United States Patent

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[72] Inventors **Hamlin Joseph Gleaton; Bobby Lee Johnson, Greenville, S.C.**

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[73] Assignee **Eaton, Yale & Towne Inc.**

[54] **CLEANING APPARATUS FOR LOOMS**
4 Claims, 7 Drawing Figs.

[52] **U.S. Cl.** **15/312,** 15/404, 15/405, 134/37
[51] **Int. Cl.** **B08b 5/02**
[50] **Field of Search** ..... 134/37, 21; 15/301, 312, 404, 405, 312.1 (Inquired); 57/56

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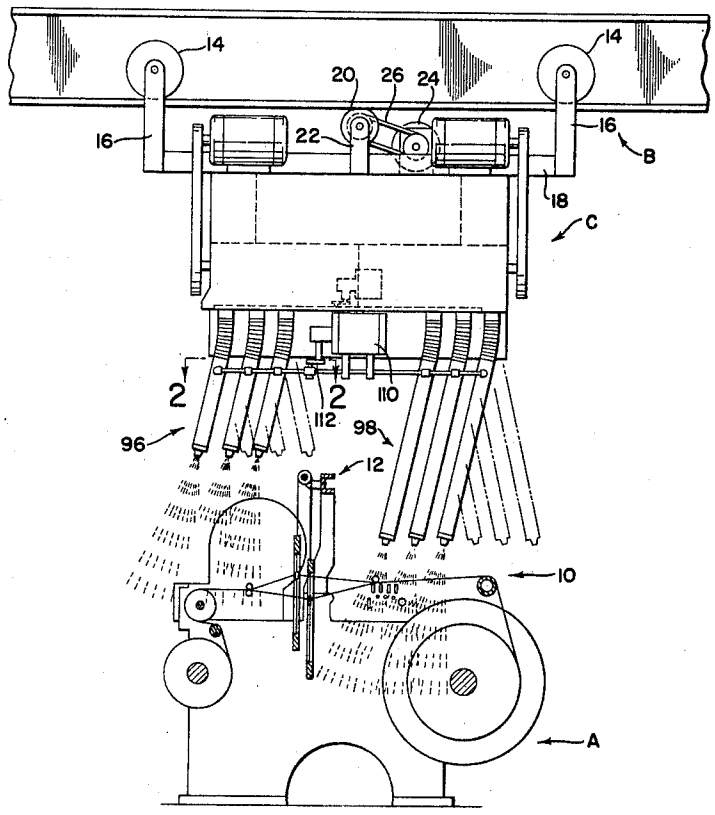
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Primary Examiner—Joseph Scovronek
Assistant Examiner—D. G. Millman
Attorneys—Joseph R. Teagno, Clayton J. Toddy, Leslie H. Blair, Thomas A. Lisle, Ramon D. Foltz, Robert J. McCloskey and Kenneth G. Preston, Jr.

ABSTRACT: Apparatus for cleaning looms and other textile machinery by the use of rapidly pulsed, high velocity air jets.



