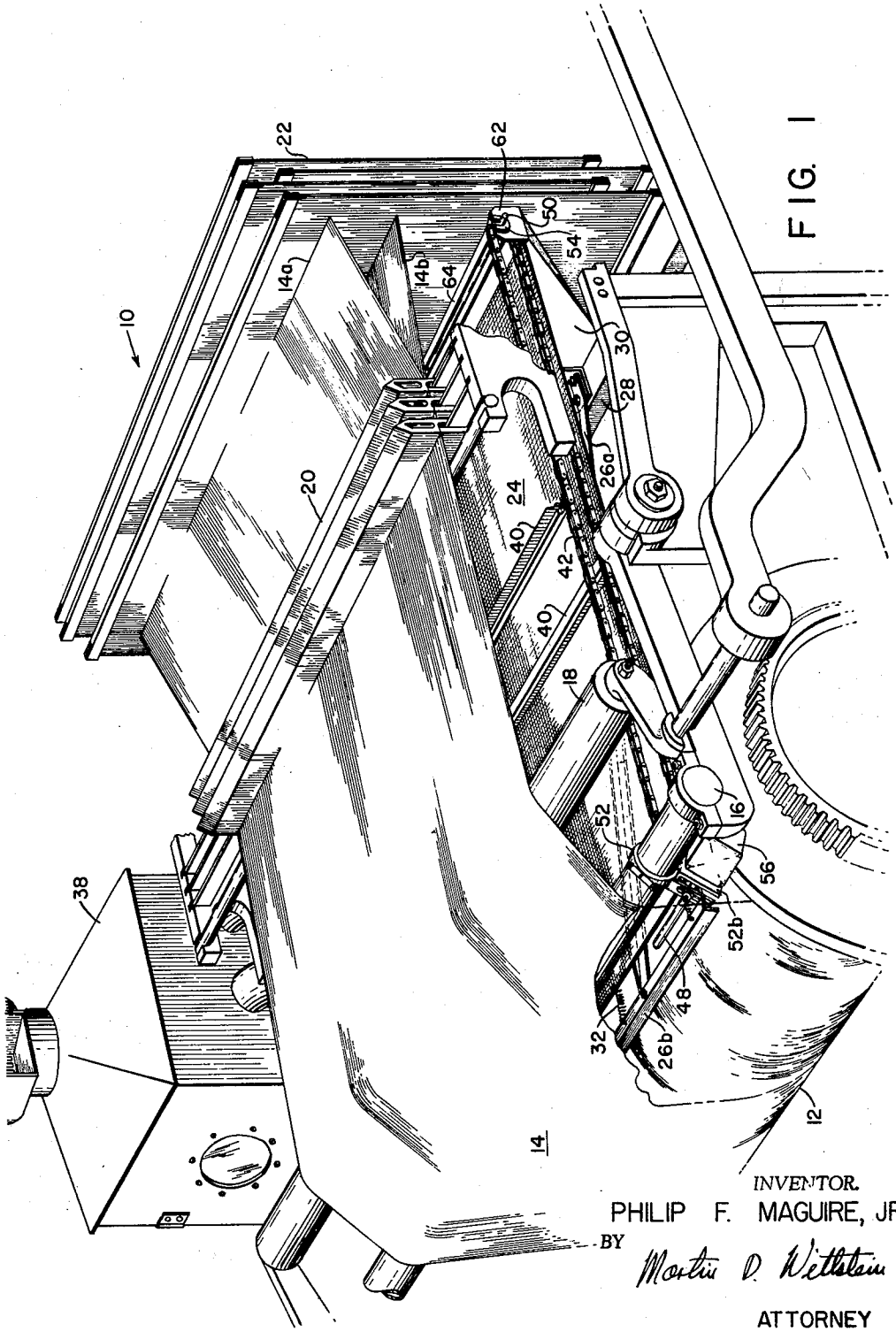
Aug. 4, 1964 P. F. MAGUIRE, JR 3,142,856

TEXTILE MACHINERY CLEANING APPARATUS AND METHOD

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FIG. 1



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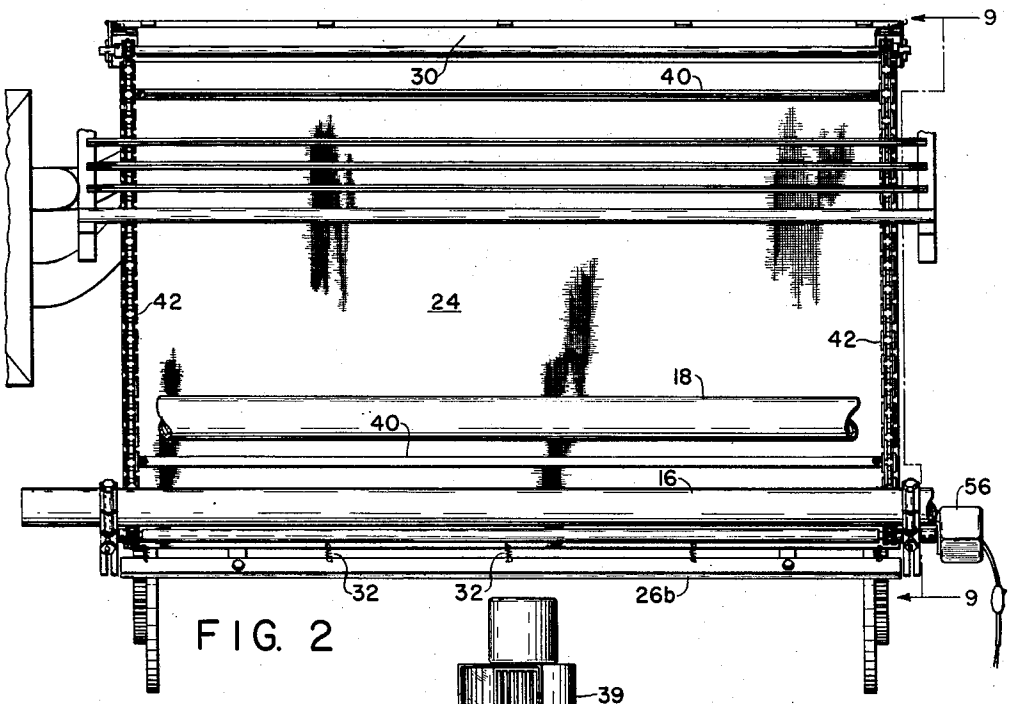


