April 25, 1967 J. F. KING, JR 3,315,446

FILTER CLEANING APPARATUS

Filed July 15, 1963 6 Sheets-Sheet 1

Fig. 1.

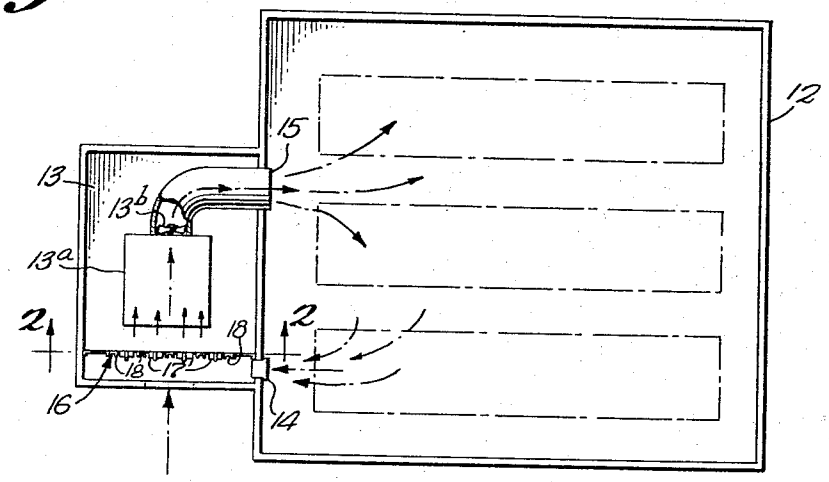
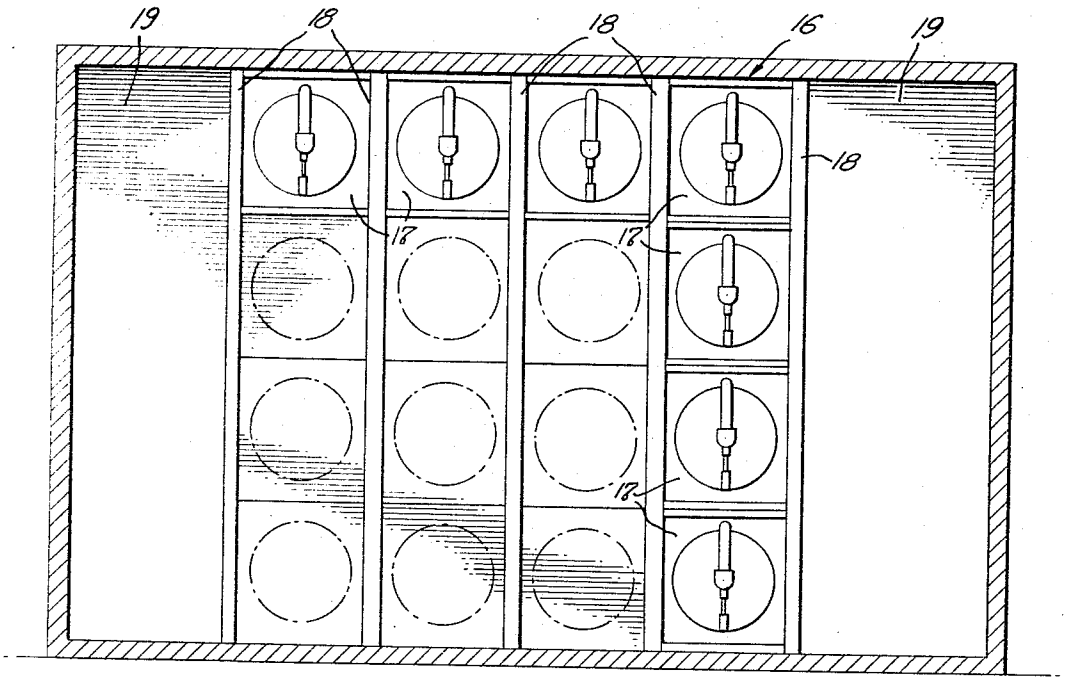


Fig. 2.



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April 25, 1967 J. F. KING, JR 3,315,446

FILTER CLEANING APPARATUS

Filed July 15, 1963 6 Sheets-Sheet 2

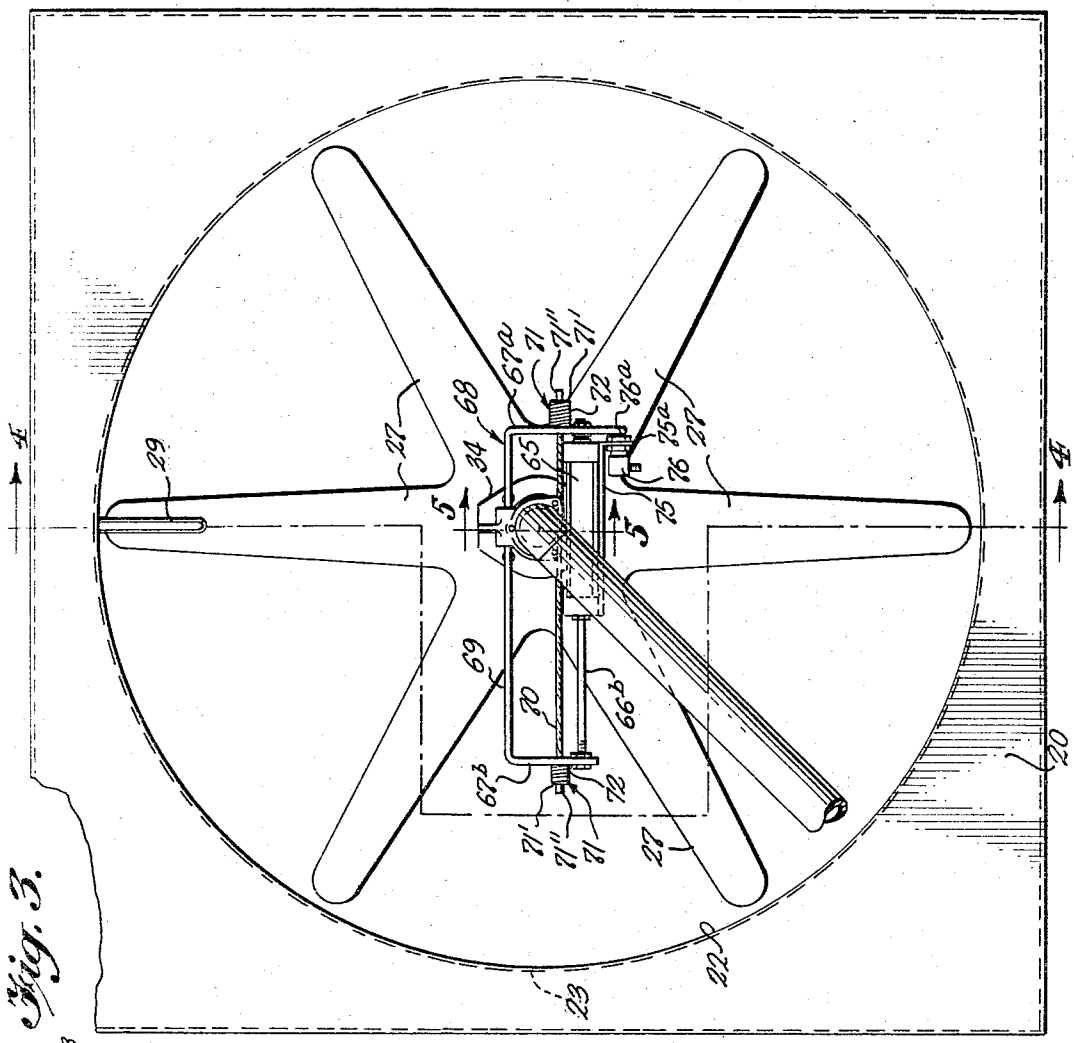


Fig. 3.

