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R. L. BLACK, JR

3,400,423

AIR OUTLET SUSPENSION SYSTEM FOR TEXTILE TRAVELING CLEANERS

Filed Oct. 17, 1966

3 Sheets-Sheet 1

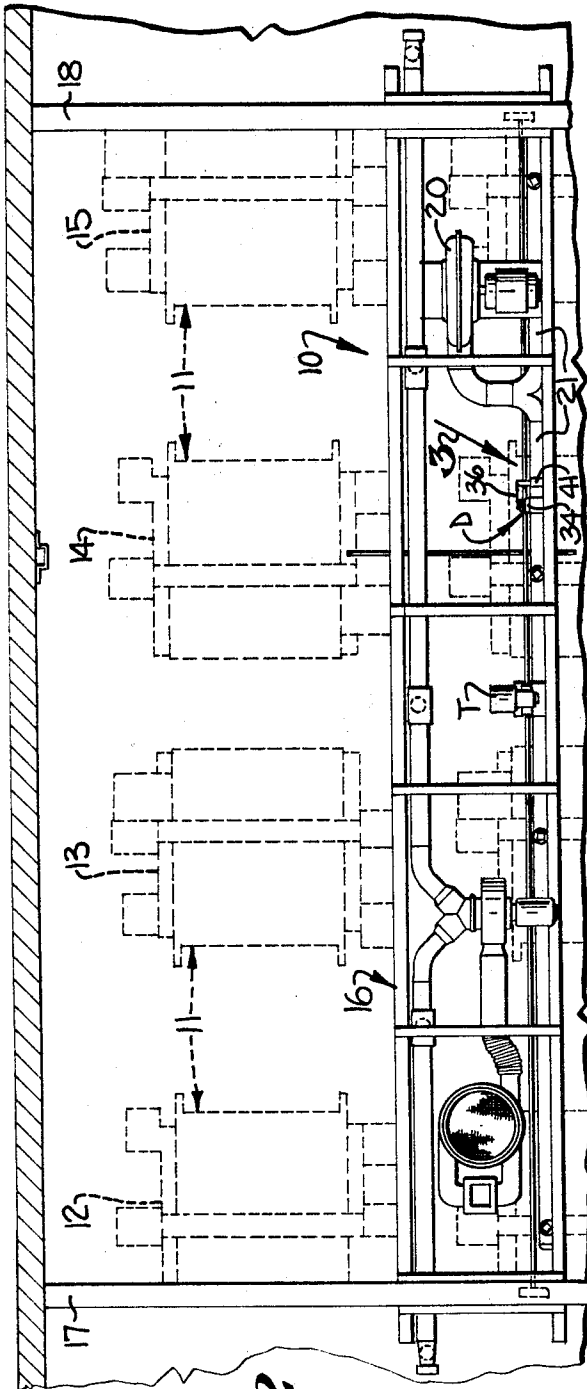


FIG. 2

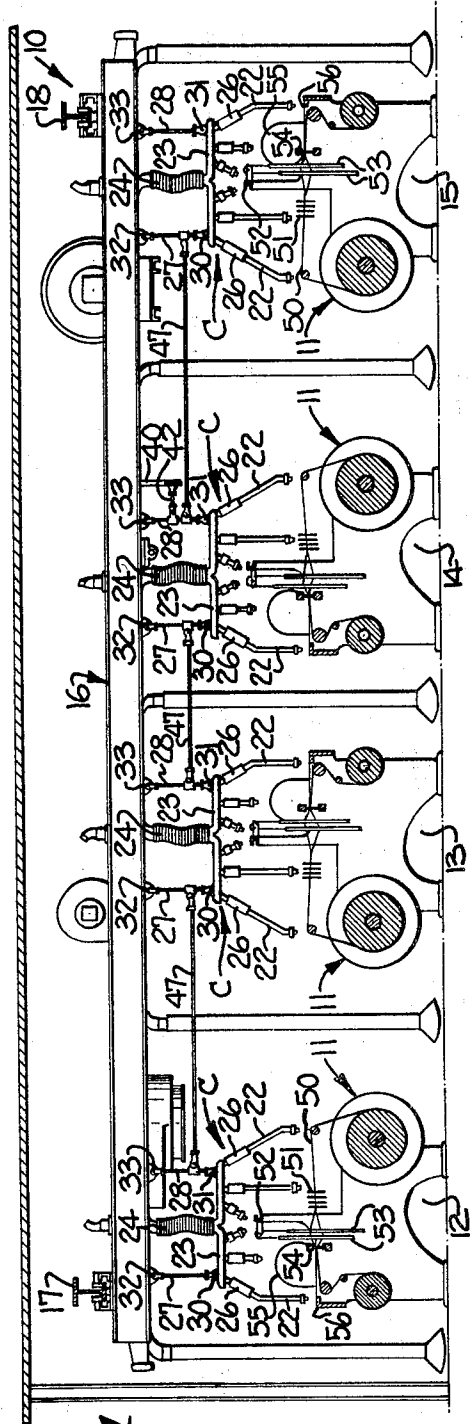


FIG. 1

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