FIG. 2

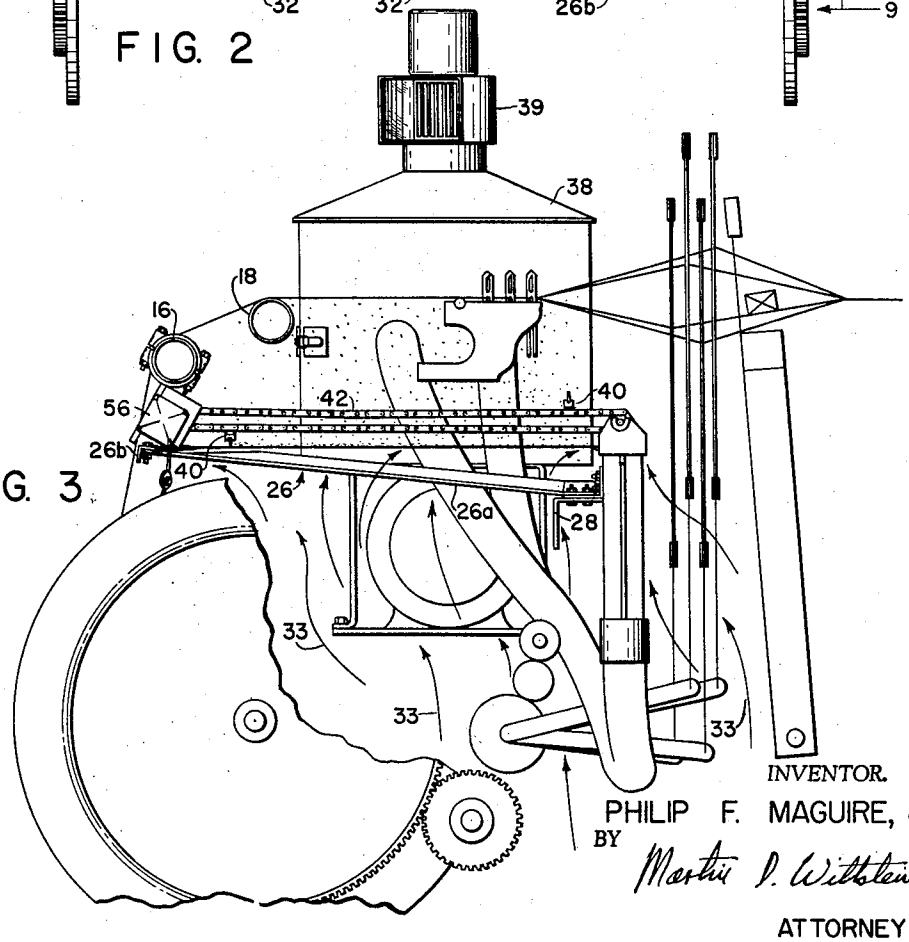


FIG. 3

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FIG. 4

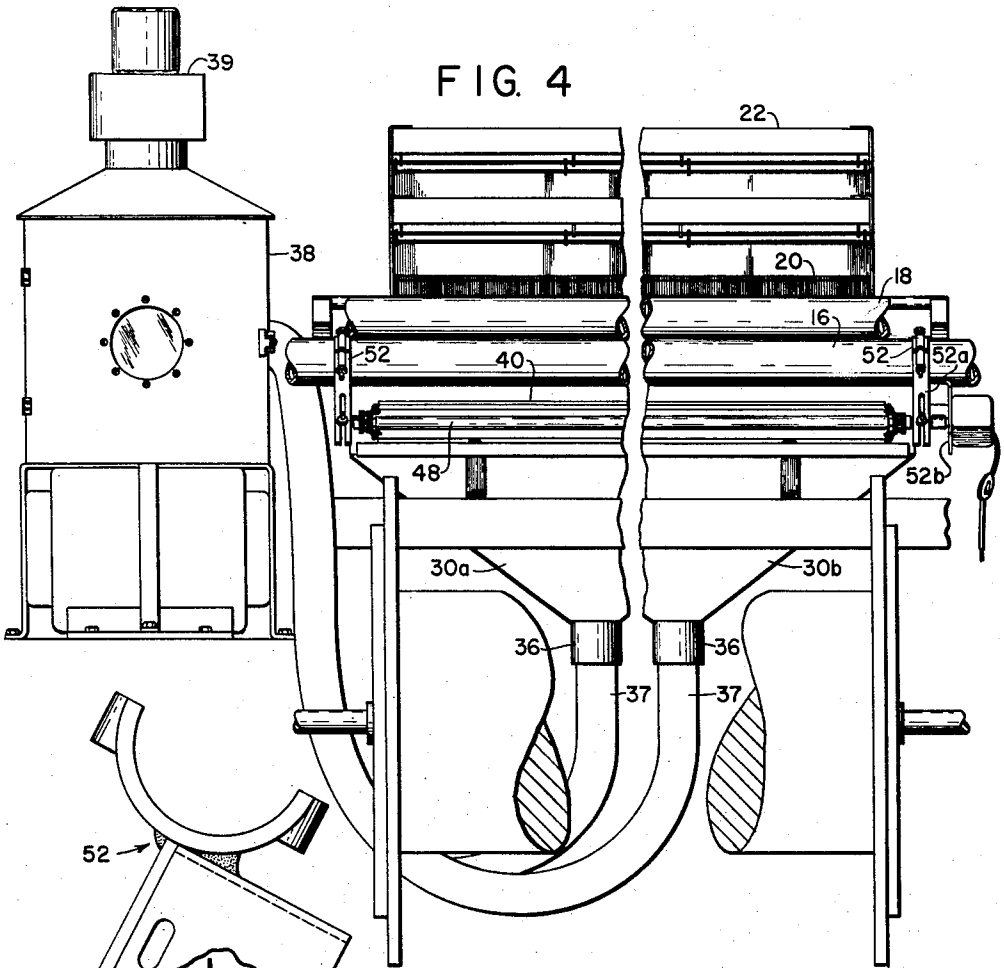


FIG. 9

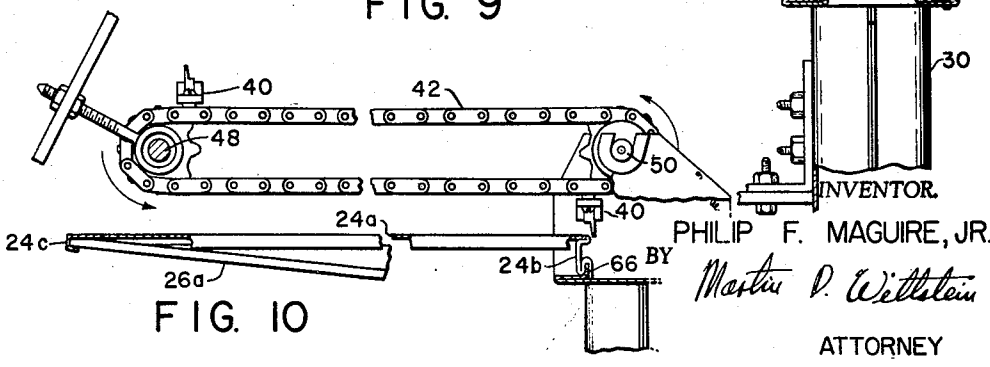


FIG. 10

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TEXTILE MACHINERY CLEANING APPARATUS AND METHOD

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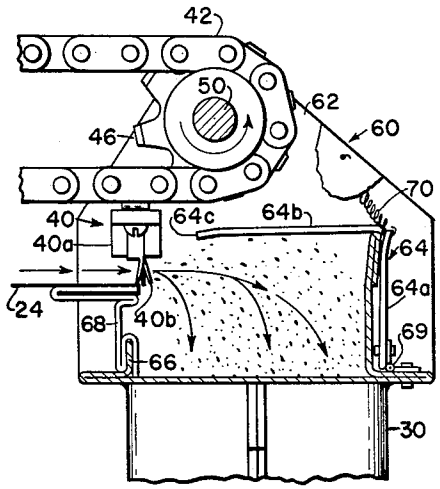