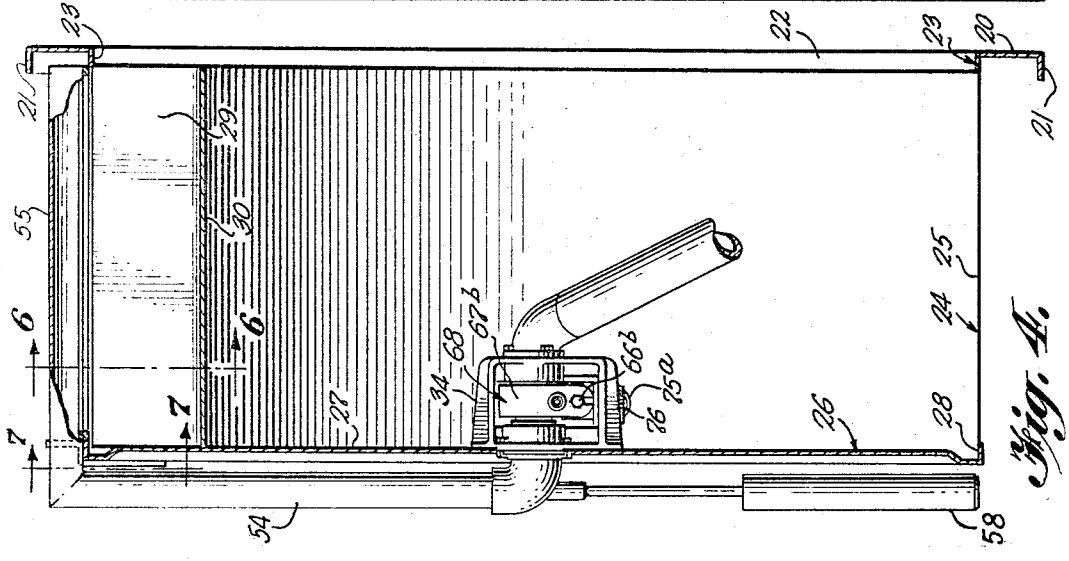


Fig. 4.

April 25, 1967 J. F. KING, JR 3,315,446

FILTER CLEANING APPARATUS

Filed July 15, 1963 6 Sheets-Sheet 3

Fig. 5.

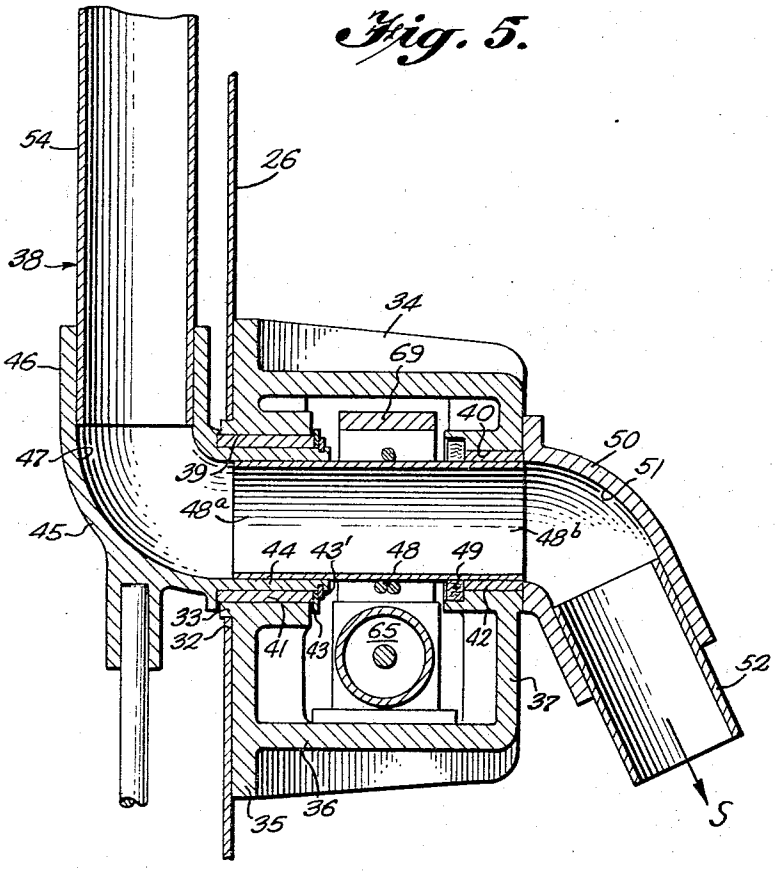
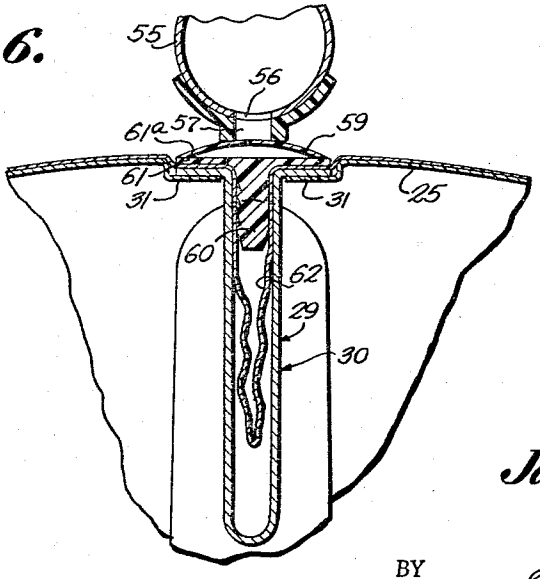


Fig. 6.



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April 25, 1967 J. F. KING, JR 3,315,446

FILTER CLEANING APPARATUS

Filed July 15, 1963 6 Sheets-Sheet 4

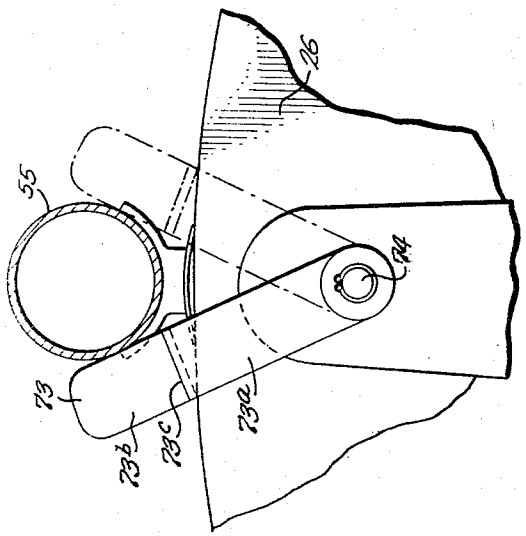

Fig. 7.