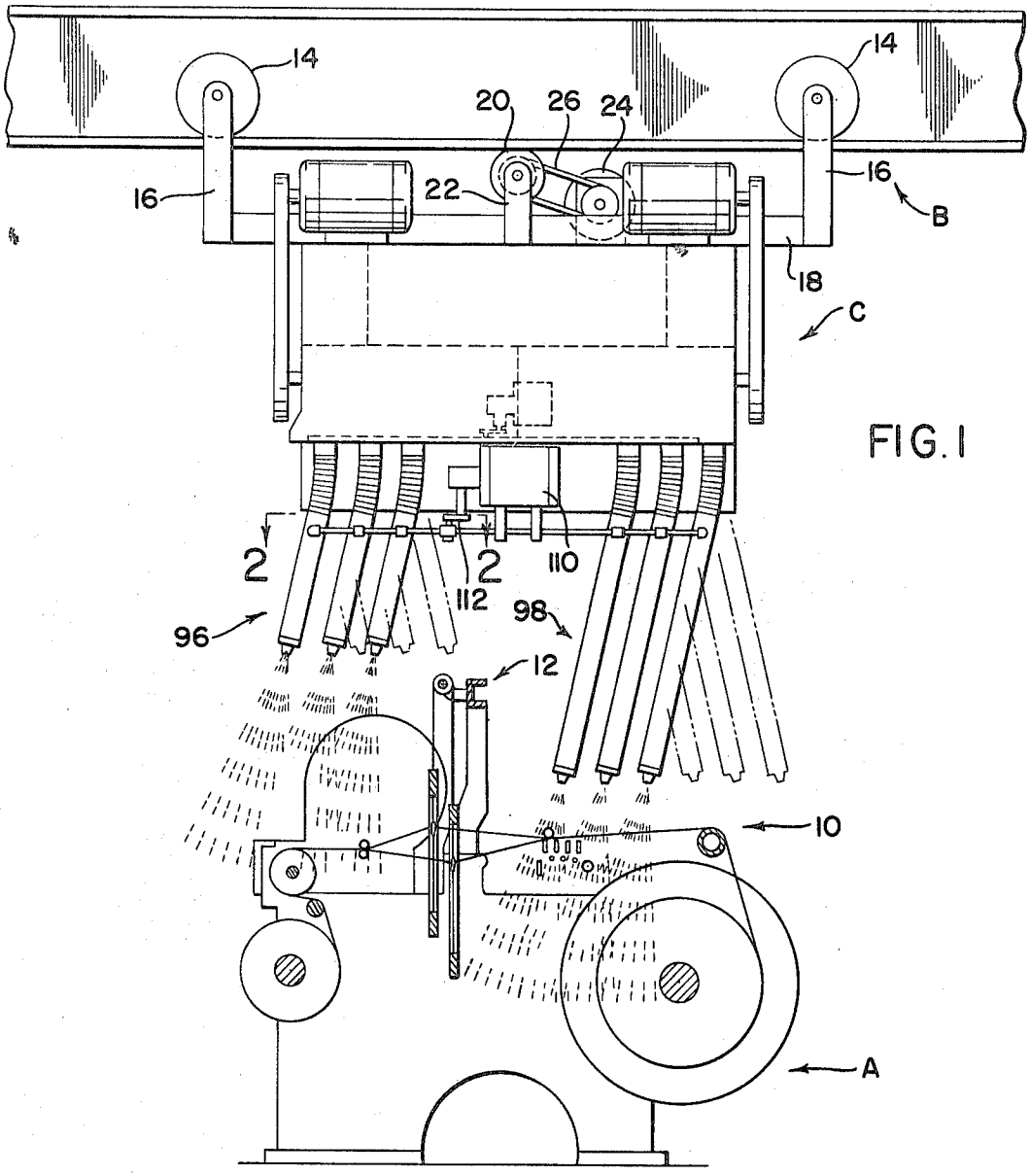


FIG. 1

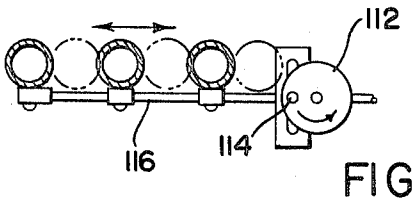


FIG. 2

INVENTOR.
HAMLIN J. GLEATON
BOBBY LEE JOHNSON
BY Meyer, Tilberry & Body
ATTORNEYS