FIG. 5

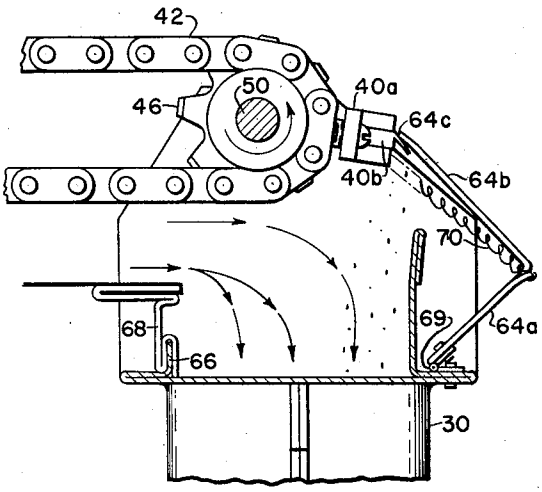


FIG. 6

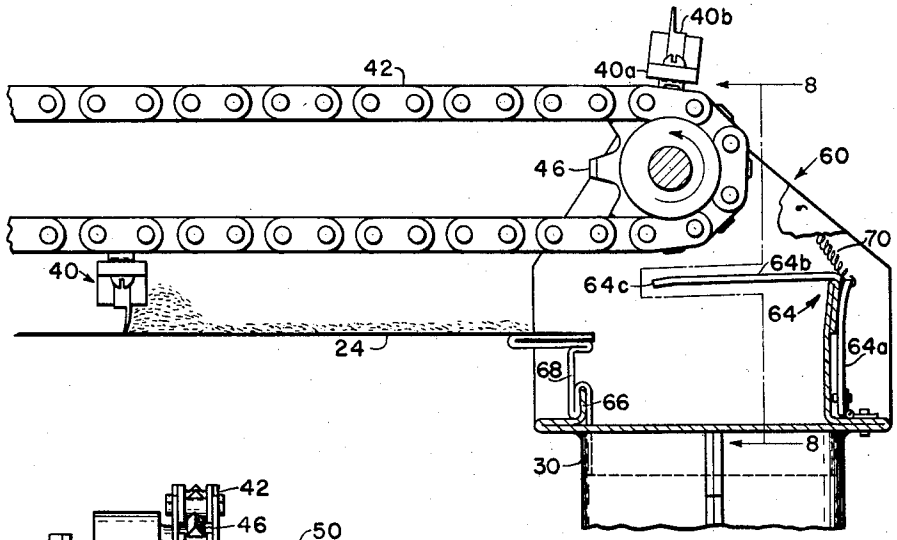


FIG. 7

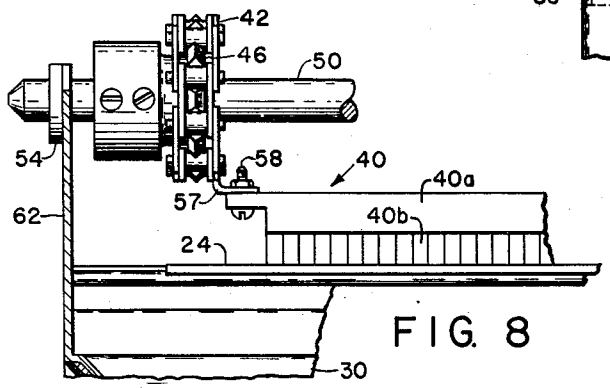


FIG. 8

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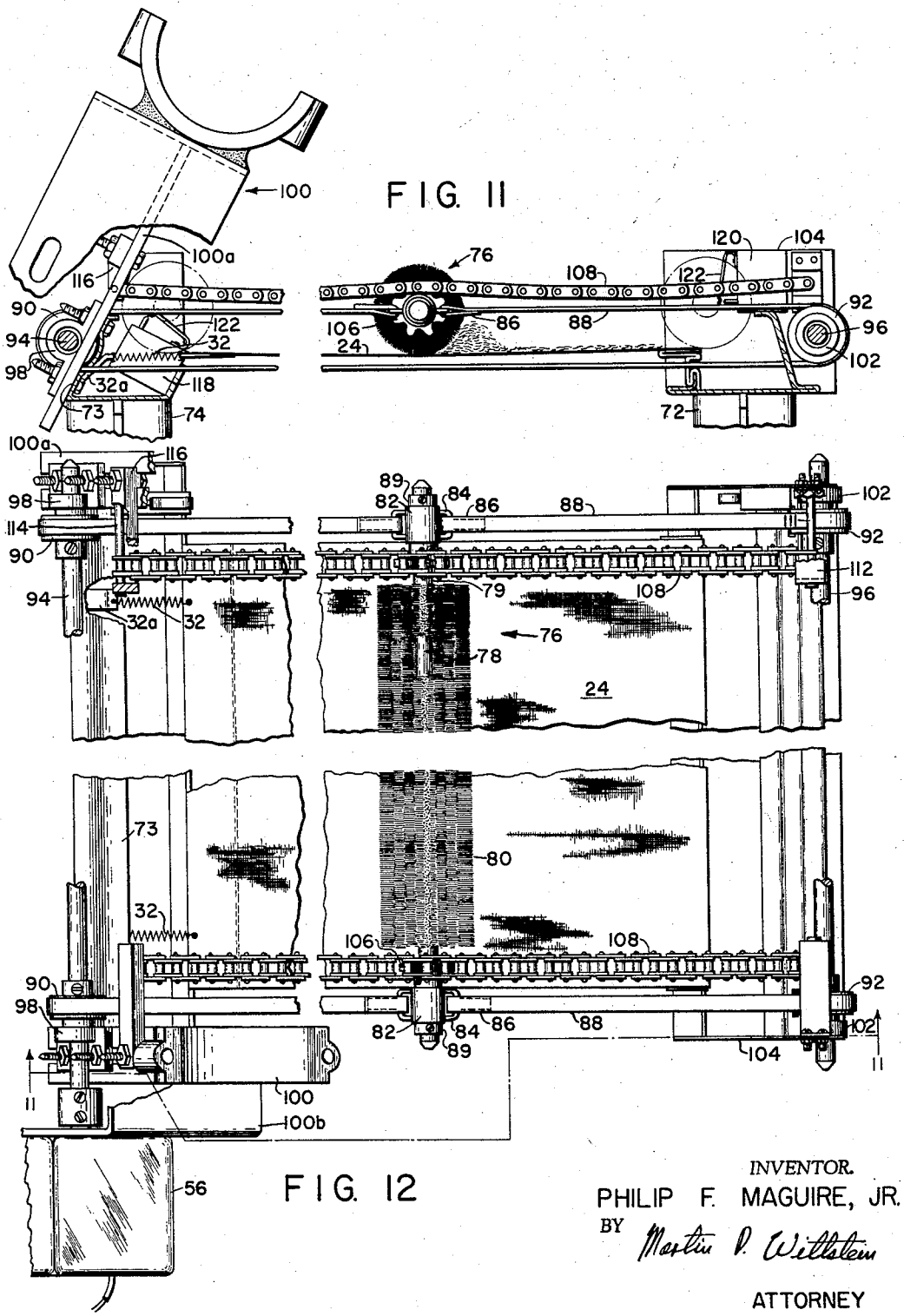


FIG. 11

FIG. 12

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TEXTILE MACHINERY CLEANING APPARATUS AND METHOD

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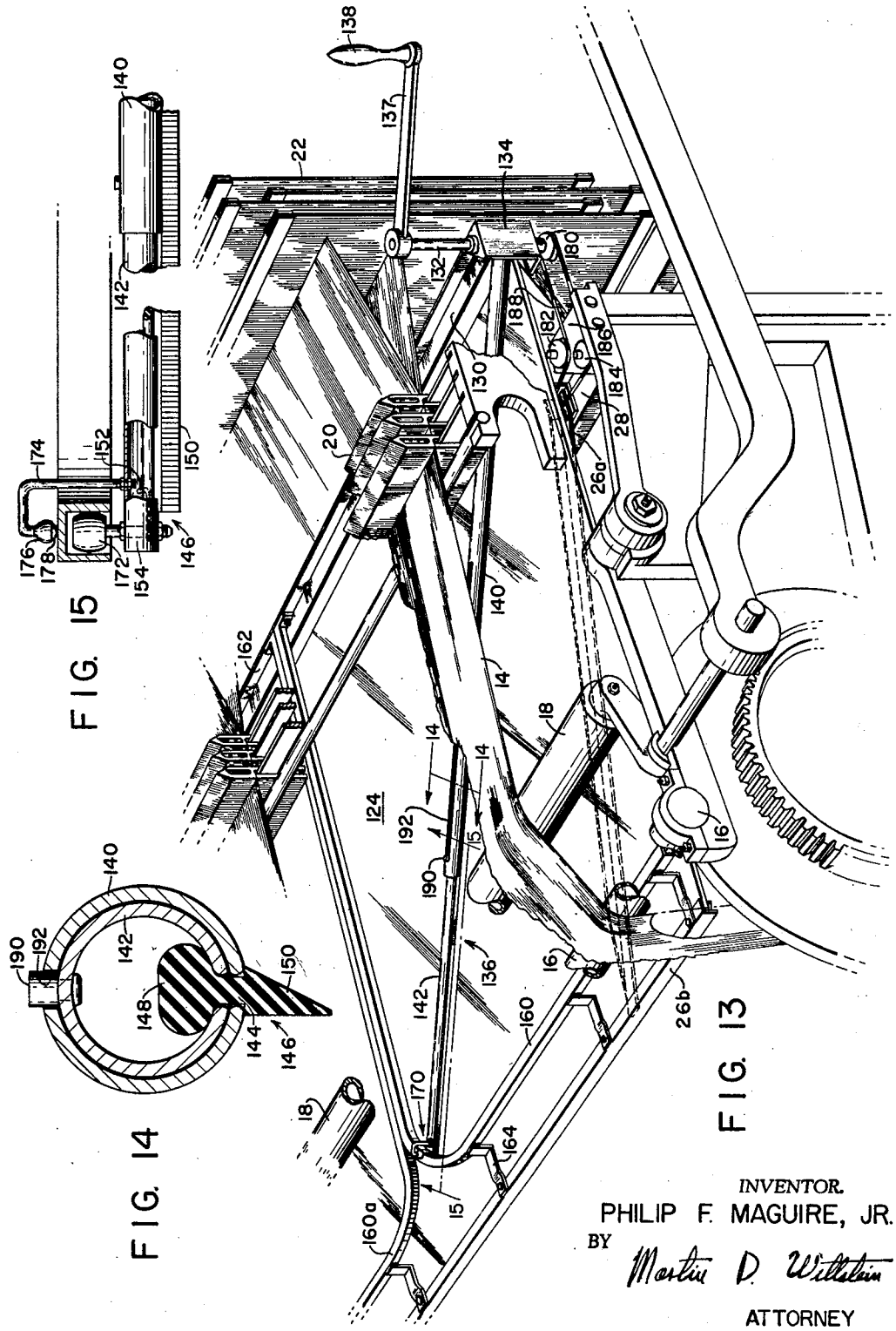


FIG. 15

FIG. 14

FIG. 13

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United States Patent Office 3,142,856 Patented Aug. 4, 1964

3,142,856

TEXTILE MACHINERY CLEANING APPARATUS AND METHOD

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Filed Dec. 20, 1961, Ser. No. 160,859
26 Claims. (Cl. 15—246)

This invention relates generally to improvements in apparatus for removing lint and fly from textile machinery such as looms or the like. More particularly, the invention relates to apparatus for blocking the passage through the textile machinery of undesirable air currents which are produced by operating components of the textile machinery, and simultaneously therewith, for gathering from the air and collecting lint and fly which is generated by operation of the textile machinery and removing the collected lint therefrom.

In the past, textile manufacturers have experienced chinery, particularly textile looms, because of large dechinery, particulary textile looms, because of large deposits of lint which are formed during textile processing operations. This lint, which results from small fibers breaking off the warp strands as the latter are drawn through the loom, either falls by gravity into the loom and is deposited thereon, or is caught by small air currents created by various operating parts of the loom and is thus distributed fairly evenly over substantially all parts of the machinery. Some of the lint will even be carried upwardly by these air currents to be thereafter deposited on areas of the loom above the warp strands or on adjacent machinery. The lint sticks tenaciously to any surface on which it is deposited because of a coating of sizing thereon which is rendered tackey by the high relative humidity normally maintained in a textile mill.

If left unattended, it would not be long before the lint would accumulate in such thick heavy deposits on the textile machinery as to interfere with proper operation thereof, and possibly to impair the quality of the product. For example, due to the aforementioned coating of sizing, the lint, if allowed to collect, would form clumps thick enough to cause malfunction of certain operating parts of the loom, resulting in frequent shut downs for repairs and cleaning. Such shut downs are obviously costly to the textile manufacturers. Further, it frequently happens that clumps of lint are deposited upon or fall into the warp strands in the area of the lay and consequently are woven into the finished cloth, thereby resulting in an inferior product which is likewise costly to the manufacturer.

