Nov. 24, 1959 A. H. BAHNSON, JR 2,914,136

APPARATUS FOR CONTROLLING EXHAUST

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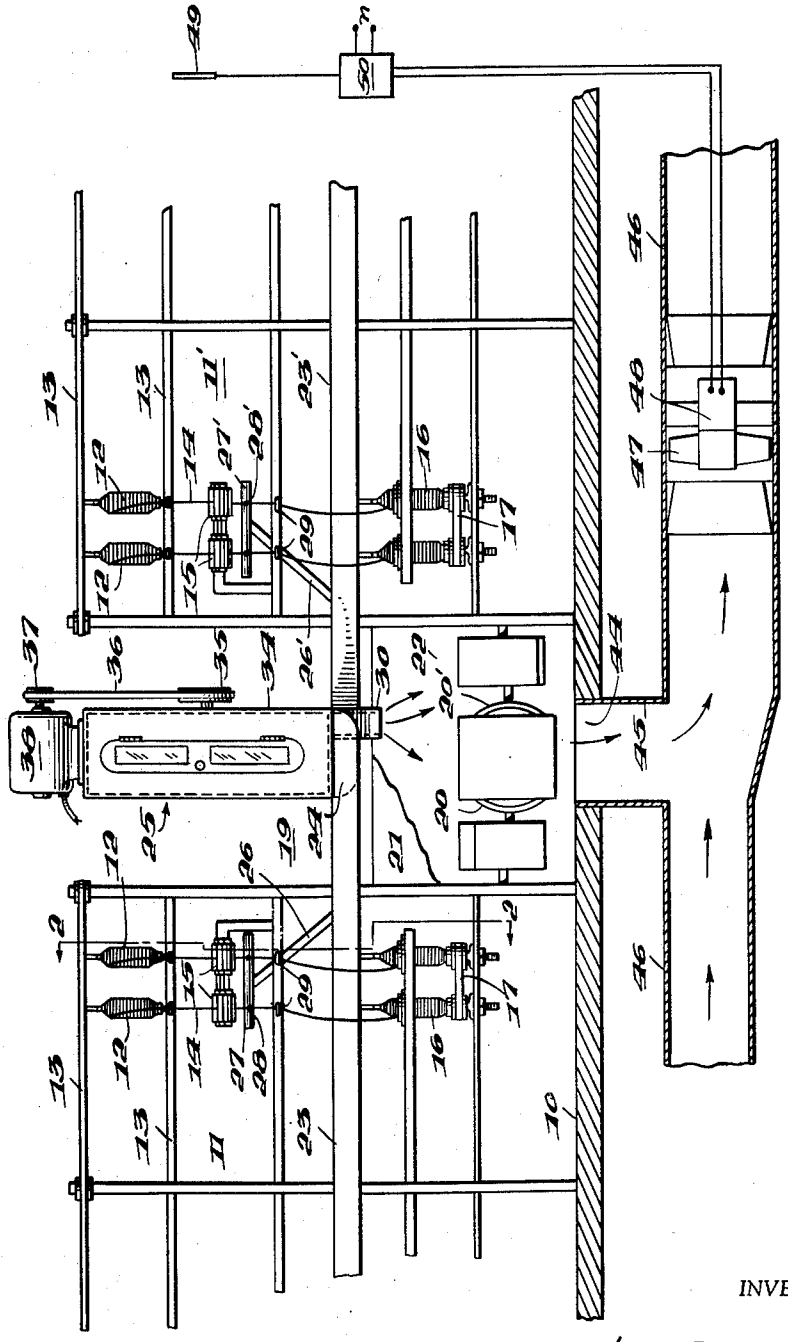


Fig. 1.

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Fig. 1.

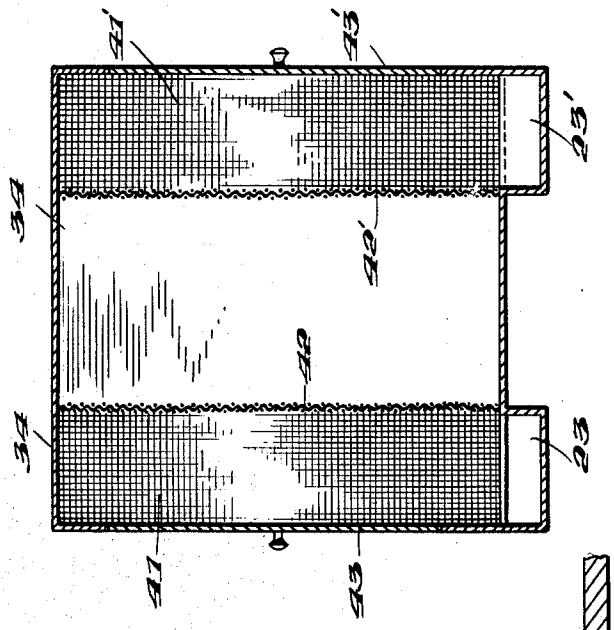
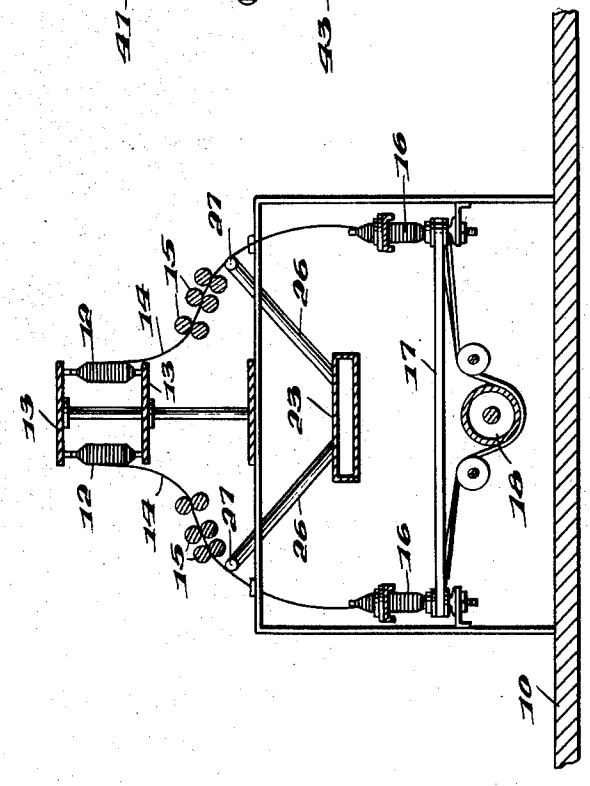