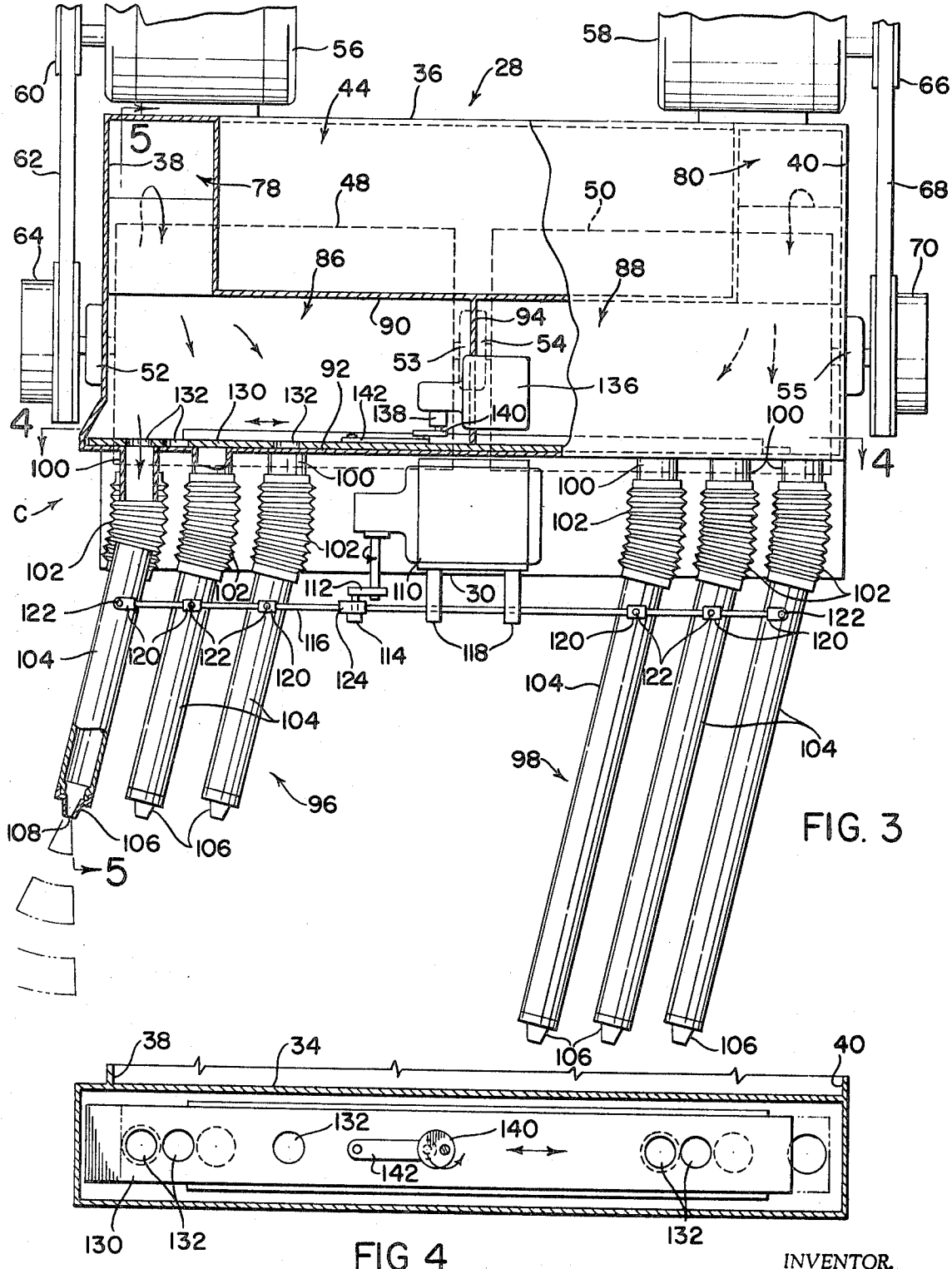


FIG. 3

FIG. 4

INVENTOR.
HAMLIN J. GLEATON
BOBBY LEE JOHNSON
BY