The problems of lint deposit are further complicated by the production of certain air currents by some of the operating parts of the loom. These parts are usually located in the lower regions of the loom and tend to create updrafts of air which prevent lint from falling by gravity into a conventional collection pan located near the floor, and instead distribute the lint over surfaces higher or to one side of the region of lint production. One example of such an operating part is the main drive shaft and cam unit for the heddles of the loom. This unit, which is located near the floor, generates a considerable amount of heat during its operation, thereby creating updrafts as the result of convection currents. Another example of such an operating part is the lay of a loom which, by its oscillatory motion, produces a fanning action and causes air currents to pass through the heddles and again upwardly through the warp strands. It will be apparent that while such air currents are being created and passed through the loom, very little lint collection can take place without employing machinery the placement of which would interfere with proper loom operation.

To help overcome the above problems, it has been proposed in the past to use equipment ranging from hand held air hoses to over-head traveling blower units to rigid vacuum hoods mounted on the machinery. Many of these devices have enjoyed considerable commercial success, but none have combined in one compact assembly the advantages attributed to the present invention.

Among the desirable features of lint collection apparatus for textile machinery are the following: the gathering of lint into a container from which it cannot thereafter escape to be deposited on the textile machinery or on the floor therearound; the gathering of lint by apparatus which does not rely upon a movement of air to conduct lint to a container inlet; the gathering of lint by apparatus which is not limited by the air moving abilities of a vacuum system of reasonable size; the gathering of lint with apparatus which effectively cleans those portions of itself which are particularly subject to becoming clogged with lint; the providing of apparatus which can conveniently fit into existing spaces in textile machinery and which is adaptable for use with different textile machinery; the blocking of upwardly moving air currents and preventing them from passing through the textile machinery and through the material being processed; and the provision of apparatus which is simple in construction and easily installed.

One embodiment of the present invention, which is preferred since it incorporates all of the above features and which is adapted for use with a textile loom, includes a relatively wide flat sheet of flexible air impervious material having a relatively smooth surface on at least one side thereof. The sheet is suspended beneath the warp strands on the drop wires side of the heddles of a textile loom, and acts as a collection pan to receive thereon lint and fly from the air that falls by gravity from the warp strands as the latter pass thereover. The collection pan also constitutes a barrier to moving air currents which are created within the loom. At the rear of the flexible sheet is a suction manifold mounted on the loom in juxta-position to the rear edge of the collection pan adjacent the heddles, this edge being secured to the suction manifold. The forward edge of the collection pan is secured by a stiffening bar to a plurality of tension springs, which in turn are secured to a cross member mounted on the loom frame.

Adjacent the front and rear edges of the collection pan is a shaft, each shaft having a pair of sprockets thereon, one shaft being driven by a small electric motor. A pair of chains pass around the sprockets and are driven by the sprockets mounted on the driven shaft. The chains carry a plurality of sweeper members having resilient fingers thereon, and are so mounted in relation to the collection pan that as the chains move, the sweeper members are drawn across the collection pan in a direction from front to rear to remove any lint which has accumulated on the collection pan during machine operation. The sweeper members push the lint toward the mouth of the suction manifold where the lint is picked up by a stream of air passing therethrough as a result of reduced pressure therein.

The aforementioned mouth is formed in part by a pivoted hood which is pushed backwardly on its hinge as the sweeper member advances into the mouth. As will be seen, the sweeper member passes around an arc while pushing on the hood in such manner that the outer edge of the hood scrapes against the resilient fingers to ensure that all the lint has been removed therefrom and drawn into the suction manifold. The sweeper member is then conveyed along the upper run of the chains to the front edge of the collection pan whereupon the cycle repeats itself.

One desirable feature of this embodiment is that the

springs which secure the forward edge of the resilient sheet to the cross member maintained a sufficient tension thereon so that it will conform to any irregularities in the sweeper members and yet maintain proper contact therewith, so that all the lint resting on the sheet will be pushed away.

Having thus described generally a preferred embodiment of the invention, a principal object thereof is the provision of lint removing apparatus for textile machinery wherein a flexible stationary air current barrier simultaneously blocks the movement of undesirable air currents and collects lint falling by gravity and holds such lint for subsequent removal.

Another object of the invention is the provision of lint removing apparatus for textile machinery having a stationary barrier for moving air currents with a lint collecting surface adapted to receive lint falling by gravity thereon and means to remove lint so collected from the receiving surface.

Another object of the present invention is the provision of a lint receiving surface in position to receive lint and fly falling by gravity from the strands of material being processed, with means to move the lint on the receiving surface to a removal station for subsequent concentration and disposition.

Still another object of the present invention is the provision of lint removing apparatus for textile machinery having a stationary surface upon which lint and fly fall by gravity from strands of the material being processed, with sweeping means arranged to push or otherwise convey the lint resting on the receiving surface to a suction manifold located adjacent to an edge of the receiving surface whereby the lint is drawn by air currents to a collection box and concentrated therein.

Another object of the present invention is the provision of lint removing apparatus for textile machinery wherein a lint receiving surface positioned on the textile machinery so as to receive lint and fly falling by gravity from strands of material being processed is swept clean by at least one sweeper member which is caused to move over the surface, and having a scraper for removing any lint from the sweeper member not drawn off by an air suction over which the sweeper member passes.

Another object of the present invention is the provision of lint removing apparatus for textile machinery having a rigid shield acting as a barrier to moving air currents in lint producing regions of the textile machinery which barrier has a lint receiving surface for arresting lint falling by gravity onto the surface, and a resilient sweeper member element so arranged that it will conform to any irregularities in the contour of the lint collecting surface as it moves across the latter to remove lint collected thereon.

Another object of the present invention is the provision of a method for removing lint from the lint producing regions of textile machinery which involves the blocking of undesirable air currents in the lint producing regions, the arresting of lint falling through the air, the supporting of the lint on a lint receiving surface, the moving of the arrested lint across the surface to a lint removal station independently of air currents, and the removing of such lint from the lint removing station.

Other objects and advantages will become apparent from the detailed description which follows when considered in conjunction with the accompanying drawings.

In the drawings, in which the same reference numerals are used throughout the several views to indicate like parts:

FIGURE 1 is a perspective view of part of a textile loom showing one embodiment of the present invention incorporated therewith, with portions of the loom omitted and other portions broken away for greater clarity;

FIGURE 2 is a somewhat diagrammatic top plan view of the device of FIG. 1;

FIGURE 3 is a somewhat diagrammatic side elevation of the device of FIG. 1 with some parts broken away for clarity;

FIGURE 4 is a somewhat diagrammatic front elevation of the device of FIG. 1 with the vacuum collection box included;

FIGURES 5–7 are fragmentary side elevational views on a larger scale, with certain parts removed for clarity; showing a portion of the operating cycle of the device of FIG. 1;

FIGURE 8 is a fragmentary sectional view of the sweeping means taken on the line 8—8 of FIG. 7;

FIGURE 9 is a fragmentary sectional view, taken on the line 9—9 of FIG. 2, showing the sweeping means, but with a modified form of collection pan forward edge support;

FIGURE 10 is a fragmentary sectional view, similar to FIG. 9, showing a modified form of collection pan;

FIGURE 11 is a fragmentary side elevation of an alternative form of sweeping means taken on the line 11 of FIG. 12;

FIGURE 12 is a top plan view of the embodiment of FIG. 11;

FIGURE 13 is a view similar to FIG. 1 illustrating another embodiment of the invention having a manual drive means;

FIGURE 14 is a sectional view of the sweeper member of the embodiment shown in FIG. 13 taken on the line 14—14 of FIG. 13; and

FIGURE 15 is a fragmentary part sectional view of the guide track and sweeper member of the embodiment shown in FIG. 13 taken on the line 15—15 of FIG. 13.

Referring now to the drawings FIG. 1 illustrates a portion of a textile loom, generally indicated by the numeral 10, with which the present invention is concerned. The loom 10 comprises a warp roll 12 from which warp strands 14 unwind as they pass over a drag roll 16 and a whip roll 18. The warp strands 14 pass through the drop wires 20 and thence to the heddles 22 after which they are drawn to the lay side of the loom to be processed into finished material. Upper and lower layers 14*a* and 14*b* respectively of the warp strands between the drop wires 20 and the heddles 22 are continuously alternated by the heddles during loom operation. It is thus apparent that considerable quantities of lint will be produced in this part of the loom. In addition, lint is produced in the entire region extending from the drag roll 16 to the drop wires, 20. The invention now to be described is directed toward the collection and removal of this lint.

In the embodiment of the invention illustrated in FIGS. 1–8, a relatively wide flat sheet made of an air impervious resilient material constitutes a flexible collection pan 24 which extends from a point substantially beneath the drag roll 16 to a location adjacent the heddles 22, this area being considered a collection station. The collection pan 24 has a smooth upper surface which is presented toward the warp strands 14 and which is adapted to receive thereon lint falling from the warp strands through the air space over the collection pan 24 as the warp strands 14 pass thereover.