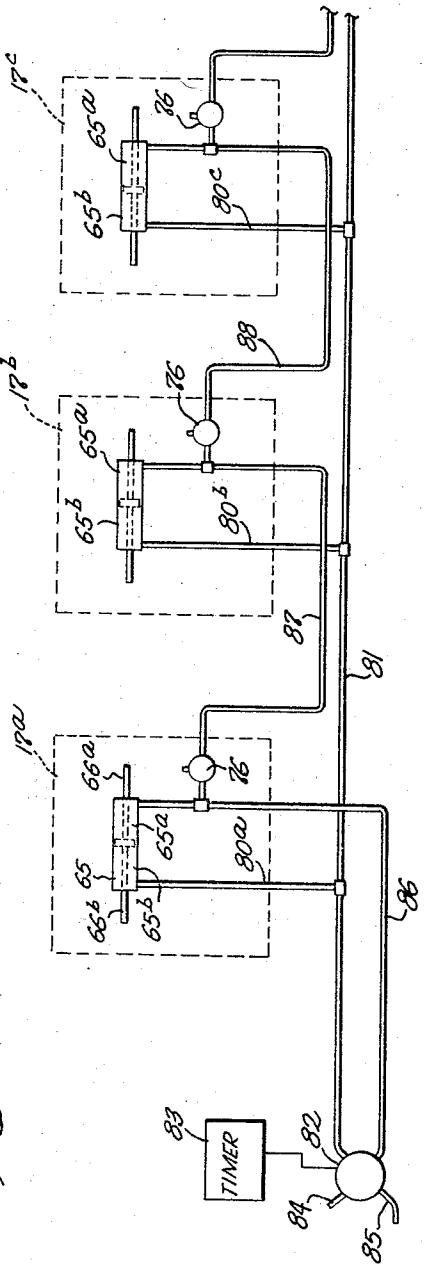

Fig. 8.

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April 25, 1967 J. F. KING, JR 3,315,446

FILTER CLEANING APPARATUS

Filed July 15, 1963 6 Sheets-Sheet 5

Fig. 10.

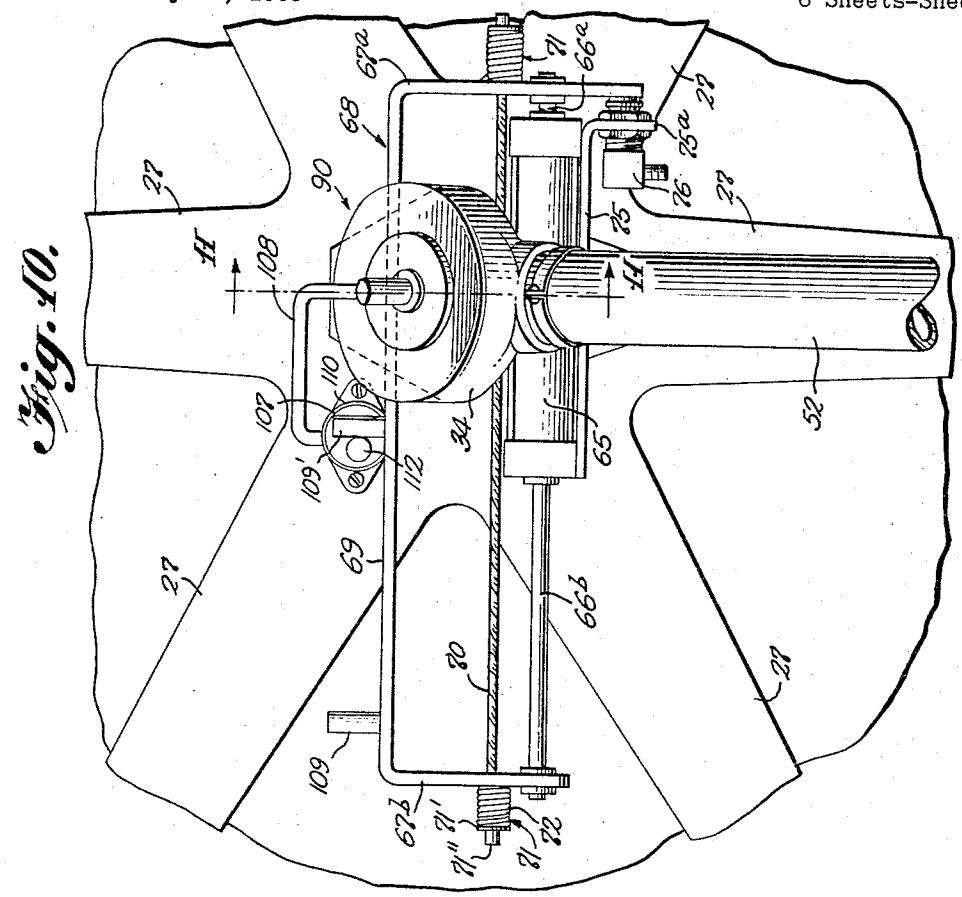
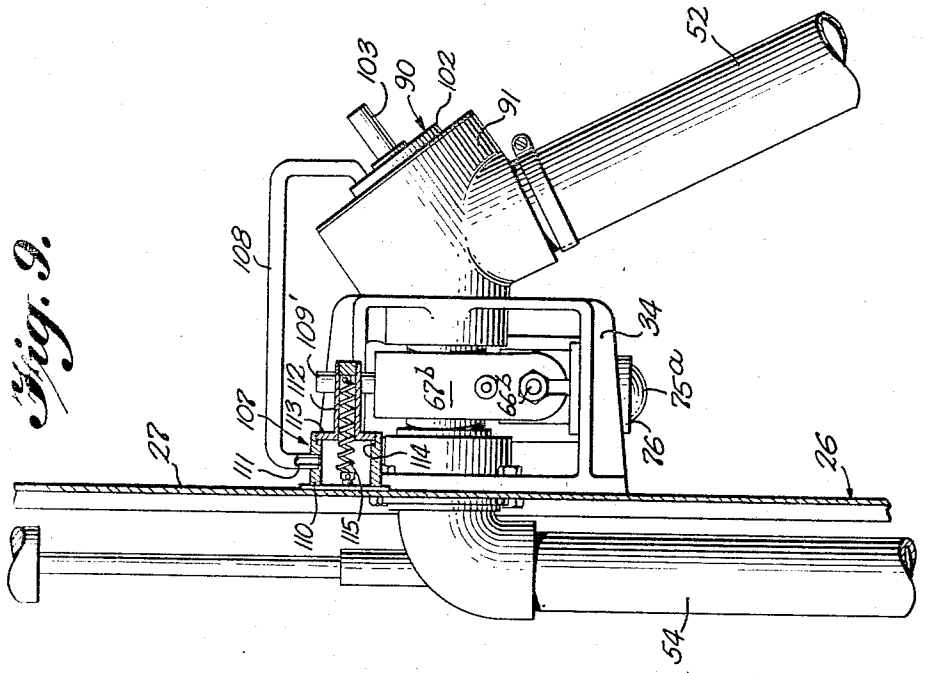


Fig. 9.