Meyer, Tilberry & Body
ATTORNEYS

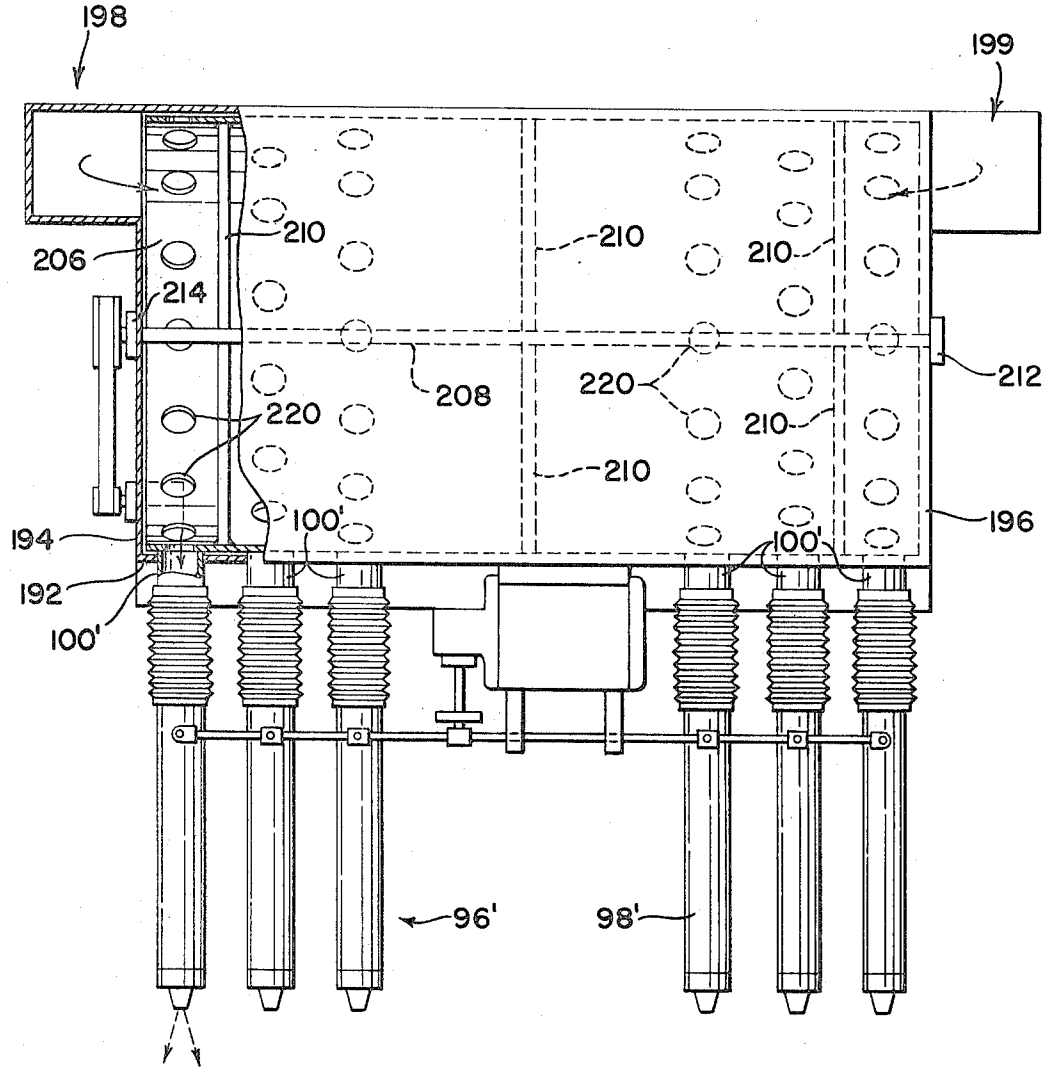
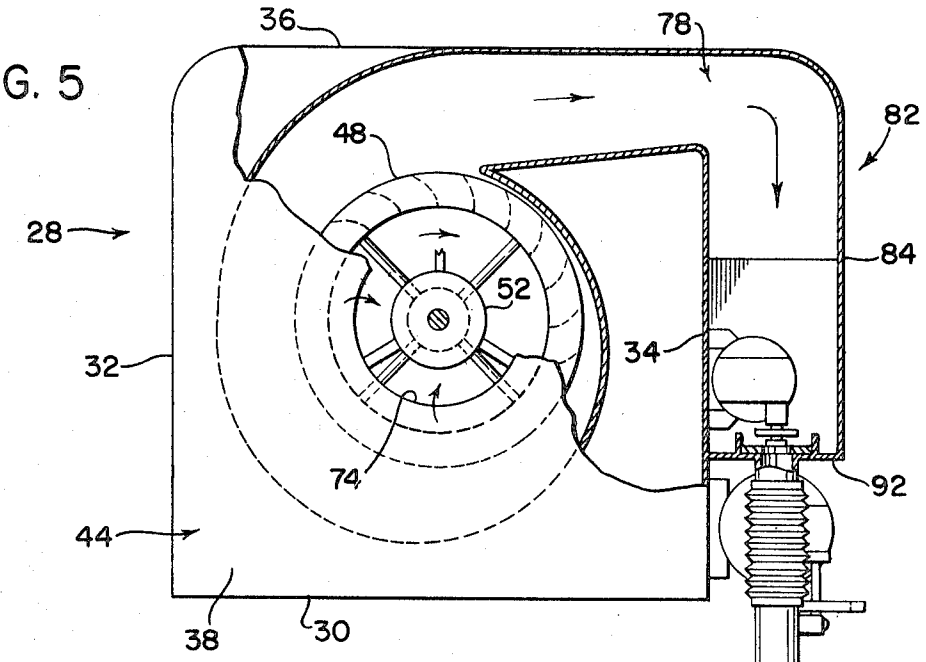