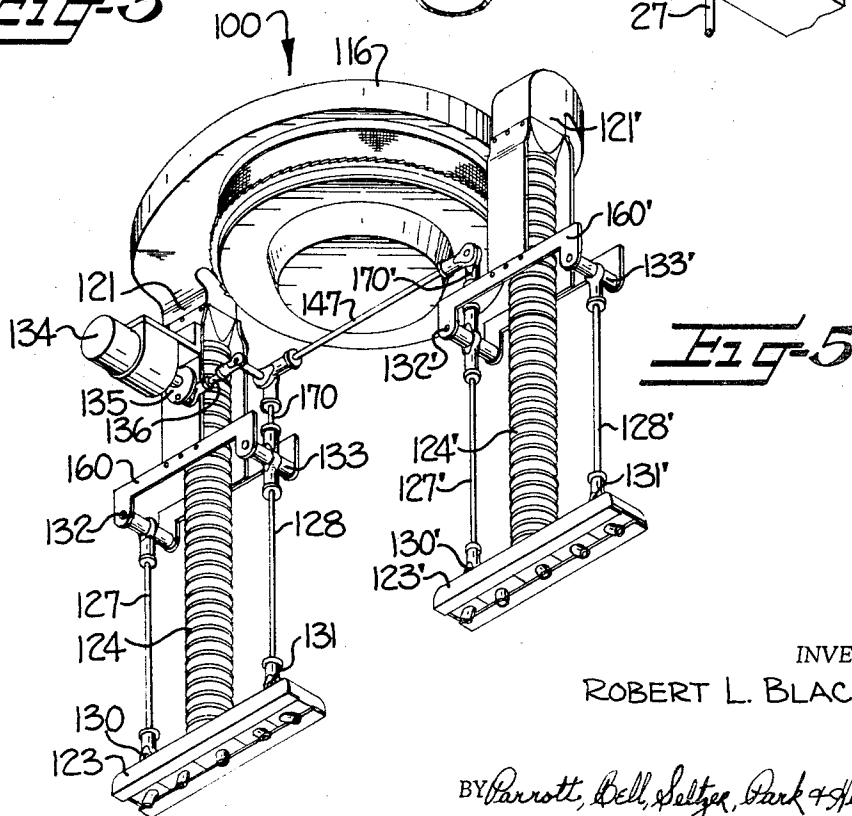
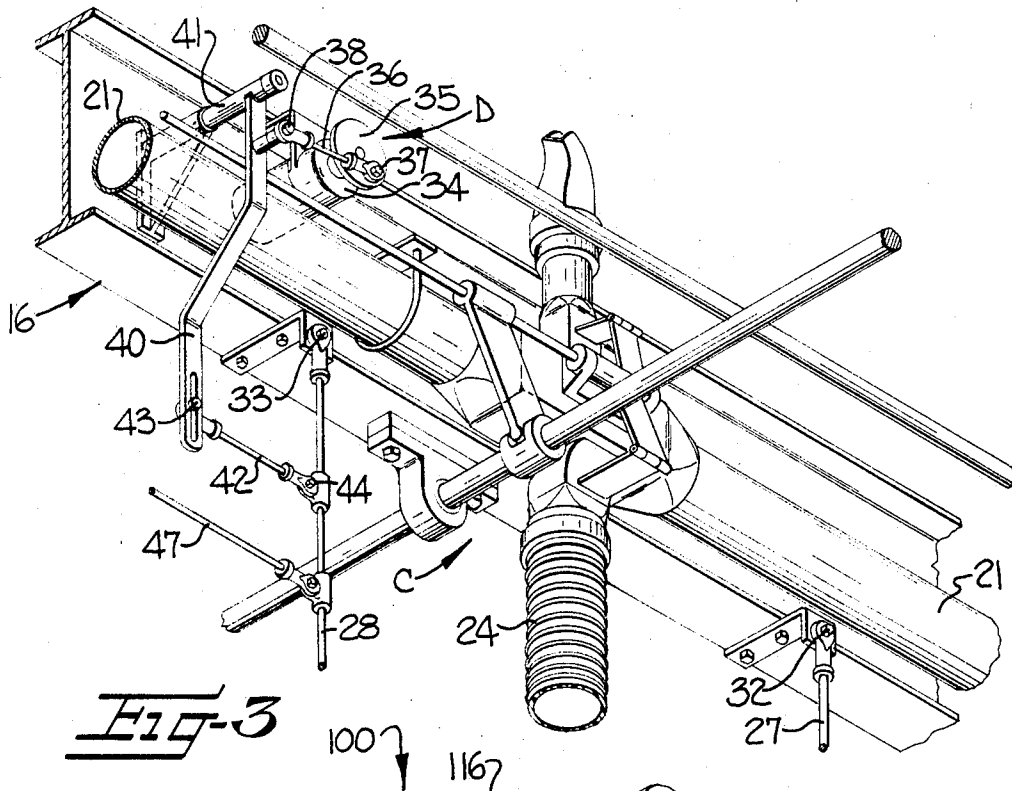
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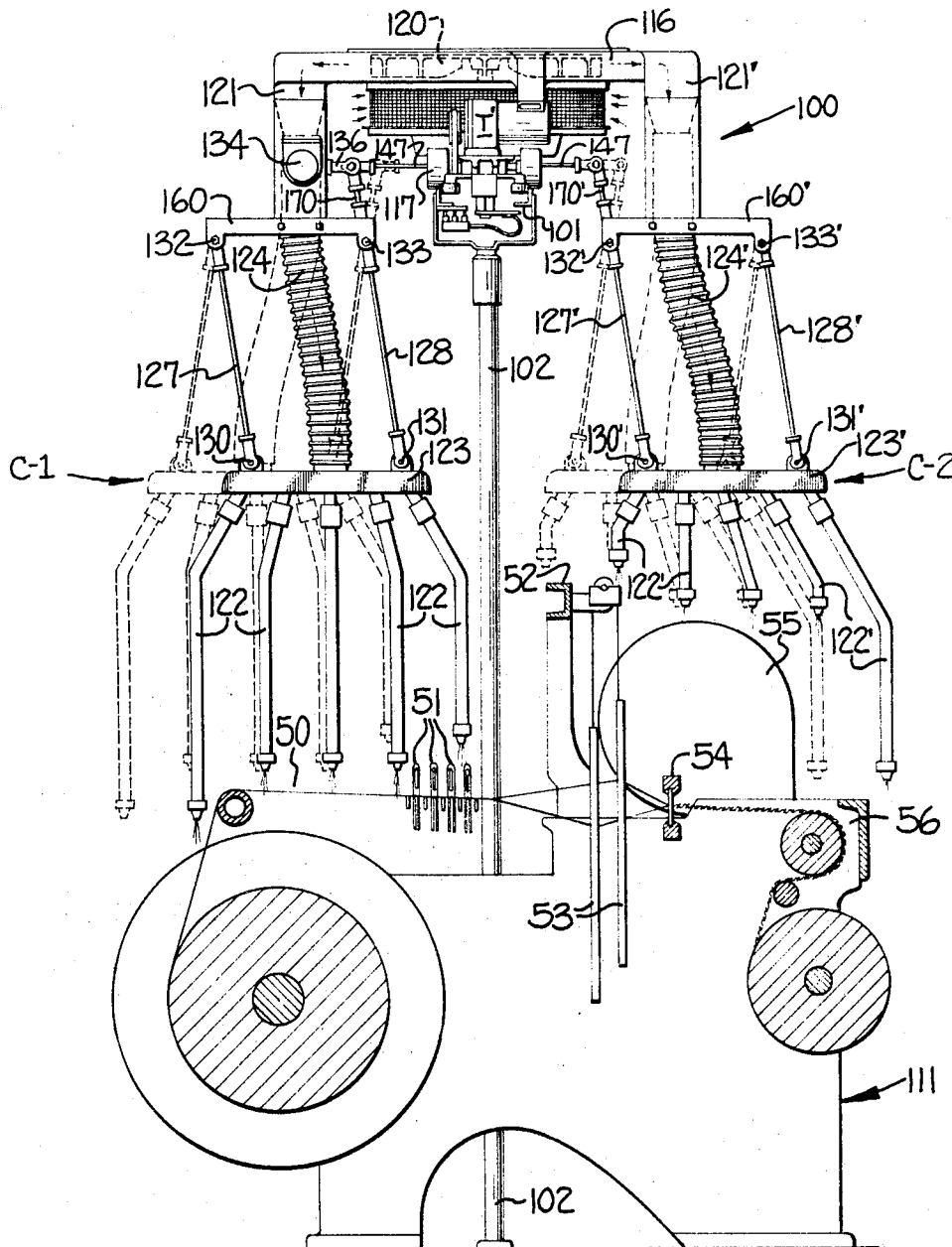