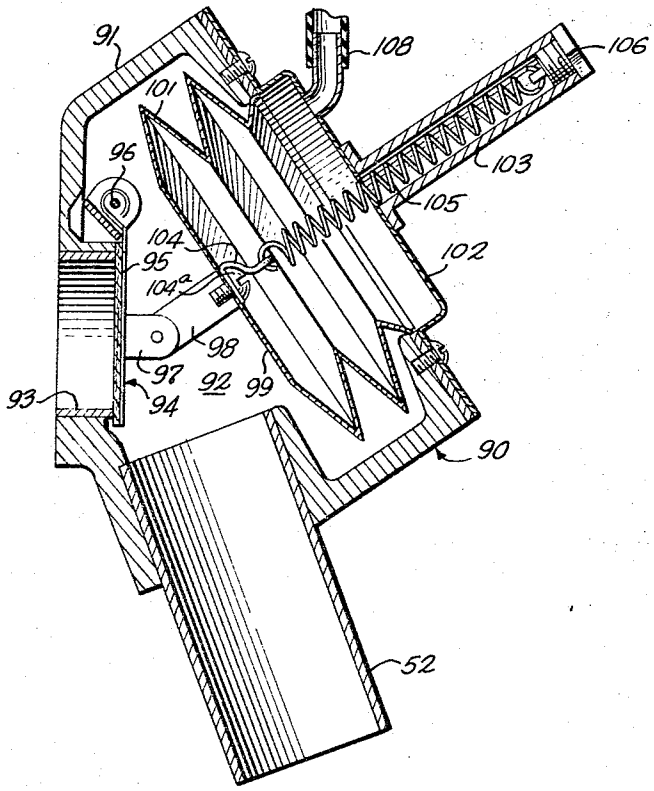


April 25, 1967 J. F. KING, JR 3,315,446

FILTER CLEANING APPARATUS

Filed July 15, 1963 6 Sheets-Sheet 6

Fig. 11.



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United States Patent Office

3,315,446

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FILTER CLEANING APPARATUS

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Filed July 15, 1963, Ser. No. 294,880

7 Claims. (Cl. 55—272)

The present invention relates in general to filter apparatus, and more particularly to automatically cleaned filter apparatus for removing selected types of solid foreign matter from a fluid medium. This invention has particular application to the removal of lint fibers from lint-laden air and will be described in connection with that specific application, although it will be understood that the invention will provide advantageous operating characteristics in many other applications.

It is common practice in textile processing plants to provide continuous conditioning of the air in such plants so as to maintain such temperature and humidity conditions as will insure that the textile fibers being processed are in the optimum condition for the processing being performed. Such textile air conditioning involves moving of large quantities of lint-laden air, since it is an inescapable incident of high speed textile processing that lint fly is dislodged from the textile yarn or fabric and becomes entrained in the air streams moving about the building. Thus lint screening becomes necessary to remove the fibers from the air to be conditioned and thereby protect lint-vulnerable mechanical components downstream from the lint screen. Because of the high concentration of lint in textile room air, the lint accumulation on a lint screen occurs at a speed rate that requires periodic screen cleaning to prevent plugging of the air passages in the screen and resultant faulty operation. Considerable effort has therefore been devoted to the provision of automatically cleaned screens which will effectively remove the lint from the air at sufficiently frequent intervals and in an appropriate manner to maintain the air in the textile processing spaces in appropriate condition. It will be apparent that it is impractical in such textile air conditioning installations to continuously condition fresh supplies of exterior ambient air and deliver the same to the textile processing space, for example a textile spinning room, at a sufficient rate to provide rapid changing of the air in the processing space, as excessively expensive temperature conditioning, air cleaning and humidifying apparatus will be required.

The common practice, therefore, is to provide a facility for conditioning and recirculation of the air in the processing space, such as an apparatus room adjoining the textile processing room into which air from the processing room is withdrawn for cleaning and conditioning and then circulated back to the processing room. Several types of filter mechanisms have been heretofore employed to remove lint from the air withdrawn into the apparatus room or to remove lint from the air at selected zones in the processing room. One of these types of filter apparatus heretofore employed has been the brush and wiper doffed rotary drum, wherein a drum shaped screen was rotated past a brush structure which served to mechanically sweep the lint fibers from the surface of the screen drum and effect discharge of the fibers to a suitable collection zone. Such devices had undesirable characteristics as they released great quantities of fine dust into the return air which would impede or interfere with further processing of the air, and involved rotation of the greatest mass part of the apparatus, namely the screen. Further, such apparatus, wherein one end of the drum was open, required a circumferential seal which absorbed a great amount of power and required more flexibility than could be easily achieved because the open end of the drum could not be

kept precisely round when produced by mass production methods.

Another type of automatically cleaned filted developed for such processes involved a flat screen of large area appropriate to the volume of air to be handled wherein a wiping blade spanning the small dimension of the screen was scanned back and forth along the length of the long dimension of the screen by a chain drive to dislodge the lint from the clean surface and effect its discharge to a collection point below the screen. Such flat screen type filter mechanisms also had undesirable properties, as the long-span chain drive was subject to lint contamination and could not be effectively kept clean, the mechanical wiping of the screen disturbed the lint mass on the surface of the screen and allowed the dust which had been effectively filtered out of the air to then pass through the screen, a very heavy screen frame was required because of the air load imposed on the surface of the screen due to the static pressure difference existing across the filter surface, and, in practice, sagging of the central portion of the screen became unavoidable and rendered exceedingly difficult attainment of relatively uniform effective wiping action over all parts of the screen area.

To overcome these disadvantages, others have commercially offered automatically doffed screens utilizing a moving filter paper cover for the screen which is rolled across the screen and continuously or periodically changed at a sufficient rate to prevent contamination of the portion in the air stream. Such devices, however, have the drawback of high replacement cost of the paper medium.

An object of the present invention, therefore, is the provision of a novel filter apparatus having an automatically cleaned screen, which avoids the aforementioned disadvantages of prior art filter apparatus.

Another object of the present invention is the provision of a novel filter apparatus wherein large area screen capacity is provided in a small space and wherein the screen is pneumatically stripped of lint fibers or similar foreign matter in a manner minimizing release of dust into the air and which attains substantially complete stripping of the screen in one pass over the screen surface.

Another object of the present invention is the provision of a novel filter apparatus having an automatically pneumatically doffed screen, wherein the screen is not subject to deformation from air loads, and may be used with many different types of filter fabrics.

Another object of the present invention is the provision of a novel filter apparatus for removing lint fibers from lint-laden air, and similar applications, wherein the filter apparatus may be constructed in standardized modules of selected capacity by mass production techniques, to be adaptable for use as single filter units located at selected zones in or associated with an area to be served or in a multiple unit installation of varying numbers of units for a central station return air filtering application, and wherein substantially no more suction system is required to handle a large number of such units or central station bank of the filters than would be required to operate one filter unit. Such a standardized module filter unit suitable for such varied installation situations has great flexibility, permitting the units to be assembled in central station groups of large air handling capacity or to be installed in spaced single unit arrangements, for example over inlets to ducts leading from selected locations about a room where lint fly problems are encountered, or in building wall openings leading from such a room to other rooms or to outside air, or in hoods overlying certain types of machinery responsible for producing such lint fly problems, such as high speed carding engines and the like.