FIG. 6

INVENTOR.
HAMLIN J. GLEATON
BOBBY LEE JOHNSON
BY
Meyer, Tilberry & Body
ATTORNEYS

FIG. 5



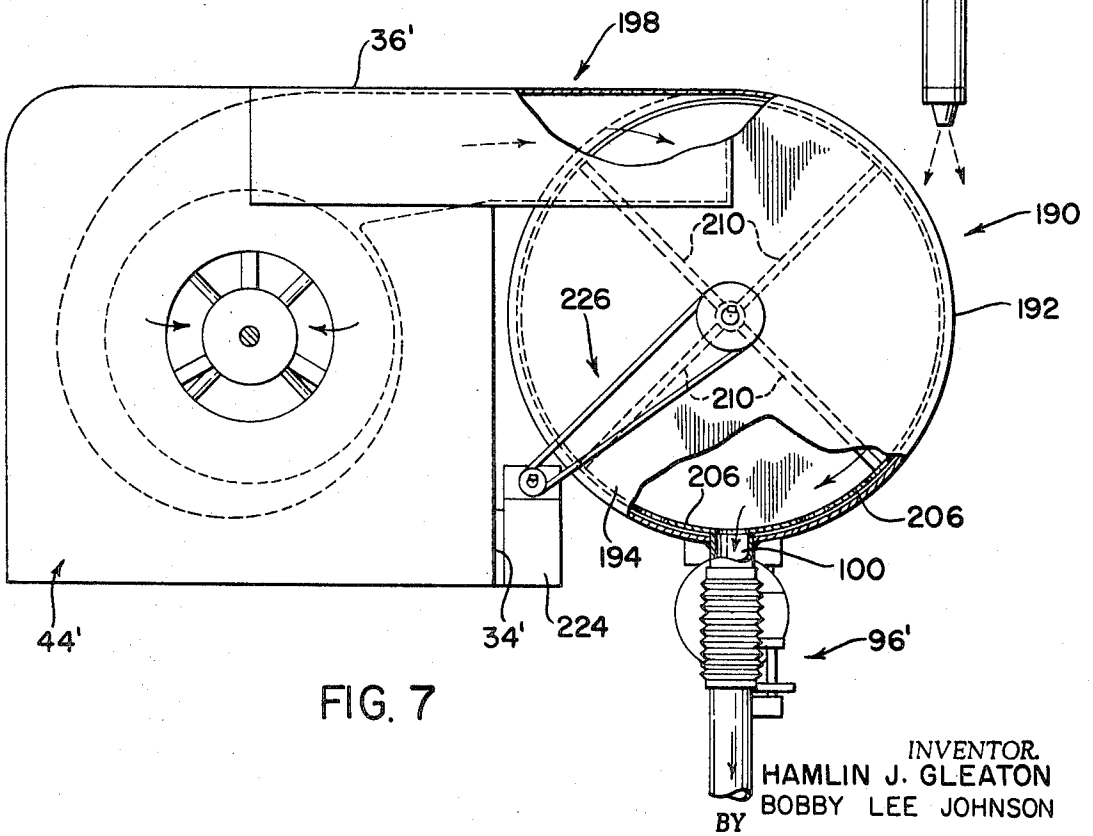


FIG. 7

INVENTOR.
HAMLIN J. GLEATON
BOBBY LEE JOHNSON
BY
Meyer, Tilberry & Body
ATTORNEYS

CLEANING APPARATUS FOR LOOMS

The present invention is directed toward the cleaning art and more particularly, to an improved method and apparatus for cleaning textile machinery.

The invention is especially suited for use in cleaning looms and will be described with particular reference thereto; however, it will be appreciated the invention is capable of broader application and could be utilized for cleaning a variety of different textile machines, such as spinning machines and the like.

In the art of cleaning textile machinery such as looms, it has been the practice to utilize blower units on overhead trackways or traveling cranes and arranged to traverse longitudinally of rows of looms and direct air streams or jets downwardly against the various parts of the looms. Generally, the most successful of the cleaning units have utilized oscillating or rotating continuous air jets of relatively high velocity. For example, one of the most successful units is disclosed in U.S. Pat. No. 2,798,825 to De V. Miller et al. The unit disclosed in the patent produces oscillating air streams having velocities as high as 2,800 fpm and higher. Subsequent workers in the art have proposed units of the same general nature producing various air velocities and air stream diameters, as well as, differing patterns of air stream movement. In general, these subsequent units have been capable of effectively removing lint, etc. from the looms. However, none of the units have been capable of achieving the degree of cleaning which is desirable.

The present invention provides a method and apparatus for cleaning textile machinery to a degree heretofore unobtainable. The inventive method and apparatus produce an air stream "pulsing" and "scrubbing" action which has proven especially effective in dislodging lint and fiber particles. Further, the improved cleaning ability is achieved with little or no increase in equipment or operational cost.

In accordance with one aspect of the invention an improved method of cleaning textile machinery is provided which includes the steps of: creating at least one air stream having a velocity above 1,000 f.p.m.; directing the air stream downwardly against a subjacent textile machine while, simultaneously, moving the stream in directions transverse of said machine; and, periodically, interrupting the air stream for brief, closely spaced time periods to produce impingement of said air stream against said machine in discrete high velocity transversely moving puffs.

In accordance with a more limited aspect, the air stream is interrupted at a rate in the range above 30 cycles per minute.

In accordance with another aspect, improved apparatus is provided for cleaning textile machinery. The apparatus includes: means for generating a source of air under substantial pressure; nozzle means adapted for positioning above the machine and connected with the source of air and arranged to direct an airstream having a velocity above 1,000 f.p.m. downwardly against the machine; and, power means for continuously moving the nozzle means in directions transversely of the machine while simultaneously interrupting the flow of air out of said nozzle means for brief closely spaced time periods to produce impingement of the air stream against the machine in discrete high velocity transversely moving puffs.

By providing the above-noted interrupted or "puffed" air streams it has been found that the air stream engages the machine with a "scrubbing" action which readily dislodges substantially all fiber and lint particles. The air stream velocity and the number of puffs per minute can vary over the substantial ranges however, velocities in a range from 3,000 to as high as 20,000 fpm, and pulsations in a range between 60 to 1,000 per minute are believed to produce the best results. Additionally, as can be appreciated, the cross-sectional area of the air stream can be varied substantially, bearing in mind such known factors as limitations in terms of air stream impact on loom stop motion mechanisms.

Accordingly, a primary object is the provision of an improved method and apparatus for cleaning textile machinery by the use of high velocity, rapidly pulsed, air jets.

Another object is the provision of a traveling loom cleaner which is capable of producing high velocity, pulsed air jets.

A still further object is the provision of a method for cleaning looms which produces an air "scrubbing" action against the exposed loom portions.

Yet another object is the provision of an apparatus of the type described which is simple to build and operate.