Fig. 4

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AIR OUTLET SUSPENSION SYSTEM FOR TEXTILE TRAVELING CLEANERS

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Continuation-in-part of application Ser. No. 574,443, Aug. 23, 1966. This application Oct. 17, 1966, Ser. No. 587,252

9 Claims. (Cl. 15—312)

This application is a continuation-in-part of my application Ser. No. 574,443, filed Aug. 23, 1966, entitled, Crane Mounted Loom Cleaner With Synchronized Oscillation.

This invention relates to overhead-mounted traveling pneumatic cleaners for textile weaving plants, and more especially, to an improved means for oscillatably suspending air outlets of traveling loom cleaners so as to provide a more efficient control of the disposition of the air streams traversing critical areas of the looms.

As is well known, considerable amounts of fiber waste are generated incident to the operation of looms, and in order that looms will operate efficiently and to minimize the presence of impurities and undesirable slubs and wads of lint in the cloth being woven, such fiber waste must be removed from at least the more critical areas of the looms, such as dropwires, heddles, reeds, warp yarns and the cloth. The problem of removing fiber waste from such critical areas is aggravated by the fact that warp yarns usually are treated with a sticky size material which causes fiber waste to cling tenaciously to the aforementioned critical areas, especially to the dropwires. Dropwires are thin flat pieces of metal arranged in upstanding, close side-by-side relationship in rows extending weftwise of each loom, and air streams, when utilized for removing fiber waste from the dropwires, should be controlled so as to avoid tilting or otherwise upsetting the dropwires to such an extent as to cause unintentional actuation of the loom stop motion.

Various forms of overhead-mounted traveling pneumatic loom cleaners equipped with oscillating air outlets are known, such as are disclosed in United States Patents Nos. 2,695,039 and 2,812,251, for example. The oscillating air outlets of such prior art cleaners are spaced substantial distances above the warp and cloth level of the looms. Also, they are of large diameter and direct air streams of relatively low velocity onto the looms therebeneath.

Recently, it has been discovered that the critical loom elements can be kept substantially free of fiber waste by utilizing a traveling pneumatic cleaner provided with laterally oscillating small nozzles spaced more closely above the warp and cloth level of a row of looms and which direct very high velocity, fine jet air streams onto the critical loom areas during travel of the cleaner above a row or rows of looms. The copending application of Seress et al., Ser. No. 367,323, filed May 14, 1964, now Patent No. 3,304,570, and assigned to the assignee of this application, discloses a traveling loom cleaner and method of the type mentioned above and which have proved to be very successful.

The oscillating nozzles or air outlets of the known traveling cleaners are suspended in such a manner that they oscillate, individually or in groups, about a single pivot point and move, therefore, in an arcuate path of such radius as to produce, depending upon the particular structure, some variance in the angle of attack of each air stream relative to the warp and cloth level of the loom.

It is therefore an object of this invention to provide a pneumatic traveling loom cleaner whose air outlets are maintained in respective substantially constant angular

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lation with respect to the warp and cloth level of the looms during lateral oscillation and longitudinal travel of the outlets along a row of looms, and wherein each outlet is maintained, independently of any other air outlets, at a substantially uniform level a predetermined distance above the warp and cloth level of the looms during operation of the cleaner. Such more uniform and precise control of the angle of impingement and spacing of the nozzles relative to areas to be cleaned reduces variations in velocity of the air streams at points of impingement and results in better cleaning.