Other objects, advantages and capabilities of the present invention will become apparent from the following

detailed description, taken in conjunction with the accompanying drawings illustrating one preferred embodiment of the invention.

In the drawings:

FIGURE 1 is a diagrammatic plan view of a typical textile spinning room and air conditioning installation wherein a central station return air filtering bank embodying the present invention is employed;

FIGURE 2 is an elevation view of such a central station bank of filter units as viewed from the line **2—2** of FIGURE 1;

FIGURE 3 is a rear elevation view to enlarged scale, of a filter apparatus module embodying the present invention, viewed from the downstream side;

FIGURE 4 is a vertical section view of the filter apparatus module, taken along the line **4—4** of FIGURE 3;

FIGURE 5 is an enlarged section view illustrating the details of the bearing housing and immediately adjoining structure, taken along the line **5—5** of FIGURE 3;

FIGURE 6 is a fragmentary section view illustrating the structure for removably holding the filter medium on the screen and providing a periodic seal for the suction stripper tube, taken along the line **6—6** of FIGURE 4;

FIGURE 7 is a fragmentary section view illustrating the action of the stop mechanism for the suction stripper tube, taken along the line **7—7** of FIGURE 4;

FIGURE 8 is a diagrammatic view of an exemplary control system for a plurality of filter modules of the present invention;

FIGURE 9 is a fragmentary section view of a modified filter unit construction taken from a position corresponding to the line **4—4** of FIGURE 3, with part of the atmospheric valve broken away;

FIGURE 10 is a fragmentary rear elevation view of the structure shown in FIGURE 9; and

FIGURE 11 is a vertical section view taken along the line **11—11** of FIGURE 10.

The invention will be specifically described in connection with a central station filter bank for a textile spinning room installation, from which description an adequate understanding of the invention will be attained to enable persons skilled in the art to use the invention in the many other applications for which it is suitable. Referring to the drawings, wherein like reference characters designate corresponding parts throughout the several figures, and particularly to FIGURES 1 and 2 illustrating an exemplary installation involving the present invention to remove lint fibers from lint-laden return air in a textile spinning room air conditioning system, the reference character **12** designates a textile spinning room containing, for example, a large number of textile spinning frames (not shown), the surrounding air of which is to be continuously conditioned during operation of the spinning frame to maintain desired temperature and humidity conditions. In this exemplary installation, an apparatus room **13** adjoins the spinning room **12** and contains the usual air treating and conditioning apparatus, indicated generally at **13***a*, and an air circulating fan **13***b* which effects return of air through suitable return ducts of a return grill **14** from the spinning room **12** into the apparatus room **13** and through treating and conditioning apparatus **13***a*, and discharges the treated and conditioned air through suitable ducting or a supply opening **15** in the illustrated installation. A central station filter bank is provided at **16** in the form of a partition spanning the apparatus room **13** from side to side and from top to bottom in the path of the return air from the spinning room **12** to the air treating and conditioning apparatus **13**. It will be understood by those skilled in the art that the filter bank **16**, which is made up of a selected number of modular filter units **17** constructed in accordance with the present invention will not necessarily have its total area occupied by such modular filter units **17**, but will embody only an appropriate number of such filter units **17** as will be adequate to handle the volume of air being circulated through the system. For example, if sixteen of such modular filter units **17** are required for the particular air volume rate encountered in the installation, the modular filter units **17** may conveniently be arranged in four vertically extending tiers of four modular units each, arranged in side by side relation in the central portion of the partition between vertical channel posts **18**, with the remaining portion of the partition closed by blank plates 19 flanking the group of filter units **17** and extending to the opposite walls of the apparatus room **11**.

Each modular filter unit **17** is constructed with a rectangular base **20**, formed for example, of sixteen gauge steel having a square periphery and an angle flange **21** at each of the four edges thereof. In the center of the base **20** is a large diameter hole **22** bounded by a circular flange **23**, to which is spot welded a screen drum generally indicated by **24** having a perforated cylindrical wall **25** whose downstream edge lies radially outwardly of the circular flange **23** and laps the same. To the opposite edge of the cylindrical screen wall **25** is welded a drum head **26** formed, for example, of 22 gauge sheet metal having radially extending stiffening spokes **27** pressed therein and a formed angle flange **28** around its outer edge which is pressed over the cylindrical screen wall **25** and spot welded thereto. The screen wall **25** is formed at one circumferential location thereon with a locking channel **29** which spans the axial length of the screen wall **25** to facilitate removeable locking of a filter medium in outwardly covering relation to the screen wall **25** as will be later described. This locking channel **29** may be conventionally formed by a U-shaped channel member **30** having opposite projecting flanges **31** at the ends of the channel sides adjoining the channel opening which are spot welded to the opposite edges of the rolled screen wall **25** as shown more clearly in FIGURE 6.

In one practical example, the base **20** may be formed as a 41″ square having a 36″ diameter hole **22** therein, and the screen wall **25** may be rolled into a 26″ diameter screen having a 15″ wide open area with ½″ selvedge on each side, the perforations in the screen wall **25** having a diameter of for example, ½″ with the perforations arranged in staggered rows so that the open area of the screen wall is approximately 60% of the total screen area.

This assembly provides a very rigid filter support which by being attached to blanked and formed circular parts, is round and smooth to a high degree of accuracy.

The drum head **26** has a punched center hole **32**, more clearly shown in FIGURE 5 into which a circular extrusion **33** of a bearing housing **34**, for example of cast aluminium, extends. The bearing housing **34** includes a mounting wall **35** which lies flat against the filter drum head **26** and is suitably fixed thereto and axially projecting body portion **36** extending toward the base **20** and terminating in an outwardly spaced wall portion **37** generally parallelling the plane of the mounting wall **35**. Each of the walls **35** and **37** have axially aligned bearing assemblies for journalling a rotating stripper tube unit **38** and include openings **39**, **40** surrounded by bosses having axially elongated cylindrical surfaces against which sleeve bearings **41** and **42** are seated. The sleeve bearing **41** rotates freely against the surface of opening **39** and is suitably held, as by a retaining washer **43** and split ring **43′** on a bearing seat of one arm **44** of a cast aluminum elbow **45** forming part of the stripper tube unit **38**. The elbow includes an arm **46** extending at right angles to the arm **44** and a bore **47** extending entirely therethrough. A short journal tube **48** having a length corresponding substantially to the axial length of the bearing housing **34** has one end **48***a* tightly fitted and suitably fixed in the bore **47** of the elbow arm **44** and is rotatably journalled at its other end in the sleeve bearing **42**. A suitable felt seal

49 in the bearing housing 34 and adjoining the sleeve bearing 42 is in sealing engagement with the exterior of the journal tube 48. A fixed elbow 50 having a bore 51 in registry with the end 48*b* of the tube 48 and a suction tube 52 fixed in the opposite end of the bore 51 extends from the elbow 50 to suitable suction sources.

