane motor **31** and other elements described below may be provided by bus bars (not shown) carried by the rails **27** or by wires supported from the pillars (not shown) of the weave room. Collectors, such as wheels or shoes engaging the wires or bus bars may be used to collect current for conduction to a switch box on the crane, whence conductors carry current to the motor. In operation, it will be understood that the crane **26** can be moved from any position on the runway to another position where the crane is stopped and its direction of movement reversed. It will also be understood that more than one crane provided with the cleaning equipment hereinafter described can be mounted on a runway.

The apparatus **25** also includes at least one carriage **40** mounted on the crane **26** for movement between its ends across the several rows **20–23** of looms. Referring now to FIGS. 4 through 7, the carriage **40** is shown to comprise spaced side channels **41** which are connected at their ends to transversely extending frame members **42**. The carriage **40** is suspended from the crane bridges **28** by trolleys **43** carried by the end members **42**. The trolleys **43** have pairs of wheels **44** running on the upper surfaces of the lower flanges of the two bridges **28**. In order to actuate the carriage **40** longitudinally of the crane **26**, a reversible drive motor **45** is mounted on one of the channels **41**. The motor **45** drives a spur gear **46** which meshes with a rack **47** that is secured to and extends along one of the crane bridges **28**. With this arrangement, actuation of the motor **45** serves to rotate the rack gear **46** and thereby move the carriage **40** along the crane **26** to a selected position above one of the rows of looms **10**. The motor **45** is then de-energized and the crane motor **31** is actuated to propel the crane in one direction along the runway.

A rotatable air blower unit **50** is mounted on the carriage **40** for the purpose of directing air streams onto the row of looms below the carriage as the crane moves along its runway. The blower unit comprises a plate **51** which is suspended below the carriage by a rotatable shaft **52**. A pair of spaced parallel beams **53** is secured across the side channels **41** of the carriage **40**. The shaft **52** extends upwardly between the beams **53** through flanged bearing blocks **54** which are secured to the upper and lower surfaces of the beams **53**. A sleeve **55** is disposed around the shaft **52** above the upper bearing block **54** and the rotatable shaft is held in place by a nut **56**. The lower end of the shaft **52** is secured to a plate **57** which is in turn connected by braces **58** to the plate **51**.

Two motors **63** are fastened to the ends of the plate **51**. Each of the motors **63** is disposed between a pair of centrifugal blowers **64** which are operatively connected to the ends of the motor drive shaft **65**. As is best shown in FIG. 7, each blower **64** includes a fan **66** mounted on an end of a motor shaft **65** and a fan housing **67** around the fan. Each fan housing **67** has a tangential outlet or nozzle **68** (FIG. 5) which may be fitted with an extension **69** of any desired cross-sectional shape and length for concentrating the outgoing air stream onto a portion of a loom.

The fan housings **67** are connected to the motors **63** in a convention manner to provide for varying the direction of the outgoing air streams and for oscillating the fan housings. A ring **75** is attached, as by screws **76**, to each end of each of the motors **63**. Each ring **75** supports the inner race **77** of a roller bearing. A plurality of U-shaped clips **78** (only one of which is shown) are positioned about the outer race **79** of the roller bearing with one leg of each clip bearing against the end of the outer race adjacent to the motor and with the other leg of the clip resting on the outer cylindrical surface of the outer race **79**. A ring **80** bears against the end of the outer race **79** opposite to the motor and is secured to the housing **67** by screws **81**. The clips **78**, the outer bearing race **79** and the ring **80** are held assembled by screws **82** which extend through both legs of the clip and into the ring.

Some or all of the several fan housings **67** may be oscillated during operation of the fans **66**. To accomplish this, a ring **84** having a crank arm **85** is clamped between the clips **78** and the ring **80** associated with each housing. An oscillating motor **86** (FIGS. 5 and 6) is secured to the underside of the plate **57** and the output shaft of the motor **86** is connected by a belt and pulley drive **87** to a shaft **88**. The shaft **88** is journaled in bearings **89** which are secured to the plate **51**. A pair of rods **91** are rotatably mounted on cranks **90** at each end of the shaft **88**. The rods **91** extend in opposite directions from the ends of the shaft **88** and the remote ends of the rods are suitably pinned to the crank arms **85** associated with the blowers **64**. It will be understood that actuation of the motor **86** serves to rotate the shaft **88** and reciprocate the push rods **91** with resultant oscillation of the fan housings **67** through limited angular distances.