In its preferred embodiment, the invention comprises an improved parallelogram linkage suspension system connecting the air outlet or outlets to the carriage of the traveling loom cleaner for lateral oscillatory movement of the outlets relative to the carriage.

An object of the invention having been stated, other objects will appear as the description proceeds when taken in connection with the accompanying drawings, in which—

FIGURE 1 is an end elevation of several rows of looms showing one embodiment of a traveling loom cleaner provided with a preferred form of the improved air outlet suspension system of the present invention;

FIGURE 2 is a plan view of the structure shown in FIGURE 1;

FIGURE 3 is an enlarged perspective view of an oscillation drive for the air outlet suspension system, looking in the general direction of arrow 3 of FIGURE 2;

FIGURE 4 is an end elevation of another embodiment of a traveling cleaner provided with the air outlet suspension system of this invention; and

FIGURE 5 is an enlarged perspective view looking up at the structure shown in FIGURE 4 with parts omitted for purposes of clarity.

Referring more specifically to the drawings, one type of pneumatic traveling loom cleaner equipped with an air outlet suspension system according to this invention is shown in FIGURES 1, 2 and 3, wherein the loom cleaner is of the crane-mounted type similar to that described in my said copending application Ser. No. 574,443, filed Aug. 23, 1966. The cleaner, generally designated at 10, travels above a plurality of looms 11 arranged in each of a plurality of spaced rows 12–15, with the warp yarns of each loom extending laterally of the rows of looms. A pair of spaced overhead supporting rails 17, 18 extend parallel to the loom rows 12–15. A crane bridge or carriage 16 is spaced above the looms and is the principal structural member or frame of cleaner 10. Bridge 16 extends transversely of the loom rows 12–15 and is supported by the rails 17, 18 for longitudinal movement relative thereto.

Bridge 16 is driven for repeated or reciprocatory travel along rails 17, 18, and thus along the rows 12–15, by suitable drive means T such as is disclosed in Miller et al. U. S. Patent No. 2,812,251, for example. Carried by and traveling with bridge 16 is a source of air under pressure, such as a blower 20 provided with an output air conduit 21 extending longitudinally of bridge 16.

Bridge 16 has a plurality of loom cleaning units C suspended therefrom by means of the novel suspension systems of this invention, there being one of said loom cleaning units located above and movable along each row of looms 12–15. Each loom cleaning unit C comprises a plurality of downwardly opening air outlets or tubes 22, positioned above corresponding rows of looms, and whose upper portions are communicatively connected to and depend from a hollow manifold 23. Each air outlet 22 is supplied with forced air from conduit 21 through a flexible sleeve 24 and through manifold 23, and directs a blowing air stream against the looms therebelow. These

air streams preferably are of the fine jet high velocity character described in said copending application Ser. No. 367,323. A resilient flexible tube 26 preferably is interposed in the upper portion of each outlet 22 so that each outlet may yield upon interfering contact with an obstacle, such as a machine operator, and thereby avoid personal injury and machine damage. When the interference is removed, the respective tube 26 returns the outlet 22 to its original position. During their travel with bridge 16 along the rows of looms, air outlets 22 are oscillated transversely of the rows by oscillation drive means to be later described. As a result of their compounded longitudinal travel and lateral oscillation along the rows of looms, the air outlets 22 and the blowing air streams issuing therefrom follow sinuous paths progressing generally along the rows of looms.

According to this invention, each outlet 22 is maintained, throughout its sinuous movement just described, in a substantially constant angular relation to the warp and cloth level of looms in the corresponding row. It should first be noted that bridge 16 remains in constant angular relation to the aforesaid loom level. It follows that by maintaining outlets 22 in substantially constant angular relation to bridge 16, the desired results are achieved.

The suspension system for each loom cleaning unit C is best shown in FIGURE 1 and comprises a parallelogram linkage which preferably takes the form of a pair of spaced suspension links 27, 28. The lower ends of links 27, 28 are pivotally connected, as at 30, 31, to manifold 23, and the upper ends of links 27, 28 are pivotally connected, as at 32, 33 to bridge 16. The links 27, 28 may be of about the same length, and the distance between pivot points 30, 31 on manifold 23 is about the same as that between pivot points 32, 33 on bridge 16. Thus, manifold 23 and bridge 16 form one pair of sides of a parallelogram, and links 27, 28 form the other pair of sides.