The arm 46 of the rotating elbow 45 which lies externally of the screen drum 24 adjacent the drum head 26 supports a radial tubular leg 54 fixed to the elbow arm 46 in communication with the bore 47, the outer end of which is joined to a pneumatic stripping tube 55 lying immediately externally of the screen wall 25 in parallelism with the axis of the screen wall and adapted to travel circumferencially one complete turn about the screen wall surface. The stripping tube 55 is also in the form of a hollow tube which is closed at its end adjacent the base 20 and has an intake slot 56 extending subtsantially the length thereof facing toward the screen wall 25 flanked by suitable lips, formed for example by a plastic stripper tube nozzle 57. The rotating stripper tube unit 38 is suitably counterbalanced by a counterweight 58 carried by the rotating elbow 45.

A suction seal and filter medium retainer 59 is designed to co-act with the locking channel 29 to seal the stripper tube nozzle 57 against ambient air pressure when the stripper tube 55 is at its normal or quiescent position, and to this end is formed of a suitable resiliently deformable material, such as vinyl plastic extrusion, shaped as illustrated in FIGURE 6 to provide a locking tongue portion 60 having, for example, saw-tooth cross sectioned ribs on the opposite sides thereof and a hollow sealing head portion 61 provided with a thin upwardly arching top web 61*a*. When an endless strip of filter medium, indicated by the reference character 62, or the opposite edge portions of a cut strip of filter medium, is pressed into the channel member 30 after the filter medium has been placed about the screen wall 25, the tongue 60 of the retainer 59 is pressed into the opening of the channel member 30 and acts to draw the filter medium taut over the surface of the screen wall 25 and locks the same within the channel member 30. Also, this retainer 59 serves to seal the stripper tube nozzle 57 closed when the stripper tube 55 overlies the retainer 59, as the suction conditions at the nozzle 57 draw the upwardly arched web 61*a* of the retainer head 61 into intimate sealing contact with the suction nozzle lips along the entire length thereof.

The rotating stripper unit 38, is driven by means of a small air cylinder 65 fixedly supported by the bearing housing 34 and having, for example, a 6" stroke. The air cylinder 65 is of the type having a through piston rod wherein piston rod sections 66*a* and 66*b* project externally from the opposite ends of the air cylinder 65. The outer ends of the piston rod sections 66*a*, 66*b* are fixed to the depending to legs 67*a*, 67*a* of a drive yoke 68 whose web 69 slides in a suitable guideway in the bearing housing 34. Also, a drive cable 70 having a full turn about the exterior of the tubular section 48 extends between the depending legs 67 of the drive yoke 68 and is suitably anchored thereto by spring anchors 71 maintaining proper tension on the drive cable 70. The spring anchor 71 may, for example, comprise a spring stop washer 71' fitted over the adjacent end of the drive cable 70 having a circumferential rabbet for receiving the outermost turn of a coil spring 72 and a suitable cable clamping bushing or sleeve 71" backing up the washer 71'.

A stop mechanism illustrated in detail in FIGURE 7 and located on the drum head 26 is provided adjacent the end of the retainer 59 and locking channel 29 to accurately locate the stripper tube 55 over the retainer 59 at the rest position and provide a full 360° range of rotation for the stripper tube 55. This stop mechanism comprises a stop lever 73 pivotally secured, as indicated at 74, to the drum head 26 and having a body portion 73*a* overlying the drum head 26 and an offset terminal portion 73*b* lying in a plane parallelling the plane of the body portion 73*a* and spaced toward the base 20, which is connected to the body portion 73*a* by a connecting web 73*c* forming a shoulder to abut against the periphery of the drum head. The offset terminal portion 73*b* of the stop lever 73 projects into the path of the stripper tube 55 to be engaged by the latter and shifted to either the solid line position or the broken line position illustrated in FIGURE 7. The shoulder formed by the connecting web 73*c* is so located relative to the pivot 74 that the stop lever 73 will be stopped by engagement of the shoulder with the drum head periphery when the stripper tube 55 is properly centered over the retainer 59, regardless of the direction of travel of the stripper tube 55.

A suitable hanger bracket 75, illustrated as having an L-shaped configuration, is fixed to the air cylinder 65 and has a depending leg 75*a* carrying a normally closed three-way air valve 76 which is actuated by contact button 76*a* positioned to be engaged by one of the depending legs 67*a* of the drive yoke 68. The arrangement is such that the valve 76 is in a closed position relative to its upstream port and vents its downstream port to atmospheric pressure at all times except when the drive yoke 68 is at its limit of travel illustrated in FIGURE 3 wherein the depending leg 67*a* of the drive yoke engages and forces inwardly the valve contact button 76*a*.

An exemplary control layout for a plurality of filter units of the foregoing construction is illustrated in FIGURE 8, wherein three filter units are indicated generally by broken lines and designated by the reference characters 17*a*, 17*b*, 17*c*, each including an air cylinder 65 having chambers 65*a* and 65*b* at the opposite sides of the piston, and having an air valve 76. The cylinder 65 and air valve 76 of each filter unit are shown in solid lines for clarity of illustration. Fluid supply lines to the left hand filter chamber 65*b* of each filter unit 17*a*, 17*b*, 17*c* are indicated by the reference character 80*a*, 80*b*, 80*c* and connect in parallel with a fluid supply manifold line 81 extending to one port of a four-way valve 82, for example, a solenoid valve controlled by a suitable timer 83 of conventional construction. The four-way valve 82, as is the conventional practice, has an exhaust port 84, a main fluid supply port 85 connected with a suitable source of fluid under pressure, and a fourth port connected to a fluid supply line 86 communicating with and forming the supply to the right hand cylinder chamber 65*a* of cylinder 65 in the filter unit 17*a*. Assuming that all filter units 17*a*–17*c* are initially at a rest position wherein the drive yoke 68 is fully thrown to the right, as viewed in FIGURE 3, with the depending yoke leg 67*a* spaced fartherest from the air valve 76, the timer 83 causes suction to be applied to the suction tubes 52 in a conventional manner and applies pressure to the port 85. Application of fluid pressure, for example air pressure, to the main inlet port 85 of the four-way valve 82 routes air pressure to the fluid line 86 connected to the drive cylinder chamber 65*a* of the first filter unit 17*a*, while the other drive cylinder chamber 65*b* is connected through line 80*a*, 81 and the solenoid valve 82 to the exhaust port 84. Thus the piston of drive cylinder 65 of the first filter unit 17*a* will be activated to shift the drive yoke 68 through a full advance stroke toward the left, as viewed in FIGURE 3, carrying therewith the drive cable 70 and rotating the stripper unit 38 so as to sweep the stripper tube 55 through a 360° path along the exterior surface of the screen wall 25 and filter medium 62 thereon to pneumatically clean lint and dust from the exterior surface of the filter medium and withdraw the same by pneumatic suction through the suction tube 52. The sweep of the stripper tube 55 will be stopped directly over the retainer 59 by the stop lever 73 as previously described, and the depending leg 67*a* of the drive yoke 68 at the end of the stroke will engage the contact button 76*a* of the valve 76 and force the same to open position. This opening of the valve 76 asso-

ciated with the first filter unit **17***a* connects its upstream port with its downstream port and cuts off the external vent to atmosphere, thus admitting the pneumatic pressure from the line **86** to which the upstream port of the valve **76** is connected, through a fluid supply line **87** connected to the downstream port of valve **76** and to the corresponding drive cylinder chamber **65***a* of the next filter unit **17***b*. The air cylinder **65** of the second filter unit **17***b* will be activated in similar manner to the air cylinder of the first filter unit **17***a*, and upon completion of the advance stroke of the associated drive yoke **68**, the normally closed air valve **76** of the second filter unit **17***b* will be opened admitting pneumatic pressure through line **88** to the cylinder chamber **65***a* of the third filter unit **17***c*, producing a similar cycle of operation. When all of the filter units of the central station bank of filter units have been driven through their advance stroke, the timer **83** then shifts the four-way valve **82** to connect the pneumatic supply at port **85** to the line **81** and parallel branch lines **80***a*, **80***b*, **80***c* to supply pressure to the drive cylinder chambers **65***b*. Concurrently, the timer may cut off the suction supply to suction tubes **52** by suitable conventional valve means or the suction to the suction tubes **52** may be left on during the return strokes of tubes **52**, as desired.