The positions of the nozzles or outlets **68** of the fan housings **67**, as well as the degree of oscillation of the fan housings can be selectively changed by loosening the screws **82** and relatively rotating the rings **80**, **84**. As shown in FIG. 8, each of the rods **91** may include a threaded portion **91***a* and a ball rod end **91***b*. The threaded rod portion **91***a* projects into the rod end **91***b* and a nut **92** is adjustable on the portion **91***a* to regulate the length of the rod **91** to the position of the associated ring **84**.

The action of the oscillating blowers **64** is indicated in FIG. 2. For convenience in description, the set of blowers of the unit **50** which pass over the front A of the illustrated loom are designated by reference numeral **64***a* (only one of which is shown), while the set of blowers which pass over the back B of the loom are designated by reference numeral **64***b* (only one of which is shown). The positions and oscillation of the blowers **64** are adjusted in the manner described above so that the nozzle extensions **69** move between the extreme positions shown in broken lines. The streams of air from the blowers **64***a*, for example, may move from above the cloth roll **11** in one extreme position of oscillation nearly to the drop wires **16** in the other extreme position. Similarly,

the blowers **64***b* may be adjusted so that the emitted streams of air travel from above the warp beam **13** nearly to the drop wires. As generally described above, the looms **10** must be delicately cleaned and certain areas of each loom may require higher velocities and volumes of air than other areas. Accordingly, the volume of air generated by the sets of blowers **64***a*, **64***b*, the amount of oscillation of each set of blowers and the size of the nozzle extensions **69** are adjusted to obtain a satisfactory cleaning action over a selected loom area.

In some installations it may be desirable to oscillate only selected blowers **64** and to fix the other blowers against movement. For example, one blower in each set **64***a* and **64***b* may be oscillated in the manner described and the other blower in each set may be stationary. In such an instance, each stationary blower may be provided with a boot, such as shown in broken lines at **69***a* in FIG. 2, having fixed outlets oriented to clean specific areas.

When the carriage **40** is periodically indexed along the crane **26** to position the blower unit **50** to travel over a new row of looms **10**, it may be necessary to rotate the blower unit **50** in order to maintain the blowers **64***a* over the fronts of the looms and the blowers **64***b* over the backs of the looms. To this end, a reversible gear motor **100** is mounted on a plate **101** (FIG. 4) which extends between the side channels **41** of the carriage **40**. The motor **100** drives a shaft **102** on which is mounted a small sprocket **103**. The sprocket **103** is connected by a chain **104** to a large sprocket **105** connected to the shaft **52**. Selective actuation of the motor **100** serves to rotate the shaft **52** of the blower unit **50** through approximately 180° and thereby reverse the positions of the sets of blowers **64***a* and **64***b*.

The operation of the apparatus **25**, including the reversing crane travel, the indexing movement of the carriage **40** on the crane **26**, and the rotation of the blower unit **50** is preferably automatically controlled. Referring to the control arrangement illustrated in FIG. 9, a pair of limit switches **110** and **111** are shown mounted at one end of the crane **26**. The limit switch **110** has a rotatable fork arm comprised of arms **110***a* and **110***b*. The limit switch **111** has a similar fork arm comprised of arms **111***a* and **111***b*. Both limit switches are connected in circuit relation with the crane actuating motor **31** and the carriage actuating motor **45**. The limit switch **110** also is connected in circuit relation with the reversible gear motor **100** which rotates the blower unit **50**.

A plurality of limit switches **112–115** are mounted in spaced relation along the length of the crane **26**, there being one limit switch in alignment with each row of looms traversed by the cleaning apparatus. These limit switches are in circuit relation with the carriage drive motor **45** and are adapted to stop the carriage on the crane when the carriage is over a particular row of looms. Taking FIGS. 1 and 9 in conjunction, the illustrated arrangement is such that the limit switch **112** stops the carriage over the row of looms **20**, the switch **113** stops the carriage over the row **21**, the switch **114** stops the carriage over the row **22**, and the switch **115** stops the carriage over the row **23**. The arms of the switches **112–115** are actuated by a cam **116** mounted at one side of the carriage **40**. The arms of the limit switches **112** and **113** are adapted to be contacted to stop the carriage motor **45** when the carriage is moved to the left on the crane (as viewed in FIG. 9), while the arms of the limit switches **114** and **115** are adapted to be contacted to stop the carriage motor **45** when the carriage is moved to the right as viewed in FIG. 9.