Further objects and advantages will appear from the following description when read in conjunction with the accompanying drawings wherein:

FIG. 1 is a side elevational view, somewhat diagrammatic, showing a preferred embodiment of a cleaning apparatus formed in accordance with the invention and associated with a subjacent row of looms;

FIG. 2 is a cross-sectional view taken on line 2–2 of FIG. 1;

FIG. 3 is an enlarged view, partially in section, of the cleaning apparatus shown in FIG. 1;

FIG. 4 is a cross-sectional view taken on line 4–4 of FIG. 3;

FIG. 5 is a left end elevational view, partially in section, of the apparatus shown in FIG. 3;

FIG. 6 is a front elevational view, partially in section, of a modified form of cleaning apparatus formed in accordance with a second embodiment of the invention; and,

FIG. 7 is a left end elevational view of the apparatus shown in FIG. 6.

Referring now more specifically to the drawings wherein the showings are for the purpose of illustrating a preferred embodiment of the invention only and not for the purpose of limiting same, FIG. 1 shows a typical installation of a cleaning apparatus formed in accordance with the present invention.

Specifically, FIG. 1 shows an end elevation of a row of looms A over which a traveling crane or bridge B extends transversely to the row and transverses in a longitudinal direction in the manner such as shown in U.S. Pat. No. 2,812,251 to De V. Miller et al. Suspended from the traveling crane B is an improved cleaning apparatus C formed in accordance with a preferred embodiment of the present invention.

Normally, any weaving loom includes a plurality of parallel rows of looms A and, for this reason, the cleaning apparatus C is preferably arranged so that it can be indexed longitudinally of the crane B so as to be capable of selectively cleaning any row of looms. Alternately, it is to be understood that a separate cleaning apparatus C could be provided for each row of looms or, alternately, that the apparatus could be carried on a single overhead trackway extending longitudinally of the loom as is conventional in the art.

Although as previously mentioned, the particular construction and arrangement of the looms form no part of the present invention, merely for the purpose of future discussion it is noted that the looms A are shown with their cloth and warp beams 10 positioned to the right, and with 12 indicating the arch of the loom.

In the embodiment shown, the cleaning apparatus C is arranged to traverse parallel to the arch 12 and is supported from the overhead crane or bridge B by two sets of trolley wheels 14 which are connected through downwardly extending frame members 16 to a horizontally extending frame 18. The actual construction of the support frame is not of importance to the invention and could be constructed in any manner providing the necessary rigidity. In order to permit the frame 18 to be traversed longitudinally of the beam or crane B a frictional drive wheel 20 is supported in engagement with the undersurface of the crane B by a support member 22 extending upwardly from frame 18. The wheel 20 is selectively rotated to drive the frame 18 along the beam by a reversible electric motor and gear reducer unit 24 supported from frame 18 and drivingly connected with wheel 20 through a belt 26. Obviously, motor unit 24 can be controlled either manually or automatically.

The cleaning apparatus C is suitably supported from the frame 18 and, as best shown in FIGS. 3 and 5, includes a main blower housing 28 which is shown as being of generally rectangular shape and formed from sheet metal or other suita-

ble material. In particular the housing 20 includes a horizontally extending lower wall 30, sidewalls 32 and 34 and a horizontally extending top wall 36. The opposite ends of the housing 28 are closed by vertically extending end walls 38 and 40. The housing 28 forms a blower chamber 44. Positioned within the chamber 44 are conventional elongated radial flow fans or blowers 48 and 50, respectively. Blowers 48 and 50 are supported for independent rotation from respective sets of bearings 52, 53 and 54, 55 which are carried by the end walls 38 and 40.

Each of the blowers 48 and 50 are separately driven by motors 56 and 58, respectively, which are mounted on the top wall 36 of the blower housing 28. As shown, the motor 56 is drivingly connected through pulley 60, belt 62, and pulley 64 with the drive shaft of the blower 48 whereas, motor 58 is similarly connected through a pulley 66, belt 68 and pulley 70 with the drive shaft of blower 50. Each of the blowers are provided with separate air intake openings formed in the respective end walls 38 and 40. Referring specifically to FIG. 5, it is seen that the air intake openings 74 for blower 48 is formed in end wall 38 and axially aligned with the blower. Although not shown, a similar opening is formed in end wall 40 to provide an air intake for blower 50.

Conventional scroll-type ducting is provided about each of the blowers 48 and 50 and arranged to direct the air to respective outlet openings 78 and 80. Outlet openings 78 and 80 connect with a plenum chamber 82 which is formed by a continuation of the top wall 36 and a vertical front wall 84 outwardly spaced from the sidewall 34. Internal ducting, best shown in FIG. 3, is provided within the chamber 82 and supplies the air to two separate air plenums 86 and 88 formed within chamber 82 by a top wall 90, a bottom wall 92 and an intermediate partition wall 94.