As the pressure applied to cylinder chamber **65***b* of filter unit **17***a* drives the yoke arm **67***a* off of contact button **76***a* of valve **76**, the valve **76** returns by internal spring bias to closed condition venting the downstream port connected to branch **87** to atmosphere, and thus permitting the pressure through line **80***b* to chamber **65***b* of filter unit **17***b* to drive the latter in return direction. The cylinder **65** of the third filter unit **17***c* and any subsequent units are activated through their return cycle in like manner.Thus, the stripper tube units **38** of all of the filter units are rotated through their return strokes in substantially concurrent manner, although there is a slight time staggering of the initiation of return of the successive filter units. Since the stripper tube **55** of only one filter unit is displaced off of its associated suction seal and retainer **59** at any one time during the advance stroke, all of the other stripper tubes being sealed by their associated retainers **59** except during their individual sweeping cycle, the pneumatic doffing suction system connected to the suction tubes **52** of the plurality of filter units does not have to provide any greater suction than would be needed for a single filter unit.

It will be apparent, of course, that by providing a similar valve and valve actuation arrangement for regulating the return stroke as is provided for controlling the advance stroke, and maintaining full suction pressure on the stripper tubes during the return stroke, the stripper units may be caused to pneumatically doff the filter media of the filter units during the return stroke as well as the advance stroke.

An alternate arrangement for conditioning the stripper units **38** to extinguish the suction currents at the nozzle **57** when the associated stripper tube **55** occupies its rest position and prevent it from loading the master suction source, is illustrated in FIGURES 9, 10 and 11. In this modification, the filter unit is of the same construction as that described in connection with the first embodiment, except that the thin deformable top web **61***a* is omitted from the filter medium retainer **59** and a valve is associated with the suction tube **52** at the bearing housing to valve off the suction pressure otherwise communicated to the stripper tube **55** through the suction tube **52**. Accordingly those parts of the filter units illustrated in FIGURES 9–11 which correspond to components described in connection with the first embodiment are designated by the same reference characters.

In this modification, the retainer **59** from which the top web **61***a* is omitted but which is otherwise identical to the retainer **59** of the first embodiment, serves merely as a means to lock the filter medium **62** in the channel member **30** as the tongue portion **60** is forced into the channel **29**. Valving of the suction pressure through suction tube **52** to stripper tube **55** is accomplished by a valve assembly **90** which is substituted for the elbow **50** and mounted on the bearing housing **34**. The valve assembly **90** comprises a cast valve housing **91** provided with an internal chamber **92** with which the suction tube **52** communicates. A short tube section **93** is pressed into an opening of the valve housing **91** and conforms to the journal tube **48** in the bearing housing **34** to register therewith and form a continuation thereof. The end of the tube section **93** lying within the chamber **92** forms a surface on which a valve member **94** can adequately seal, the valve member **94** being formed of a disk of suitable sealing material, such as a fiber washer or pad, bonded onto a metal hinge panel **95** pivoted about a hinge axis **96**. A yoke **97** is securely fixed to hinge panel **95** and is pinned to a link **98** which is secured to a backing plate **99** supporting the free end of a bellows **101**. The opposite end of the bellows **101** is fixed to the valve housing **91** and is covered by a retaining cap **102** having an extension **103** aligned with the axis of the bellows **101**. A spring anchor **104** is attached to the backing plate **99** by a suitable fastener screw **104***a* and a return spring **105** is connected to the spring anchor **104** and extends through the bellows **101** and extension **103** of retaining cap **102** to an anchor **106** to constantly urge the bellows to a collapsed condition. A very small leak port is provided between the inerior of the bellows **101** and the chamber **92**, as by drilling a small bore through the center line of screw **104***a*, so that some of the suction pressure that exists in suction tube **52** as supplied from the master suction source can leak into the interior of the bellows **101**.

An atmospheric valve **107** communicating with the interior of the bellows **101** through tube **108** selectively vents the bellows interior to atmosphere or isolates the same and permits suction pressure to build up therein through the leak port in screw **104***a*, in accordance with the position of the drive yoke **68** and piston rods **66***a*, **66***b*. The valve **107** is mounted on the filter drum head **26** just above the web **69** of drive yoke **68** in a position to be contacted by either of two actuator pins **109**, **109'** fixed on the yoke **68** at proper locations to strike the valve **107** slightly before the strokes of the yoke **68** are completed. The valve **107** includes a hollow valve body **110** fixed to the drum head **26** having an outlet **111** connected by tube **108** to the bellows interior, and a rigid extension **112** having a valve plate **113** which is normally held tightly against valve seat **114** by a spring **115**. When one of the pins **109**, **109'** strikes the valve extension **112**, the valve plate **113** is rocked away from its seat **114**, thus venting the inside of the valve body **110** and of bellows **101** communicating therewith to atmosphere. When the interior of the bellows **101** is thus vented to asmosphere and atmospheric pressure conditions are attained therein, the pressure in the bellows then exceeds the suction pressure conditions in the valve chamber **92** established through tube **52** and the bellows **101** expands against the force of spring **105** to the position shown in FIGURE 11, closing the valve hinge panel **95** against tube **93** and preventing communication of suction pressure from tube **52** to stripper tube **55**.

It will be apparent that when the piston of air cylinder **65** of the associated filter unit has completed its stroke in either direction, either pin **109** or **109'** on the drive yoke **68** will have contacted the atmospheric valve extension **112** and rocked the valve plate **113** away from its seat **114**, thus venting the inerior of valve body **110** and bellows **101** to atmosphere and producing a much greater pressure in the bellows **101** than the suction pressure in valve chamber **92**, so that the bellows **101** expands and closes the valve member **94** against the seat formed by the adjacent end of tube **93**. This is the condition attained in valve assembly **90** when the stripper tube **55** occupies its rest position. When the air cylinder **65** is next activated

to drive the yoke **68** and rotate the stripper unit, slight movement of the yoke **68** withdraws the pin **109** or **109'** from contact with the valve extension **112** and permits the atmospheric valve **107** to close under the biasing force of spring **115**. Pressures will very quickly equalize between the inside and outside of bellows **101** due to leakage through the leak port of screw **104***a*, so that return spring **105** can collapse the bellows **101** and open valve member **94** to communicate suction pressure from tube **32** to stripper tube **55** and effect pneumatic doffing during the remainder of the rotary stroke of the stripper unit. When the stripper tube **55** nears the completion of its one revolution stroke, one of the pins **109**, **109'** again engages the atmospheric valve extension **112** and rocks the valve **107** to open condition, to vent the bellows interior to atmosphere and shift the valve member **104** to closed condition as described above. Thus, by this valving arrangement, the stripper tube **55** is cut off from the suction pressure source whenever it attains its rest position until it is again displaced from the position, to attain the action and characteristics of the first described embodiment with out employing a flexible sealing member externally of the nozzle **57**, such as the top web **61***a* of retainer **59**, to seal closed the suction nozzle **57**.