As is well known, opposed sides of a parallelogram always remain parallel, even though the corner angles may change. Thus, manifolds 23 and bridge 16 are maintained in parallel relationship during oscillation of each manifold. The outlets 22 of each cleaning unit C are in constant angular relation to manifold 23, and are therefore also in constant angular relation to bridge 16 and to the horizontal planes of the warp yarns or to the warp and cloth level of the looms therebelow.

A preferred form of oscillation drive for the cleaning units C is generally indicated at D in FIGURE 3, and includes a motor 34 carried by bridge 16. Motor 34 drives a crank disk 35. A drive link 36 is pivotally connected, as at 37, 38, respectively, to disk 35 and to a lever 40 pivotally connected to bridge 16, as at 41. A tie rod 42 is adjustably and pivotally connected, as at 43, 44, to lever 40 and to one of the suspension links, such as 28, of one of the cleaner units C so as to transmit lateral oscillation from lever 40 to the respective unit C.

While an independent oscillation drive could readily be provided for each unit C, it is convenient in a crane-mounted cleaner to oscillate all the units C from a single drive. This also facilitates synchronization of the oscillation of adjacent units as described in my said copending application Ser. No. 574,443. A simple way of achieving this result is shown in FIGURE 1, in which a cross link or rod 47 extends between each adjacent pair of units C and is pivotally connected at each end to adjacent suspension links of adjacent units C, so that oscillation of a single suspension link imparts oscillation to all connected units C.

It is preferred that each unit C be provided with a plurality of outlets 22 spaced along its manifold 23 laterally of the corresponding row of looms. Due to arcuate motion, a slight variation in the distance between an outlet and the warp and cloth level of the looms occurs during oscillation of the outlet. By providing a plurality

of laterally spaced outlets 22, it is possible to reduce the length of the arc of oscillation of each unit C necessary to achieve full coverage of the width of the loom row, and consequently, the variation of distance between each outlet and the warp and cloth level of the looms is minimized.

Another and perhaps more important advantage derived from use of plural outlets 22 for each unit C is that each outlet may be designed for cleaning a particular portion of the looms. As illustrated, the unit C above row 12 as shown in FIGURE 1 is provided with six outlets 22. From right to left, the first outlet oscillates above a region including a portion of warp area 50 of the loom 11 and the warp beam; the next outlet oscillates above the dropwire rows 51; the next two outlets oscillate above the regions of the arch 52 and of the heddles 53; the next outlet oscillates above the area of the reed 54 and is spaced high enough to pass over the battery 55; and the area of the balance of the cloth side 56 is covered by the left-hand outlet 22.

In each instance, the particular outlet 22 is oriented and dimensioned in accordance with the requirements of the corresponding region of the looms. For example, the outlet 22 oscillating above the region of the dropwire rows 51 may be substantially vertically arranged, and the air stream issuing therefrom accordingly may be substantially parallel to the vertical planes of the upstanding dropwires in the rows 51. The size of the opening in that outlet, and the velocity of the air stream issuing therefrom, may be determined with consideration of requirements relating to the dropwire rows 51, which may be quite different from the requirements relating to other regions of the looms; e.g., arch 52.

By maintaining the angle of each nozzle substantially constant, it is possible to maintain the outermost nozzles 22 at angles which are primarily downward, which reduces the problem of turbulence which would be caused by conflicting air streams from cleaners over adjacent rows of looms.

An air outlet suspension system according to the invention is also applicable to pneumatic traveling loom cleaners other than the crane-mounted type described above. For example, the improved outlet suspension system is shown in FIGURES 4 and 5 adapted to a track-mounted loom cleaner of the type which travels along a single trackway extending above a row or rows of looms. A traveling loom cleaner of this type is generally designated at 100 in FIGURE 4, and is shown by way of example as being of the type disclosed in said copending application Ser. No. 367,323. Loom cleaner 100 is shown mounted for travel over an elongate trackway 101 extending above and longitudinally of a row of looms represented by a loom 111, whose regions and parts will bear the same reference characters as are applied to looms 11 in FIGURE 1. A plurality of upright posts, one of which is shown at 102 (FIGURE 4), support the trackway 101 above and approximately centrally of the row of looms 111.