As seen in FIGURES 1 to 3, the front or leading edge of the collection pan 24 is supported beneath the drag roll 16 by a pair of support frames 26 each of which comprises an angle member 26*a* secured at one end to a loom frame cross member 28 and which supports, at its other end, a cross bar 26*b* extending from one side of the loom to the other. A plurality of coil springs 32 are connected between the cross bar 26*b* and a stiffening bar 34 (FIG. 9) which is inserted through an appropriate seam formed in the front edge of the collection pan 24. By means of these springs 32, the collection pan can be maintained under proper tension so as to continuously present a smooth flat surface to the lint falling thereon, and it will be self-restoring in shape in the event it is deformed in any way, for example, by an uneven sweeper member, or inadvertently by an attendant.

By mounting the collection pan 24 in the foregoing manner, it divides the textile machine into two separate zones, an upper zone through which the textile material passes and in which lint is generated, and a lower zone in which various loom parts operate and in which air currents are created which tend to move upwardly as indicated by the arrows 33 in FIG. 3. The collection pan 24 acts as a barrier to prevent these air currents from rising into the lint producing zone of the textile machine and spreading the lint haphazardly over the loom and over adjacent machinery. A suction manifold 30, also mounted on the loom frame cross member 28, has downwardly tapering sides 30*a* and 30*b* which, as seen in FIG. 4, terminate in a plurality of outlet openings 36 to which a pair of flexible hoses 37 are attached. These hoses communicate with a vacuum collection box 38 conveniently located adjacent the loom, and on which is mounted a blower unit 39 which draws air from the manifold 30, through the hoses 37, through a filter and lint receptacle located within the vacuum collection box 38, and thence out through a discharge opening of the blower unit 39. Thus, any lint which is deposited in the suction manifold 30 after being removed from the collection pan 24 will be drawn by the vacuum into the collection box and there retained for future disposition.

As seen generally in FIGS. 1–4 and more particularly in FIG. 9, a sweeping means is provided for sweeping or pushing the lint which has collected on the collection pan 24 during machine operation from its place of deposit to the suction manifold 30 for removal. The sweeping means constitutes essentially a sweeper member or brush type element and a driving means therefor, and in this embodiment includes one or more sweepers or brushes 40 which are suspended between a pair of endless chains 42 for uni-directional movement across the collection pan 24. Each of the chains 42 passes over a front and rear sprocket 44 and 46 which are respectively mounted on front and rear shafts, 48 and 50, the front shaft being supported for rotation by a pair of adjustable bearing supports 51 which are secured to the bifurcated portion 52*a* of a support bracket 52 which is clamped or otherwise conveniently secured to the drag roll 16. The rear shaft 50 is supported by bearings 54 mounted on upstanding side extensions 62 of the suction manifold 30. The front shaft 48 is driven by a small electric motor 56 mounted on a side plate 52*b* of one of the brackets 52 as shown in FIGS. 1 and 4. The sweeper member 40 is secured to the chains 42, (see FIG. 8) by a small angle bracket 57 having one leg secured to a chain link and the other leg secured to the sweeper member by a screw 58 or other convenient means. The sweeper member 40 comprises a substantially channel shaped relatively rigid frame 40*a* which partially encloses a blade element 40*b* made of rubber or other suitable resilient material which is cut to form a plurality of individual fingers for a purpose to be hereinafter described.

Referring now to FIGS. 5, 6 and 7, it will be seen that the suction manifold 30 has an upper channel portion generally indicated by the numeral 60 which forms a lint receiving mouth for lint deposited therein by the sweeper members 40. More particularly the channel portion 60 is defined by side extensions 62 of the suction manifold 30 which support the rear chain shaft 50, a pivoted right angle shaped door 64 along the rear part of the channel portion, and the upper rear edge of the collection pan 24 along the front part of the channel portion. A short upstanding lip 66 supports a clamping member 68 which is bent as seen in FIGS. 5, 6 and 7, to secure the rear edge of the resilient collection pan 24 to the suction manifold 30. The door 64 is mounted upon the rear edge of the suction manifold 30 by a hinge 69 so that the door may pivot from a closed position seen in FIG. 5 to an open position seen in FIG. 6. A spring 70, secured at one end to one of the side extensions 62 normally maintains the door in its closed position.

The door 64 is composed of a vertical component 64*a* which constitutes the rear wall of the channel portion, and a horizontal component 64*b* which extends from the upper edge of the vertical component 64*a* toward the rear edge of the collection pan 24 to constrict the size of the lint receiving mouth, thereby increasing the velocity of the air that is drawn therethrough by the blower unit 39.

The operation of the device as thus far described is as follows: referring to FIGS. 1 and 5–9 it will be seen that operation of motor 56 causes rotation of drive shaft 48 and the sprockets 44 mounted thereon which in turn drive the chains 42 in uni-directional movement around the front and rear sprockets 44 and 46. The chains 42 carry the sweeper members 40 across the collection pan from front to rear so that the resilient blade element pushes any lint which has collected on the collection pan toward the suction manifold 30.

As seen in FIG. 7, the lint forms into a mound or drift in front of the sweeper member 40 which is pushed by the latter across the surface of the collection pan 24. After a relatively short travel of the sweeper member 40, a mound of lint has accumulated of sufficient size that the mound itself acts as a sweeper element which is pushed by the sweeper member 40 in a manner similar to the action of a snow plow.

As the sweeper member 40 approaches the rear edge of the collection pan and the forward edge 64*c* of the suction manifold door 64 (FIG. 5), the receiving mouth is still further restricted so as to obtain the maximum air velocity; this aids in drawing the accumulated mound of lint into the suction manifold. When the resilient blade element 40*b* reaches the rear edge of the collection pan, the individual fingers thereof snap rearwardly due to a slight compression in the fingers caused by the proximity of the sweeper member to the collection pan. This snapping action of the fingers assures the removal of all the lint from the collection pan into the suction manifold.

After the sweeper member frame 40*a* contacts the forward edge 64*c* of the pivoted door 64, continued movement of the sweeper member 40 around the rear sprockets 46 causes the door 64 to pivot rearwardly on its hinge 69, whereupon the respective parts assume the position seen in FIG. 6; at this time, the door 64, being biased by the spring 70 to its closed position, maintains contact with the sweeper member 40 and scrapes against the resilient blade element 40*b* as the latter continues in its path of travel. Thus, any lint which may adhere to the blade element 40*b* as it passes over the suction manifold 30 is scraped off by the aforementioned forward edge 64*c*. The door 64 returns to its closed position, as seen in FIG. 7, after the resilient fingers 40*b* pass beyond the forward door edge 64*c*, whereupon the sweeper member 40 is carried by the upper run of the chains 42 back to the front edge of the collection pan 24 and around the forward sprockets 44 in position to commence another cycle of operation.

Referring again to FIG. 9, an alternative means of supporting the forward edge of the collection pan is illustrated wherein the cross bar 26*b* is bolted or otherwise conveniently secured to the bifurcated portion 52*a* of the support brackets 52. The front edge of the collection pan 24 is connected to the cross bar 26*b* by tension springs 32 as before.

While this construction is somewhat simpler than the previous arrangement since it eliminates the angle members 26*a*, it nevertheless suffers the disadvantage of making the tension in the collection pan 24 subject to any displacement of the support brackets 52 from their initial position, which displacement may itself be desirable as constituting an alternative means of adjusting the tension in the chains 42.

FIGURE 10 illustrates an alternative form of collection pan 24*a* having the form of a flat sheet, preferably fabricated from thin gage metal which is secured at its rear edge to the upstanding lip 66 of the suction mani-

fold 30 by being bent as 24*b* in a shape similar to that of the bracket 68 shown in FIG. 5, and is supported at its front edge by a lip 24*c* bent over the forward ends of a plurality of angle members 26*a* similar to those employed in FIGS. 1–8. This construction has the advantage of being easier to fabricate and install than the flexible sheet. However, one drawback of this type of collection pan is the fact that it is not shape restoring, and, in the event that it is inadvertently bent or distorted out of shape, the sweeper member 40 may not maintain proper contact therewith.

FIGURES 11 and 12 illustrate another embodiment of the invention wherein a modified form of sweeper member reciprocates across the surface of a resilient collection pan and simultaneously rotates about its longitudinal axis in a direction of rotation opposite to that normally urged by the contact surfaces of the sweeper member and collection, thereby causing the wiper member to scrape across the collection pan surface. In this embodiment of the invention, a resilient collection pan 24 is mounted along its rear edge on a modified rear suction manifold 72 and is connected along its front edge to a plurality of tension springs 32, which are secured to spring brackets 32*a* welded or otherwise secured to a forward upstanding wall 73 of a front suction manifold 74 disposed adjacent to and just beneath the front edge of the collection pan 24 and fastened to the bifurcated portion 100*a* of support brackets 100; by this arrangement, lint can be deposited in a removal station by the sweeper member moving in either direction.

The sweeper member 76 of this embodiment consists of an elongated brush-type element, circular in cross-section, having a rigid central core 78, and a plurality of individual bristles 80 extending therefrom, the ends of which form a substantially solid peripheral sweeping surface. As seen in FIG. 12, the core 78 extends across the collection pan 24 and has extensions 79 which project beyond the outer edges of the collection pan to receive a pair of bearings 82 thereon which have eyelets 84 to receive the end loops 86 of a pair of driving belts 88. The belts 88 pass around front and rear pulley wheels 90 and 92 which are respectively non-rotatably mounted on front and rear shafts 94 and 96. The front shaft 94 is journaled for rotation in a pair of bearings 98 mounted on portions 100*a* of brackets 100 adjacent the manifold 74. It will be evident that upon rotation of the front shaft 94 by the electric motor 56 secured to a plate 100*b* integral with one of the support brackets 100, or by other convenient means whether powered or manual, the belts 88 will be driven by the pulleys 90 to move the sweeper member 76 bodily across the collection pan 24 in one direction. By means hereinafter described, the sweeper member 76 is translated back and forth across the collection pan to deposit lint alternately in the front and rear suction manifolds.