Although in the specific application herein illustrated, a single air circulating fan as an independent device spaced from the bank of filter units at another location in the air flow path is employed to effect air movement through all of the filter units in the bank, a fan unit may be associated with each filter unit module if desired. Such an association of a fan with each filter unit module may be particularly desirable where filter units are to be installed over air inlets to individual air flow ducts or in building wall openings for exhausting air to the exterior of a building or in hood assemblies over individual machines for reducing the amount of airborne lint in the vicinity of the machine. Where an assembly of a fan and filter unit module is desirable a fan can be conveniently assembled to the filter unit by providing a fan motor and supporting wire cage on a carrier plate having planiform flanges or rim portions which lap over and may be bolted to the surface of the base **20**, the carrier plate, for example, having a central opening for the fan blades bounded by a circular flange concentric with the hole **22** in the filter base **20** and integral with the carrier plate to which the cage is secured to support the fan motor and blades within the central opening.

While but two preferred examples of the present invention have been particularly shown and described, it is apparent that various modifications may be made therein within the spirit and scope of the invention, and it is desired, therefore, that only such limitations be placed on the invention as are imposed by the prior art and set forth in the appended claims.

What is claimed is:

1. Apparatus for filtering solids from a fluid stream containing the solids comprising a fluid pervious drum member having a fluid pervious cylindrical filtering wall located in the fluid stream for passage of the fluid along radially inwardly directed flow paths therethrough, the outwardly facing surface of said filtering wall being the upstream surface thereof relative to said flow paths, means for establishing pressure conditions within said drum to produce flow of said fluid along said radially inwardly directed flow paths through said wall with accumulation of said solids on the upstream surface thereof, an elongated penumatic stripper tube spanning the axial length of said wall extending parallel to said member's axis radially outwardly of said wall having an intake nozzle immediately adjacent said upstream surface facing radially inwardly toward the wall and spanning the axial length thereof, means for periodically sweeping said stripper tube through a single revolution cycle along the circumference of the wall from a selected rest position to said rest position, means for applying suction to said stripper tube to produce suction currents immediately externally of said suction nozzle during sweeping movement thereof to pneumatically withdraw the accumulated solids from the whole working area of said upstream surface through said nozzle into said stripper tube during each single revolution cycle, and means at said rest position for closing said suction nozzle to terminate said suction currents during the period said stripper tube registers with said rest position.

2. Apparatus as defined in claim **1**, wherein said means for terminating said suction currents comprises a resiliently deformable sealing strip element supported on said filtering wall at said rest position having a portion extending the length of said nozzle located sufficiently close to said nozzle when the latter occupies said rest position to be resiliently deformed by the suction current of said nozzle into sealing engagement therewith to hold the same in closed condition.

3. Apparatus as defined in claim **1**, wherein said means for terminating said suction currents comprises valve means activated in coordinated relation to the position of said stripper tube for discontinuing application of suction to the stripper tube when the latter registers with said rest position.

4. In a filtering apparatus, the combination recited in claim **1**, wherein said means for sweeping said stripper tube includes a rectilinearly reciprocative drive yoke, a pneumatic cylinder supported at a stationary position adjacent said axis having a reciprocative piston and piston rods connected to said drive yoke, said stripper tube having a supporting arm including a radial section and a portion aligned with said axis, cable means fixed to said drive yoke and trained about said portion of said supporting arm aligned with said axis for rotating said stripper tube and supporting arm about said axis responsive to reciprocative movement of said drive yoke and piston rods, and means for selectively valving fluid under pressure to said cylinder to produce movement of the piston and piston rods in either of two opposite directions.

5. Apparatus as defined in claim **1**, wherein said means for periodically sweeping said stripper tube includes drive means, a controlled source of energy for activating said drive means, main conduit means for normally directing energy from said source to said drive means to activate the drive means to sweep said stripper tube through its cycle when the source is conditioned to supply energy, branch conduit means connected to said main conduit means for connection to an external device, and means responsive to conditions denoting attainment by said stripper tube of a selected end position in its cycle to automatically direct the energy from said source to said branch conduit means.

6. Apparatus for removing lint from lint-laden air comprising a cylindrical fluid pervious wall means for supporting a cylindrical lint filtering web disposed in outwardly surrounded relation by the lint-laden air concentric to a reference axis to intercept the lint-laden air, means for drawing the air outwardly surrounding said web along radially inwardly directed paths therethrough to accumulate lint on the outwardly facing surface thereof, an elongated pneumatic stripper tube extending parallel to said axis radially outwardly of said web having an elongated intake nozzle immediately adjacent said outwardly facing surface of the web facing radially inwardly toward the wall and spanning the axial length thereof, means for periodically sweeping said stripper tube through an arcuate stroke along the circumference of the web concentric with said reference axis from a selected rest position to said rest position, means for applying suction to said stripper tube during sweeping movement thereof to produce suction currents immediately externally of said suction nozzle concurrently along the whole axial length of the web for pneumatically withdrawing accumulated lint from said outwardly facing surface of said web through said nozzle into said stripper tube, and means

at said rest position activated by said suction currents when said stripper tube registers with said rest position to close said nozzle along the length thereof and terminate said suction currents during the period said stripper tube occupies said rest position.

7. Apparatus for removing lint from lint-laden air comprising a cylindrical fluid pervious wall means for supporting a cylindrical lint filtering web disposed in outwardly surrounded relation to the lint laden air concentric to a reference axis to intercept the lint-laden air, means for drawing the air outwardly surrounding said web along radially inwardly directed paths therethrough to accumulate lint on the outwardly facing surface thereof, an imperforate circular wall peripherally jointed to said screen wall at one end thereof and disposed perpendicular to said axis, an elongated pneumatic stripper tube extending parallel to said axis radially outwardly of said web having an elongated intake nozzle immediately adjacent the outwardly facing surface of the web facing radially inwardly toward the wall and spanning the axial length thereof, a radial suction conduit arm supporting said stripper tube and journaled in said circular wall for rotation about said axis, means for periodically sweeping said stripper tube through a single revolution cycle along the circumference of the web from a selected rest position to said rest position, means for applying suction to said stripper tube through said conduit arm during sweeping movement of said tube to produce suction currents immediately externally of said suction nozzle concurrently along the whole axial length of the web to pneumatically withdraw accumulated lint from the whole working area of the upstream surface of said web through sad nozzle into said stripper tube during each single revolution cycle, and means at said rest position activated by said suction currents when said stripper tube registers with said rest position to close said nozzle along the length thereof and terminate said suction currents during the period said stripper tube occupies said rest position.

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