Loom cleaner 100 differs in some respects from crane-mounted loom cleaner 10 of FIGURES 1, 2 and 3. For example, the principal structural member or frame of cleaner 100 is a blower housing 116 mounted on a wheeled carriage 117 movable along trackway 101. Housing 116 and carriage 117 may be propelled repeatedly along trackway 101 by a suitable drive means or motor T'. A driven fan or impeller 120 is positioned within housing 116 and directs air under pressure into output ducts or conduits 121, 121' and thence to respective sets of air tubes or outlets 122, 122' of cleaner units C-1, C-2, by means to be presently described. As shown, outlets 122, 122' are communicatively connected to respective manifolds 123, 123' which are, in turn, communicatively connected to the respective blower output conduits 121, 121' by means of flexible sleeves 124, 124'. Each outlet 122, 122' is accordingly supplied with forced air from blower

120, and directs an air stream downwardly against a corresponding region of the looms therebelow.

As in the first embodiment, outlets 122, 122' are oscillated laterally of loom row 11 during their travel with housing 116 along the row, and therefore follow sinuous paths progressing generally along the row of looms. Outlets 122 of cleaner unit C-1 are positioned above areas of loom 111 on the rear or warp side of the loom arch 52 while outlets 122' of cleaner unit C-2 are positioned above the arch and above areas on the front or cloth side of the arch.

Brackets 160, 160' are fixed to end portions of the respective conduits 121, 121' and have the laterally spaced upper portions of respective pairs of suspension links 127, 128 and 127', 128' pivotally connected thereto as at 132, 133 and 132', 133'. The lower ends of suspension links 127, 128 and 127', 128' are pivotally connected to the respective manifolds 123, 123' as at 130, 131 and 130', 131' respectively. The manifolds 123, 123' and the respective hanger brackets 160, 160' thereabove define, with the respective pairs of links 127, 128, respective parallelogram suspension linkages similar to those described with respect to FIGURE 1. Accordingly, the lower pivot points 130, 131 of the links 127, 128 of cleaner unit C-1 are spaced about the same distance apart as the pivot points 132, 133 thereabove. Additionally, the distance from the upper pivot point 132 of link 127 to the lower pivot point 130 thereof is about the same as the distance between the pivot points 131, 133.

The distance between the pivot points 130', 131' of cleaner unit C-2 also is about the same as the distance between pivot points 132', 133' thereabove, and the distance between pivot points 130', 132' of cleaner unit C-2 is about the same as the distance between pivot points 131', 133'.

As in the first embodiment, the entire suspension system is sufficiently flexible to permit it to yield upon engagement with personnel or objects in its path of travel.

Conveniently, the oscillation drive for the cleaner units C-1, C-2 or traveling cleaner 100 may comprise a motor 134 (FIGURE 5) having a crank disk 135 fixed on the shaft thereof to which one end of the link 136 is pivotally connected in eccentric relation to the disk 135. The other end of link 136 is pivotally connected to the upper end of a suspension link extension 170 which may be integral with suspension link 128. A similar extension 170' on the upper end of suspension link 127' has one end of a connecting rod or cross-link 147 pivotally connected thereto, the other end of cross-link 147 being pivotally connected to the upper portion of link extension 170. By providing the extensions 170, 170' on the suspension links 128, 127', it will be noted that the cross-link 147 is positioned above the level of trackway 101 so that cross-link 147 will not engage any of the trackway supporting posts 102.

Although a separate oscillation drive may be provided for each of the cleaner units C-1, C-2, it is preferred that both units are oscillated laterally by a common oscillation drive such as that heretofore described.

It is thus seen that I have provided a pneumatic traveling cleaner having means for oscillatably suspending air outlets therefrom in such a manner that, although different air outlets may be spaced various distances above the warp and cloth level of a row or rows of looms and the angle of the discharge end or lower extremity thereof may vary from outlet to outlet as desired, each respective outlet is maintained at a substantially constant, predetermined, angular relation with respect to the warp and cloth level of the looms during lateral oscillation of each air outlet and throughout its travel longitudinally of the corresponding loom row or rows. Also, since each air outlet has a relatively small range of oscillatory motion as compared to the lengths of the corresponding suspension links, each outlet is maintained, independently of any other outlets, at a substantially uniform level a predetermined distance above the warp and cloth level of

the looms throughout operation of the loom cleaner. This arrangement permits the nozzles to be spaced much closer to the areas to be cleaned for more precisely controlled cleaning.