The means by which the aforementioned rotation is imparted to the sweeper member 76 simultaneously with translation thereof comprises a pair of sprockets 106 which are non-rotatably mounted on the core 78 between the bearings 82 and the outer edges of the bristle portion and which engage with a pair of stationary link chains 108 suspended over the collection pan 24 in the path of movement of the sprockets 106. Each chain is secured at its rear end to a pin 111 supported in a U-shaped bracket 112 which in turn is secured to a vertical side extension 104 of the rear suction manifold 72. The forward end of each chain 108 is secured to a similar pin 114 which is secured by another U-shaped bracket 116 to one of the support brackets 100 supporting the forward drive shaft. By this structure, the chains 108 are supported in position over the sweeper member 76 and in line with the path of travel of the sprockets 106 with a predetermined amount of sag therein, with the result that the chains 108 will rise and fall with the sprockets 106 and sweeper member 76 as the latter moves up or down because of sag in the resilient collection pan; continuous contact between the sprockets and the chains is thus assured throughout the path of travel of the sweeper member.

The particular apparatus by which the sweeper member 76 is caused to reciprocate forms no part of the present invention; hence, a general description of an illustrative means of accomplishing the desired result will suffice. Referring to FIG. 11, it will be seen that a pair of limit switches 118 and 120 are mounted on the front and rear manifolds 74 and 72 respectively in such position that a leaf actuator 122 on each limit switch is in the path of travel of one of the collars 89 and is moved thereby when the sweeper member 76 reaches the end of its path of travel in a given direction. The switches 118 and 120 are connected by appropriate electrical circuitry (not shown) to an A.C. reversing switch of conventional design which has a pair of triple-pole single-throw interlocked relays which control the flow of current to the motor 56 which, in this illustration, is a triple phase A.C. reversible motor. It will be apparent to anyone skilled in the art that upon actuation of either one of the limit switches 118 or 120, the reversing switch is actuated to reverse the phase of the current being fed to the motor, thereby reversing its direction of operation.

It should be noted that the switches 118 and 120 are so positioned that the longitudinal axis of the sweeper member 76 passes beyond the front and rear edges of the collection pan 24 before the respective switches are actuated so that the bristles 80 will partake of the same flicking action as they pass the edges of the collection pan as that of the fingers 40*b* of the sweeper member 40 of the previous embodiment, as illustrated in FIG. 5.

The operation of this embodiment is as follows: assuming that the relays of the aforementioned reversing switch are set so that the motor 56 causes rotation of the forward drive shaft 94 in a clockwise direction as viewed in FIG. 11, the forward drive pulleys 90 rotate with the shaft 94 to drive the belts 88 therearound and around the rear idler pulleys 92 thereby moving the sweeper member 76 bodily across the collection pan 24 from front to rear. As the sweeper member 76 moves, the sprockets 106, carried by the core extensions 79, engage with the links of chains 108 and consequently rotate in a counter-clockwise direction about their longitudinal axis. Thus the bristles 80 scrape across the surface of the collection pan 24 and push the lint which has collected thereon toward the rear suction manifold.

When the sweeper member reaches the end of its path of travel at the rear suction manifold 72, the collar 89 engages the leaf actuator 122 of the limit switch 120 to actuate the latter in the aforementioned manner to reverse the direction of operation of the motor 56, whereupon the sweeper member 76 will be drawn by the drive pulleys 92 and belts 88 toward the front suction manifold 74 while simultaneously rotating in a clockwise direction. This motion will continue until the collar 89 contacts the leaf actuator 122 of the forward limit switch 118 whereupon the cycle just described commences again.

FIGS. 13–15 illustrate still another embodiment of the invention wherein a sweeper member is pivoted at one end thereof to one corner of a collection pan and is manually operated to swing in an arc about a pivot point, and is extensible so as to sweep an area greater than that encompassed by the quadrant of the circle which would be generated by the free end of a sweeper member of fixed length rotating about the same pivot point. More particularly, a substantially rigid collection pan fabricated of thin gage metal or other suitable material is supported generally in the region between the drag roll 16 and heddles 22 by angle members 26*a* which are secured at one end to the loom frame cross member 28 and to the edge of the collection pan 124 at the other end. A cross bar 26*b* overlies the edge of the collection pan 124 for a purpose hereinafter to be described, while the opposite edge

of the collection pan 124 is secured to a modified suction manifold 130 in a manner similar to that illustrated in FIG. 10.

A shaft 132 is journaled for rotation in a bracket 134 which is secured to one end of the suction manifold 130. A sweeper member 136, more fully described hereinafter, is fixed to the shaft 132 for rotation therewith, movement being effected by means of a crank 137 and a handle 138 secured to the upper end of the shaft 132 in a position convenient to an operator standing beside the loom.

In order to clean the maximum possible surface area of the collection pan 24 with a pivoted sweeper member the free end of which would normally swing in an arc of a circle, means are provided for causing the sweeper member to expand during a first portion of its stroke and to contract during the remaining portion of its stroke so that an area of the collection pan which lies outside of the aforementioned arc is covered. Accordingly, there is provided a sweeper member 136 having an outer tubular section 140 and an inner tubular section 142 which is telescoped within the outer tubular section 140 over a greater portion of its length. The outer tubular section 140 has one end adjacent the manifold 130 secured to the shaft 132 for rotation therewith, and has a length not substantially greater than the depth of the collection pan or about one half of its width, whichever is less. The tubular sections 140 and 142 are slotted along their bottom side as seen in FIG. 14 in order to loosely grasp the thinned neck position 144 of a resilient, stretchable and shape recoverable blade member 146 made of rubber or other suitable material. The blade member 146 has an enlarged head portion 148 which is received within the tubular sections 140 and 142 and which prevents the blade member 146 from being readily withdrawn therefrom. Formed integral with the neck portion 144 remote from the head 148 is a scraping or pushing element which comprises a plurality of individual fingers 150 which correspond to the fingers 26*b* of the embodiment of FIGS. 1–8.

The blade member 146 is secured to the outer end of the inner tubular section by a clip 152, shown in FIG. 15, having one end thereof embedded in the end of the head portion 148, the other end being looped around a shaft 154 secured to the free end of the inner tubular section 142. The other end of the blade member 146 is secured to the shaft 132 in a similar manner. Therefore, as the inner tubular section telescopes in and out of the outer tubular section to alter the length of the sweeper member 136, the blade member 146 will expand and contract accordingly to maintain the same length as the two tubular sections combined.

The means by which the wiper 136 is caused to expand and contract as it pivots about the axis of the shaft 132 comprises an open bottomed channel shaped guide track 160 having parallel vertical side walls and a horizontal top wall. The guide track 160 is secured at one end thereof to an upstanding lip 162 on the suction manifold 130 by bolts or other convenient means at approximately the transverse mid-point of the suction manifold. The guide track 160 extends forwardly beneath the drop wires 20 and warp strands 14 to a point adjacent the front of the collection pan 124 whereupon it curves 90° and extends toward one side of the collection pan and thence extends parallel to the front edge thereof, terminating adjacent the aforementioned side. That portion of the guide track 160 which lies parallel to the front of the collection pan is supported by a plurality of brackets 164 secured to a side wall of the guide track 160 and to the cross bar 26*b*.

The free end of the sweeper member 136 is forced to follow the path of, and is simultaneously supported by, the guide track 160 as the sweeper member 136 pivots about the axis of shaft 132 by means of a follower assembly generally designated 170 in FIG. 13. This assembly, as more particularly seen in FIG. 15, comprises a roller 172 journaled for rotation on the end of the shaft 154 which is secured to the outer end of the inner tubular section 142, the roller having a curved periphery so as to reduce friction to a minimum. Also secured to the inner tubular section 142 adjacent the outer end thereof is a substantially U-shaped support post 174 which extends upwardly and over the upper surface of the guide track 160 and which terminates in a socket 176 and ball 178, the latter being adapted to ride on the guide track upper surface. The socket 176 and ball 178 may take the form of a conventional ball type caster which is capable of universal motion in a horizontal plane.

Referring again to FIG. 13, a pulley 180 is fixed to the lower end of the shaft 132 for rotation therewith. Pulleys 182 and 184 are journaled for rotation on a suitable bracket 186 conveniently mounted on the loom frame. An endless drive belt 188 is passed around this group of three pulleys and thence beneath the collection pan to an identical group of three pulleys (not shown) similarly mounted on the opposite side of the loom. Another sweeper member identical in structure to the sweeper member 136 has one end mounted on a shaft journaled for rotation in a suitable bracket on the opposite end of the suction manifold 130, and is movably connected at its other end to another guide track 160*a* which is identical in all respects to the guide track 160 except that it extends from the center of the loom away from the track 160. The belt 188 is crossed over upon itself beneath the collection pan 24 like a figure 8 so that when the pulley 180 rotates in one direction to drive the belt 188, the corresponding pulley on the opposite side of the loom which is fixed to the aforementioned shaft will be driven in the opposite direction.