Depending from the lower wall 92 of the chambers 86, 88 are two sets of air supply tubes 96 and 98. In the embodiment shown, there are provided three separate tubes in each of the groups 96, 98; however, as will become apparent the precise number of tubes in each group is not of importance and would depend upon the particular type of machine being cleaned. Each of the tubes in the two groups are substantially identical in construction and, as shown, include a short comparatively rigid cylindrical section 100 which is directly connected to the wall 92 and in communication with respective ones of the chambers 86 and 88. A flexible member 102, for example, a bellows or fabric tube, is connected to the lower end of each of the tube sections 100 in any convenient manner such as by the use of adhesive or ring clamps not shown. A second elongated tube 104 is similarly connected to the lower end of each of the flexible members 102. Each of the tubes 104 are provided with an outlet nozzle 106 at their lower end. The actual shape of the outlet nozzles 106 is not of importance to the invention; however, they are shown as being of truncated cone configuration. As will hereafter become apparent, this is advantageous in that the nozzle outlet orifices 108 can be enlarged to meet the needs of any particular installation simply by cutting off a portion of the lower end of the nozzle.

In accordance with the method aspect of the invention, the nozzles are preferably sized so as to produce relatively fine air outlet streams or jets. Preferably, the nozzles have a cross-sectional outlet area in the range of around 1 and ½ square inches. This outlet area can vary substantially; however, the area of the nozzles should be related to the output of the blower units such that the air stream has a velocity of from above 1,000 feet per minute to upwards of 20,000 feet per minute. Additionally, the tubes 104 are preferably arranged so that the nozzles are in the range of between 4 and 12 inches above the loom as viewed in FIG. 1, with the preferred range being approximately 6 to 8 inches.

Preferably, according to the invention the cleaning apparatus C is moved longitudinally of the row of looms (i.e., in a direction perpendicular to the plane of the drawing as viewed in FIG. 1) at a rate in the range of 30 to 100 feet per minute. Simultaneously therewith, the nozzles are given a component of movement transverse of the looms, that is, in directions transverse of the path of movement of the cleaning apparatus. Although this component motion can be produced by either an oscillation or rotation of the nozzles, in the preferred embodiment it is preferably an oscillatory motion in a relatively limited range of up to approximately 20° from the vertical. For this reason, the cleaning apparatus C is provided with means for oscillating all of the tubes 104 and their respective nozzles 106 simultaneously throughout an adjustable range. Although in the method aspects of the invention this oscillation could be produced by any type of drive mechanism or even manually, the preferred manner of oscillating the tubes comprises an electric motor and gear reducer unit 110 which is suitably supported from the lower wall 92 of the chambers 86, 88. The output shaft of the unit 110 extends downwardly and is connected to a crank arm 112. Connected to crank arm 112 and extending downwardly therefrom is a pivot pin 114. A horizontally extending rod 116 is slidably supported in a pair of depending brackets 118 carried, for example, from the motor housing. Rod 116 is connected through small blocks 120 and pivot pins 122 with each of the tubes 104. Accordingly, reciprocation of the rod 116 causes the tubes 104 and nozzles 106 to be oscillated in a direction perpendicular to the path of movement of the cleaning unit C. The drive connection between the rod 116 and the crank disc 112 comprises a scotch yoke-type mechanism including a yoke member 124 connected in rod 116 and having an elongated opening extending therethrough which receives the crank pin 114. Preferably, as previously noted, the crank 112 and pin 114 are arranged to produce an oscillation of the tubes of about 20° from the vertical.

Of major importance to the present invention is the previously mentioned "puffing" or "pulsing" of the air jets exiting from the nozzles 106. Preferably, the puffing is accomplished by completely stopping air flow through the nozzles for discrete, closely spaced time intervals. This produces distinct, sharp and closely spaced air puffs which are especially advantageous for loosening and removing lint or fiber particles. Although many different structures can be utilized for producing the required interruption of air flow through the nozzles 106, in the embodiment under consideration, the valving or air flow interruption is accomplished by a horizontally extending slide valve plate 130 formed from nylon or other material having good sliding and wear characteristics. The plate 130 is provided with a plurality of ports 132 which are arranged so that as the valve plate 130 is reciprocated horizontally the ports move into and out of engagement with the tubes 100. By proper sizing of the orifices 132 the air pressure supplied to the nozzles 106 can be regulated independently of the blowers. Additionally, the pressures supplied to various ones of the nozzles can be different.

The particular method or structure utilized for reciprocating the valve plate 130 is not of importance; however, it is shown as comprising a gear motor 136 which has its housing extending through the divider plate 94 and its output shaft 138 extending vertically downwardly. Carried at the end of the shaft 138 is a crank arm 140 which is pivotally connected through a line 142 with the slide plate 130. Accordingly, rotation of the motor causes the valve plate 130 to be reciprocated horizontally to open and close the air supply to the nozzles. Although the ports 132 can be arranged to supply air to the nozzles in any particular desired sequence, it is preferable to open and close the air supply to the majority of the nozzles simultaneously with only one or two open during the time the majority are closed. One of the advantages flowing from this is that during the periods when air flow through the majority of the nozzles is cut off, the pressure within the chambers 86 and 88 builds up to a higher level which, when the orifices are subsequently opened, produces a much sharper, more distinct air puff.