In the drawings and specification there have been set forth preferred embodiments of the invention and, although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being defined in the claims.

I claim:

1. Traveling pneumatic cleaning apparatus for removing lint from looms arranged in rows and particularly from horizontally disposed warp yarns thereon and the associated yarn stop motions and other adjacent portions of the looms, and wherein said stop motions of each loom include at least one weftwise row of side-by-side, closely spaced, vertically disposed, flat dropwires; said apparatus comprising:

means providing a source of air under pressure adapted to travel above the looms,

air outlets communicatively connected to said air source and depending downwardly from above the looms for directing air streams downwardly against said dropwires and other surfaces of the looms,

means for traveling the air source and said outlets along the row of looms substantially normal to the longitudinal direction of the warp yarns while oscillating said outlets generally parallel to the longitudinal direction of the warp yarns to cause the air streams from said outlets to trace a sinuous path of impingement upon the warp yarns, and said traveling means including means for maintaining each outlet at a respective constant angle relative to the horizontal plane of the warp yarns and to the vertical planes of the dropwires during its travel and oscillatory movement.

2. Apparatus according to claim 1, wherein an outlet directing an air stream against the dropwires is positioned so as to direct the air stream therefrom in a direction substantially perpendicular to the horizontal plane of the warp yarns.

3. A structure according to claim 1, wherein said means for traveling the air source and said air outlets comprises a frame supporting said air source and mounted for travel in a substantially straight path above and substantially parallel to said row of looms,

a parallelogram linkage operatively connecting said air outlets to said frame for travel therewith and for oscillation laterally of said straight path,

means for oscillating said parallelogram linkage and said air outlets laterally of said straight path during travel of said frame therealong, and

said parallelogram linkage being disposed so as to maintain said air outlets at said respective constant angles with respect to the vertical planes of said dropwires throughout travel and oscillation of said air outlets.

4. A structure according to claim 3, wherein said parallelogram linkage includes a hollow manifold, said air outlets being communicatively connected to said manifold and extending downwardly at predetermined angles relative to said manifold, and said manifold being connected to said air source and thereby serving to connect said outlets to said air source.

5. A structure according to claim 4, wherein the outlets are spaced apart laterally of said row of looms.

6. A structure according to claim 5, wherein the air discharge ends of said outlets are spaced various distances above the horizontal plane of the warp yarns of the looms.

7. A structure according to claim 3, wherein said frame also extends over at least one additional row of looms of substantially the same characteristics defined with respect to said first-named row of looms and extending substantially parallel to said first-named row of looms,

additional air outlets connected to said air source for directing additional air streams downwardly against

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the dropwires and other surfaces of the looms in said additional row,
 an additional parallelogram linkage operatively connecting said additional air outlets to said frame for travel therewith and for oscillation laterally of said straight path,
 means for oscillating said additional parallelogram linkage and its air outlets laterally of said straight path of travel of said frame, and
 said additional parallelogram linkage also being disposed so as to maintain said additional air outlets at respective constant angles with respect to the vertical planes of the dropwires of the additional row of looms throughout the travel and oscillation of said additional parallelogram linkage.
 8. A structure according to claim 3, wherein said frame comprises a blower housing adapted to travel along an overhead trackway extending above and parallel to said row of looms, said housing having a pair of air output conduits on opposite sides thereof and adjacent opposite sides of said trackway, and said air source comprising a rotary air impeller in said housing,
 said parallelogram linkage including a hollow manifold from which said outlets depend, and
 said air outlets being connected to said air source by means including said manifold and a flexible sleeve

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communicatively connecting said manifold to one of said air output conduits.

9. A structure according to claim 8, including an additional parallelogram linkage operatively connected to said housing for travel therewith and for oscillation laterally of said straight path and including an additional manifold spaced laterally from said first-named manifold, an additional flexible sleeve communicatively connecting said additional manifold to the other of said air output conduits, additional air outlets depending from and communicatively connected to said additional manifold, means for oscillating said additional parallelogram linkage and its air outlets laterally of said straight path, and said additional parallelogram linkage being disposed so as to maintain said additional air outlets at respective constant angles with respect to the horizontal plane of the warp yarns during travel and oscillation of said additional parallelogram linkage.

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ROBERT W. MICHELL, *Primary Examiner*.