In order to prevent any relative rotation between the inner and outer tubular sections, a pin, 190, secured to the inner tubular section 142 by any convenient means, is adapted to slide in a groove 192 formed in the outer tubular section 140. The length of the groove 192 is approximately the distance by which the inner tubular section telescopes within the outer tubular section.

In operation, the operator or attendant for the loom grasps the handle 138 and rotates the crank 137 about the pivot shaft 132, thereby rotating the latter about its longitudinal axis. Sweeper member 136, being fixed to shaft 132, rotates with the latter to swing from a position where it lies contiguous with the side edge of the collection pan to a position where it is contiguous with the rear edge of the collection pan. As the sweeper member 136 moves in this arc, the roller, 172 follows the configuration of the guide track 160 causing the inner tubular section to be withdrawn from the outer tubular section during approximately the first half of its path of travel and thence causing the inner tubular section to be retracted back within the outer tubular section during the remainder of its path of travel. The ball caster 178 simultaneously rides along the upper surface of the guide track 160 to help support the weight of the tubular sections 140 and 142.

As the inner and outer tubular sections 142 and 140 respectively are extending or contracting, the blade element 146 is similarly expanding or contracting in length due to its resilience and also the fact that it is secured to the opposite ends of the sweeper member 136 by clips or the like. Hence, it can be readily appreciated that a much greater area of the collection pan 124 can be covered by an arrangement as shown rather than by a sweeper member of fixed length moving about a pivot at one end, the other end of which would generate an arc of a circle.

While shaft 132 is rotating during the wiping stroke, pulley 180 is rotating therewith and driving belt 188 around idler pulleys 182 and 184, and around similar pulleys mounted on the opposite side of the loom as aforementioned, which belt drives a similar pulley, shaft and sweeper member for the half of the collection pan 124 not covered by the sweeper member 136. It will be understood that the two wipers operate in windshield wiper

fashion by virtue of the belt 188 being crossed over upon itself beneath the collection pan 124.

When the wiper 136 has reached the end of its path of travel and has deposited the accumulation of lint in the suction manifold 130, rotation of a crank 137 by the handle 138 in the opposite direction moves the wiper 136 back to its initial position adjacent the side edge of the collection pan.

Although the various components of the devices illustrated have been shown as being inseparable from the textile machine, it is within the scope of the invention that certain elements of the cleaning apparatus may be separate from the textile machine. For example, the motor, fan, lint container, and connecting hoses may be part of a portable collection unit which is wheeled along the floor of the mill room in which the looms are located, or suspended from an overhead rail, and which is moved from loom to loom in a certain pattern. In such situation, each loom is provided with a collection pan, sweeping mechanism, and manifold, to which the collection unit is connected as the lint from that loom is to be removed. When the proper connections are made, the sweeping mechanism is operated to deposit the collected lint into the manifold from where it is drawn into the portable collection unit, whereupon the unit is moved to the next loom.

It will be apparent from the foregoing description that there has been provided textile machinery lint removing apparatus which is believed to provide a solution to the problems, and to fulfill the objectives hereinbefore set forth. It is to be understood, however, that the above description and accompanying drawings are to be deemed primarily as illustrative of the best modes presently contemplated of carrying out the principles of the invention, and that the devices described and illustrated may be modified or altered in their form, proportions, detail of construction and arrangement of parts without departing from the spirit and scope of the invention as defined in the appended claims.

What I claim and desire to secure by Letters Patent is:

1. Textile machinery cleaning apparatus for gathering from the air adjacent said machinery lint which is generated by the operation of said machinery in at least one region thereof and which collects thereon after falling downwardly through said air, thereby preventing said collection, said apparatus comprising:

(*a*) a first pair of supports spaced apart within said region,

(*b*) a substantially flat resilient sheet mounted on said supports and presenting a surface toward said falling lint and being impervious thereto, said sheet extending substantially across said region, whereby said sheet intercepts said falling lint and supports said lint thereon,

(*c*) a second pair of supports spaced apart within said region, each latter support being located in juxtaposition to a corresponding one of said first pair of supports,

(*d*) sweeping means mounted on said second pair of supports for movement through at least a portion of said region relative to said sheet for sweeping said supported lint to a station located adjacent an edge of said sheet in said region, and

(*e*) means located at said station for receiving from said sweeping means lint which has been moved thereby to said station and for removing said lint from said station,

(*f*) said first pair of supports including:

(1) a bracket secured to one edge of said resilient sheet and mounted upon said lint receiving means,

(2) a stiffening bar secured to the opposite edge of said resilient sheet,

(3) a plurality of coil springs secured at one end thereof to said stiffening bar,

(4) an elongate member extending transversely of said sheet and secured to the other end of said coil springs, and

(5) means supporting said elongate member substantially in the plane of said sheet, whereby said sheet is maintained under tension by said coil springs.

2. The apparatus as set forth in claim 1 wherein said means for supporting said transverse elongate member comprises a longitudinal elongate member secured at one end to said transverse elongate member and connected at its other end to said lint receiving means.

3. The apparatus as set forth in claim 1 wherein said means for supporting said transverse elongate member comprises a pair of brackets secured to said transverse elongate member and which are adapted to be mounted on said textile machinery.

4. The apparatus as set forth in claim 1 wherein said sweeping means comprises:

(*a*) at least one sweeper member, and

(*b*) drive means for said sweeper member for moving said sweeper member across said sheet.

5. The apparatus as set forth in claim 4 wherein said drive means comprises:

(*a*) a pair of shafts journaled for rotation in said second pair of supports,

(*b*) a pair of sprockets on each shaft disposed adjacent the transverse edges of said sheet,

(*c*) a pair of endless chains, each chain lying in a vertical plane and passing around a set of corresponding sprockets whereby said chains are disposed in parallel relationship to said transverse edges of said sheet, said chains being driven by said sprockets,

(*d*) means connecting said sweeper member to said chains whereby said sweeper member is transversely suspended across said sheet, and

(*e*) means for rotating one of said shafts in a given direction

whereby said sweeper member is carried by said chains in a first horizontal plane across said sheet in one direction toward one of said shafts, around the sprockets mounted on that shaft, back across said sheet in the opposite direction toward the other shaft in a second horizontal plane disposed from said first plane, and around the sprockets on said other shaft to its initial position.

6. The apparatus as set forth in claim 5 wherein said means connecting said sweeper member to said chains comprises a pair of brackets each having two legs disposed at substantially a 90° angle to each other, one of said legs being secured to a link of said chains, the other of said legs being secured to said sweeper member, said one leg being of sufficient length that said sweeper member makes contact with said sheet when said sweeper member is moving in one of said horizontal planes.

7. The apparatus as set forth in claim 5 wherein said sweeper member comprises:

(*a*) a rigid channel shaped frame extending between said chains, and

(*b*) a resilient blade element inserted in said frame and retained thereby, said blade element having a plurality of relatively narrow individual fingers which make contact with and brush across said sheet,

whereby said fingers will individually snap forwardly relative to the direction of motion of said sweeper member across said sheet when said fingers reach the rear edge of said sheet relative to said direction of motion to assure that all the lint moved by said sweeper to said edge will be removed therefrom and deposited in said receiving means.

8. Textile machinery cleaning apparatus for gathering from the air adjacent said machinery lint which is generated by the operation of said machinery in at least one region thereof and which collects thereon after falling downwardly through said air, thereby preventing said collection, said apparatus comprising:

(a) a first pair of supports spaced apart within said region,

(b) a substantially flat resilient sheet suspended between said supports and presenting a surface toward said falling lint and being impervious thereto, said sheet extending substantially across said region, whereby said sheet intercepts said falling lint and supports said lint thereon,

(c) a second pair of supports spaced apart within said region, each latter support being located in juxtaposition to a corresponding one of said first pair of supports,

(d) sweeping means mounted on said second pair of supports for movement through at least a portion of said region relative to said sheet for sweeping said supported lint to a station located adjacent an edge of said sheet in said region,

(e) means located at said station for receiving from said sweeping means lint which has been moved thereby to said station and for removing said lint from said station, and

(f) means mounted on said receiving means for cleaning said sweeping means after said sweeping means has moved said lint to said station.

9. Textile machinery cleaning apparatus for gathering from the air adjacent said machinery lint which is generated by the operation of said machinery in at least one region thereof and which collects thereon after falling downwardly through said air, thereby preventing said collection, said apparatus comprising:

(a) a first pair of supports spaced apart within said region,

(b) a substantially flat resilient sheet suspended between said supports and presenting a surface toward said falling lint and being impervious thereto, said sheet extending substantially across said region, whereby said sheet intercepts said falling lint and supports said lint thereon,

(c) a second pair of supports spaced apart within said region, each latter support being located in juxtaposition to a corresponding one of said first pair of supports,

(d) sweeping means mounted on said second pair of supports for movement through at least a portion of said region relative to said sheet for sweeping said supported lint to a station located adjacent an edge of said sheet in said region,

(e) a suction manifold located at said station for receiving from said sweeping means lint which has been moved thereby to said station and for removing said lint from said station, said suction manifold having:

(1) an inlet opening adjacent to and facing toward said edge of said sheet,

(2) an outlet opening, and

(3) vacuum means connected to said outlet opening for causing air movement through said manifold from said inlet opening to said outlet opening, and

(f) means mounted on said manifold and movable between a first and second position for constricting the size of said inlet opening when in said first position and for cleaning said sweeping means when in said second position.