As can be appreciated, the combination of the transverse movement and the distinct, puffed high velocity jet streams produces a substantial scrubbing action against the looms. Ad-

ditionally, it has been found that the combination of the oscillatory and pulsed air jets produces less boiling up of lint and other particles from the weaving room floor and tends to drive them downwardly where they can be collected by the usual vacuum equipment. The actual frequency of the puffs or pulses can be varied however it has been found that a frequency rate of 1 to 20 cycles per second produces the most satisfactory results.

As is understood, any of a variety of valving or air flow throttling arrangements could be utilized for producing the pulsed air discharge. FIGS. 6 and 7 show a modified version of the subject cleaning apparatus which utilizes a rotary type valving member. In general, the unit shown in FIGS. 6 and 7 is the same as the unit previously described. Accordingly, the same reference numerals differentiated with a prime suffix have been utilized to indicate the corresponding elements of the FIGS. 6 and 7 modification and, a description of one such element is to be taken as equally applicable to the other unless otherwise noted. Referring specifically to FIGS. 6 and 7, it is seen that the valving arrangement utilized in this embodiment includes a generally cylindrical air plenum chamber 190 which replaces the previously discussed chambers 86 and 88. The chamber 190 is formed by a cylindrical drum or housing which has its opposite ends closed by circular plates 194 and 196. The drum member 192 is supported from the blower chamber 44' by rectangular air ducts 198 and 199 which open into the opposite ends of the chamber 190. These air ducts 198 extend back to the blower chamber or housing 44' and communicate with the outlet openings 78 and 80 respectively. Although not clearly shown the ducts 198 and 199 are preferably shaped so as to provide a smooth air flow path. The air outlet tubes 100' of tube groups 96' and 98' are supported from the lower surface of the drum member 192 and given their oscillatory motion in the same manner as described with reference to the FIGS. 1 through 5 embodiment. The only difference between the two arrangements is that in the FIG. 6 and 7 embodiment the tube sections 100' extend through the wall a short distance so that their upper end is spaced inwardly from the cylindrical wall 192.

The valving function in the FIGS. 6 and 7 embodiment is provided by a cylindrical drum type valve member 206 which, as best shown in FIG. 6, is supported axially within the drum 192 by a horizontally extending shaft 208 and a plurality of radially extending rods or support members 210. The valve member 206 is rotatably supported from shaft 208 by bearings 212 and 214 which are carried by the end plates 196 and 194, respectively. As can be seen in FIG. 7, the valve member 206 is arranged so that its outer surface just clears the upper end of the tubes 100'. Additionally, the member 206 is provided with a number of circumferentially extending longitudinally spaced rows of openings 220 which are positioned so as to pass over the tubes 100' as the valve member rotates. Accordingly, with air supplied to the center of the rotatable valve member 206, its rotation will cause the air supplied to the discharge tubes to be interrupted. By varying the speed of rotation of the member 206 and/or the spacing of the openings 220, substantially any desired number of puffs per second can be achieved.

The drum 206 can be rotated in any desirable manner; however, in the FIG. 7 embodiment it is shown as driven by a small gear motor 224 which is carried on the blower housing wall 34' and drivingly connected with member 206 through a conventional V-belt drive 226.

The invention has been described in great detail sufficient to enable one of ordinary skill in the cleaning art to make and use the same. Obviously, modifications and alterations of the preferred embodiments will occur to others upon a reading and understanding of the specification and it is my intention to include all such modifications and alterations as part of my invention insofar as they come within the scope of the appended claims.

We claim:

1. An apparatus for cleaning a row of looms or the like comprising a high air velocity blower fan, means for continuously traveling said fan across the looms in said row, said fan discharging through a chamber having a plurality of fixed air discharge outlets, conduits communicating with each outlet, each conduit having a nozzle, said nozzles being spaced closely adjacent to the warp level of the loom, means for continuously oscillating said nozzles substantially perpendicular to the direction of fan travel and while said fan is moved across each successive loom, movable shutter means within said chamber opening and completely closing all of said outlets and a motor for rapidly moving said shutter means to completely stop the flow of air from said chamber to each of said outlets for brief closely spaced time periods to produce discrete, high velocity, closely spaced, transversely moving puffs of air from each of said nozzles.

2. An apparatus as claimed in claim 1 in which said shutter means for stopping said flow of air through said outlets is provided with an orifice for each of said outlets.

3. An apparatus as claimed in claim 1 in which said outlets are arranged in alignment and said shutter means includes a plurality of spaced orifices, said shutter means being reciprocably mounted within said chamber.

4. An apparatus as claimed in claim 1 in which said outlets are arranged in alignment and said shutter means for stopping said flow of air through said outlets is a rotatable cylinder in said air chamber having a spaced orifice therein for each of said outlets and means driven by said motor for rotating said cylinder to move said orifices rapidly past the outlets in said chamber.