As shown most clearly in FIG. 6, a pair of limit switches **120** and **121** are mounted on the carriage **40** adjacent to and on opposite sides of the shaft **52**. These limit switches are in circuit relation with the reversible gear motor **100**. The limit switch **120** is actuatable to stop the rotation of the shaft **52** in one direction and the limit switch **121** is actuatable to stop rotation of the shaft **52** in the opposite direction. In order to actuate the limit switches **120** and **121**, a laterally extending plate **122** having depending stops **123** and **124** near its end is secured to the top of the shaft **52** and is rotatable therewith. The stop **123** is positioned to contact the vertically extending trip arm of the limit switch **120** and the stop **124** is positioned to contact the vertically extending trip arm of the limit switch **121**.

The crane limit switch **110** is contacted by a stop **125** when the crane is at a predetermined position on its runway and the limit switch **111** is contacted by a stop **126** when the crane is at another predetermined position on its runway. The stops **125**, **126** may be mounted on one of the runway rails **27**. With the crane **26** and the carriage **40** in the solid line positions of FIG. 9, the crane motor **31** is actuated to propel the crane along the runway. As the crane reaches the position set by the stop **126**, the trailing arm **111***a* of the switch **111** is contacted by the stop **126**. This causes the fork arm of the limit switch **111** to rotate and de-energize the crane motor **31**. At the same time, the actuation of the limit switch **111** may be effective to energize the carriage motor **45** in order to drive the carriage **40** along the crane. The carriage is driven along the crane to the right as viewed in FIG. 9 until the cam **116** on the carriage **40** contacts the trip arm of the limit switch **114**. The carriage motor **45** is then de-energized and the crane motor **31** is actuated to propel the crane back along the runway toward the stop **125**. As the crane leaves the position shown in broken lines in FIG. 9, the stop **126** contacts the switch arm **111***b* to rotate the switch arm and reset it for the next cycle.

When the crane again reaches the position shown in solid lines in FIG. 9, the trailing arm **110***b* of the limit switch **110** contacts the stop **125** to rotate the arm and de-energize the crane motor **31**. Actuation of the switch **110** may serve to energize the carriage motor **45** to drive the carriage **40** toward the new position set by the limit switch **115**. While the crane is stopped, the blower unit rotation motor **100** also may be energized to rotate the blower unit **50** approximately 180° until the stop **124** contacts the limit switch **121** to de-energize the motor **100**. The blower unit **50** may be rotated during indexing movement of the carriage **40** or before or after such movement. When the carriage **40** reaches its new position on the crane, the cam **116** contacts the limit switch **115** to stop the motor **45** and again energize the crane motor **31** to propel the carriage toward the opposite end of its runway. As the crane starts to move, the stop **125** contacts the switch arm **110***a* and rotates the switch arm to re-set it for the next cycle.

The switch **111** is contacted to stop the crane and to energize the carriage drive motor **45**. The drive motor propels the carriage **40** along the crane to the left as viewed in FIG. 9 until the cam **116** contacts the limit switch **113**. When the limit switch **113** is contacted, the motor **45** is de-energized and the crane motor **31** is energized to return the crane along its runway to the stop **125** which contacts the limit switch **110** to stop the crane drive motor **31** and energize the motor **45**. The blower unit rotation motor **100** also may be energized at this time to again rotate the blower unit **50** until the stop **123** contacts the limit switch **120** to de-energize the rotation motor. The carriage moves along the crane until the cam **116** contacts the limit switch **112** which stops the carriage drive motor to complete one entire cycle of operations.

The cleaning apparatus **25** also may include a ceiling cleaning fan unit **130** for removing lint from overhead beams and other structure. As best shown in FIGS. 4 and 5, the ceiling cleaning unit **130** includes a fan housing **131** which is mounted above the carriage **40** by members **132** that extend from the carriage side channels **41**. The housing **131** has an upper outlet **133** and a fan **134** is disposed within the housing for creating a stream of air. The fan **134** is driven by a motor **135**.

The operation of the apparatus **25** will be largely apparent from the foregoing description. In summary, the crane **40** is started on the runway **27** as shown in FIG. 1 with the carriage **40** indexed on the crane into alignment with the row of looms **20**. The blower unit **50** is positioned so that the fans **64***a* will pass over the fronts A of the looms **10** in the row **20** and so that the blowers **64***b* will pass over the backs B of the looms in the row **20**. As the crane is propelled toward the opposite end of the runway, some or all of the blowers **64** are oscillated to effect the desired cleaning action.