10. The apparatus as set forth in claim 9 wherein said sweeping means comprises:

(a) at least one sweeper member, and

(b) drive means for said sweeper member, said drive means comprising:

(1) a pair of shafts journaled for rotation in said second pair of supports,

(2) a pair of sprockets on each shaft disposed adjacent the transverse edges of said sheet,

(3) a pair of endless chains each chain lying in a vertical plane and being passed around a set of corresponding sprockets whereby said chains are disposed in parallel relationship to said transverse edges of said sheet, said chains being driven by said sprockets,

(4) means connecting said sweeper member to said chains whereby said sweeper member is suspended across said sheet, and

(5) means for rotating one of said shafts, whereby said sweeper member carried by said chains in a first horizontal plane across said sheet in one direction toward one of said shafts, around the sprockets mounted on that shaft, back across said sheet in the opposite direction toward the other shaft but in a second horizontal plane disposed from said first horizontal plane, and around the sprockets on said other shaft to its initial position.

11. The apparatus as set forth in claim 10 wherein said one shaft is mounted on said suction manifold adjacent said inlet opening.

12. The apparatus as set forth in claim 11 wherein said constricting and cleaning means comprises:

(a) a hood pivotally mounted on said suction manifold, said hood overlying and partially obstructing said inlet opening when said hood is in said first position, said hood having:

(1) a forward edge directed toward said sheet and lying in the path of said sweeper member as said sweeper member passes around the sprockets of said one shaft

whereby said hood is moved by said sweeper member from said first position to said second position, and

(b) spring means urging said hood toward said first position,

whereby said forward edge of said hood scrapes across said sweeper member to remove any lint therefrom not removed by said suction manifold.

13. Textile machinery cleaning apparatus for gathering from the air adjacent said machinery lint which is generated by the operation of said machinery in at least one region thereof and which collects thereon after falling downwardly through said air, thereby preventing said collection, said apparatus comprising:

(a) a first pair of supports spaced apart within said region,

(b) a substantially flat resilient sheet mounted on said supports and presenting a surface toward said falling lint and being impervious thereto, said sheet extending substantially across said region, whereby said sheet intercepts said falling lint and supports said lint thereon,

(c) a second pair of supports spaced apart within said region, each latter support being located in juxtaposition to a corresponding one of said first pair of supports,

(d) sweeping means mounted on said second pair of supports for movement through at least a portion of said region relative to said sheet for sweeping said lint alternately to a first station located adjacent one edge of said sheet and then to another station located adjacent the opposite edge of said sheet, and

(e) means located at said first and second stations for receiving from said sweeping means lint which has been moved thereby to said stations and for removing said lint from said stations.

14. The apparatus as set forth in claim 13 wherein said sweeping means comprises:

(a) a sweeper member, and

(b) drive means for said sweeper member for moving said sweeper member across said sheet in a reciprocatory motion.

15. The apparatus as set forth in claim 14 wherein said sweeper member comprises:

(a) a core extending between said bearings and rotatably mounted therein, and

(b) a plurality of individual bristles mounted on said core and covering a major portion of the length of

said core, the outer ends of said bristles defining a peripheral brush-like surface.

16. The apparatus as set forth in claim 15 wherein said drive means includes:

(*a*) a pair of shafts journaled for rotation in said second pair of supports,

(*b*) a pair of pulleys on each shaft disposed adjacent the transverse edges of said sheet,

(*c*) a pair of drive belts passing around said pulleys and disposed in parallel relationship to said transverse edges of said sheet, said belts being driven by said pulleys,

(*d*) means connecting said sweeper member to said drive belts whereby said sweeper member is suspended transversely across said sheet, and

(*e*) means for rotating one of said shafts alternately in one direction and then in the opposite direction, whereby said sweeper member is carried by said drive belts across said sheet in one direction toward said first station receiving means while said shaft rotates in said first direction and then back across said sheet in the opposite direction toward said second station receiving means while said shaft rotates in the opposite direction.

17. The apparatus as set forth in claim 16 wherein the distance between said shafts is such that the vertical diameter of said sweeper member can be moved slightly beyond said edges of said sheet whereby said bristles snap forwardly relative to the direction of motion of said sweeper member across said sheet when said bristles reach the edges of said sheet to assure that all the lint moved by said sweeper to said edges is removed therefrom and deposited in said receiving means.

18. The apparatus as set forth in claim 16 wherein said means for connecting said sweeper member to said belts comprises a pair of bearings, each having means for connecting said bearing to said drive belts, whereby said sweeper member is free to rotate while being moved across said sheet.

19. The apparatus as set forth in claim 16 wherein said drive means further includes means for rotating said sweeper member during movement of said sweeper member across said sheet in a direction opposite to that in which said sweeper member is urged by moving contact between said sweeper member peripheral surface and said sheet and whereby said bristles scrape across the surface of said sheet.

20. The apparatus as set forth in claim 19 wherein said rotating means comprises:

(*a*) a third pair of supports mounted adjacent said second pair of supports in a horizontal plane which is disposed above the plane of said second pair of supports,

(*b*) a pair of chains suspended from said third pair of supports over said sheet in parallel relation to said transverse edges of said sheet, and

(*c*) a pair of sprockets fixedly mounted on said core and disposed beneath said chains for engagement therewith.

21. Textile machinery cleaning apparatus for gathering from the air adjacent said machinery lint which is generated by the operation of said machinery in at least one region thereof and which collects thereon after falling downwardly through said air, thereby preventing said collection, said apparatus comprising:

(*a*) first support means spaced apart within said region,

(*b*) a substantially flat sheet mounted on said first support means and presenting a surface toward said falling lint and being impervious thereto, said sheet extending substantially across said region, whereby said sheet intercepts said falling lint and supports said lint thereon,

(*c*) second support means located within said region,

(*d*) extensible sweeping means mounted on said second support means for movement through at least a major portion of said region relative to said sheet for sweeping said supported lint to a station located adjacent one edge of said sheet in said region, and

(*e*) means located at said station for receiving from said extensible sweeping means lint which has been moved thereby to said station and for removing said lint from said station.

22. The apparatus as set forth in claim 21 wherein said second support means comprises:

(*a*) a bracket mounted on said receiving means, and

(*b*) a substantially L-shaped guide track defining a path of travel for said sweeping means, said guide track:

(1) having an open bottomed, box-shaped cross-sectional configuration, and further having:

(2) one leg thereof lying parallel to and contiguous with the edge of said sheet remote from said one edge and having the other leg thereof traversing said sheet from said remote edge to said one edge and terminating adjacent said receiving means.

23. The apparatus as set forth in claim 22 wherein said extensible sweeping means comprises:

(*a*) an outer tubular member,

(*b*) an inner tubular member telescoped within said outer tubular member,

(*c*) means pivotally securing the free end of one of said tubular members to said bracket,

(*d*) follower means securing the free end of the other of said tubular members to said guide track,

(*e*) a blade element of stretchable elastic material carried by said tubular members,

(*f*) means for securing said blade element to said free ends of said tubular members whereby said blade element will expand and contract in length as said tubular members move relative to each other, and

(*g*) drive means for moving said tubular members relative to said sheet,

whereby said follower means moves along said guide track as said tubular members pivot about said bracket to cause said tubular members to move relative to each other and extend in length while said follower means traverses said one leg of said guide track, and to cause said tubular members to move relative to each other and contract in length while said follower means traverses said other leg of said guide track.

24. The apparatus as set forth in claim 23 wherein said follower means comprises:

(*a*) a roller rotatably mounted on said other tubular member and extending upwardly therefrom through the open bottom of said guide track and adapted to ride therewithin, and

(*b*) caster means attached to said other tubular member adjacent said roller and adapted to ride on the upper surface of said guide track.

25. The apparatus as set forth in claim 21 wherein said second support means comprises:

(*a*) a pair of brackets mounted on opposite sides of said receiving means,

(*b*) a pair of substantially L-shaped guide tracks each defining a path of travel for said sweeping means, each guide track:

(1) having an open-bottomed box shaped cross-sectional configuration, and further having:

(2) one leg thereof lying parallel thereto and contiguous with the edge of said sheet remote from said one edge and extending across approximately one half of said edge, and having the other leg thereof traversing said sheet from said remote edge to said one edge and terminating adjacent said receiving means.

26. The apparatus as set forth in claim 25 wherein said extensible sweeping means comprises:

(*a*) a pair of extensible sweeping devices, each device having one end pivotally mounted in one of said brackets and having the other end secured to one of said guide tracks for movement through said path of travel,

(*b*) drive means for moving one of said extensible sweeping devices, and

(*c*) motion transmitting means connecting said extensible sweeping devices for movement in opposite directions of rotation about said brackets,

whereby said extensible sweeping devices move across said sheet simultaneously and cover substantially all of said sheet.

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