When the crane **26** reaches the broken line position of FIG. 1, the crane is stopped and the carriage **40** may be moved along the crane until it is in alignment with the row of looms **22**. Rotation of the blower unit **50** is not required, since the looms in the row **22** are oriented in the same direction as the looms in the row **20**. Thus, when the crane movement is reversed to return it to the starting end of the runway, the blowers **64***a* will pass over the fronts A of the looms in row **22** and the blowers **64***b* will pass over the backs B of the looms in row **22**.

When the reverse movement of the crane **26** is stopped, the carriage **40** is moved along the crane to a new position in alignment with the row of looms **23**. At the same time, the blower unit may be rotated so that the blowers **64***a* will pass over the fronts A of the looms in row **23** and the blowers **64***b* will pass over the backs B of the looms in row **23**. The crane is then actuated toward the opposite end of the runway and some or all of the blowers are oscillated to clean the looms in row **23** in the manner shown in FIG. 2. As the crane is stopped, the carriage is moved along the crane into alignment with the row of looms **21**. Rotation of the blower unit is not required, since the looms in row **21** are oriented in the same direction as the looms in row **23**. The crane is then actuated along the runway to clean the looms in row **21**. Finally, the carriage is moved to be in alignment with the row **20** and the blower unit **50** is again rotated so that the blowers **64** are in the proper position for the new cleaning cycle.

During the cycle of operations described above, the ceiling cleaning blower **130** may be continuously operated to remove lint from walls, lights, piping, beams and the like above the crane.

It will be seen from the foregoing description that the invention achieves the objective of providing a loom cleaning apparatus and method adapted to remove lint from a plurality of rows of looms in the optimum manner. With the present invention, it is possible to provide a plurality of sets of blowers which are adjusted to clean specific areas of the looms. Since the blower unit is rotatable on the crane, the same sets of blowers will always be over the same areas of the looms even though the carriage is indexed from row to row.

Many modifications and variations of the described apparatus and its operation will be apparent. As previously mentioned, a plurality of cranes can be mounted for travel along a runway and more than one carriage can be mounted on a single crane. In the case of multiple carriages, the carriages can be individually operated in the manner described or they can be connected together by a drawbar or the like and operated through a single gear and rack. With regard to the operation of the apparatus, it is possible to stop the crane in any desired position along the runway and to index the carriage to a new location. Further, the pattern of indexing movement of the carriage and the times and locations of rotating the blower unit can be widely varied to suit any arrangement and numbers of rows of looms.

Many other modifications and variations of the invention will be apparent to those skilled in the art in view of the foregoing disclosure. Therefore, it is to be understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically shown and described.

What is claimed is:

1. A method of cleaning lint from looms arranged in a plurality of rows comprising the steps of:

(a) providing a crane extending transversely of said rows and supporting first and second air blowers,

(b) positioning said first blower for movement over the front portions of the looms in a first row,

(c) positioning said second blower for movement over the back portions of the looms in said first row,

(d) concurrently moving both blowers along said first row, while actuating said first and second blowers to blow air down onto the front and back portions, respectively, of the looms in said first row,

(e) indexing said blowers along said crane transversely of said rows into alignment with a second row of looms wherein the looms are oppositely disposed relative to the looms in said first row,

(f) repositioning said blowers subsequent to movement along said first row by rotating said blowers 180 degrees about a generally vertical axis so that said first blower is aligned with the front portions of the looms in said second row and said second blower is aligned with the back portions of the looms in said second row,

(g) and, thereafter, concurrently moving both blowers along said second row, while actuating said first and second blowers to blow air down on the front and back portions, respectively, of the looms in said second row.

2. The method as claimed in claim **1** including the step of oscillating both blowers during movement along said rows.

3. The method as claimed in claim **1** wherein said blowers are repositioned by rotating them about said axis subsequent to said indexing.

4. The method as claimed in claim **1** including the steps of:

(h) indexing both blowers from alignment with said second row into alignment with a third row wherein the front and back portions of the looms are oriented in the same directions as in said second row,

(i) and concurrently moving both blowers along said third row, while actuating said first and second blowers to blow air down on the front and back portions, respectively, of the looms in said third row.

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