Fig. 2.




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Fig. 3.

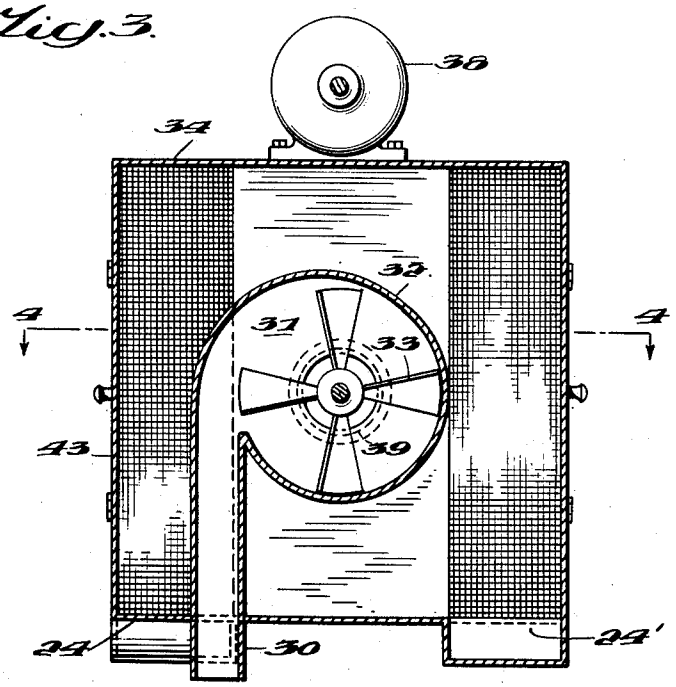
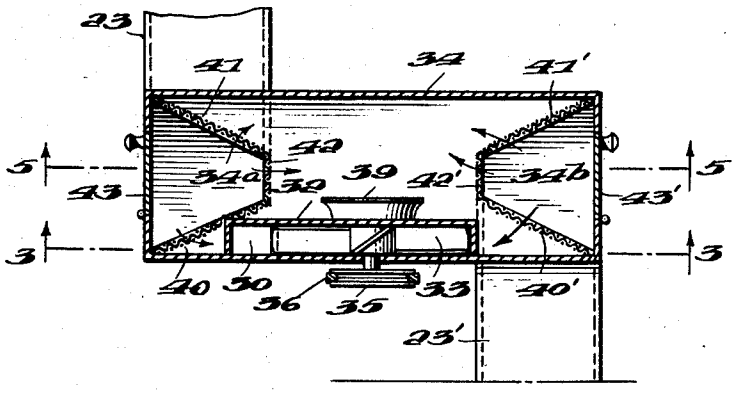



Fig. 4.




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2,914,136

# APPARATUS FOR CONTROLLING EXHAUST

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Application April 21, 1955, Serial No. 502,979
2 Claims. (Cl. 183—37)

In textile manufacturing plants and in particular those rooms of the plant wherein continuous lengths formed from staple fibers, such as slivers, rovings and the like of cotton are drawn, straightened or twisted preparatory to weaving or knitting it is most important that proper temperature and humidity conditions be maintained. Thus in temperate zones such as in the United States where the summer temperature is too hot and, conversely, the winter temperature too cold for processing of the fibers on the textile machines such as slubbers, drawing frames, roving frames and spinning frames it has been found necessary to install air conditioning equipment which will modify the ambient temperature and humidity as required to maintain those conditions considered optimum for the particular process being carried out. Generally speaking, additional heat is necessary in the winter period and cooling is required during the heated summer.

Also, during recent years more and more attention has been focussed on the problem of keeping the textile machines in these rooms relatively free from lint. This is a particularly important problem where the textile fibers are in a loose or only slightly twisted condition such as a "rove" for the reason that fibers in such condition are most likely to break and also shed loose particles which tend to "grow" into fluffs as they are blown about. The loose particles and fluffs can easily become entangled in the lengths of fibers being processed into strands and the like and tend to reduce quality of product. Moreover, the lint and fluffs get into the moving parts of the machines which is also undesirable. A further reason for keeping the work rooms free from lint is that a relatively clean room promotes morale of the employees who operate the machines.

One type of apparatus that has been developed for clearing textile machines such as a spinning frame and the like of lint and broken strands is comprised of a plurality of air suction tubes positioned adjacent the strands as they come off the drawing rolls, these tubes including an intake orifice or slot in alignment with each strand. The air suction maintained at these orifices is effective for drawing in loose particles in the vicinity of the strands and also for catching and drawing in the ends of any strands which should happen to break between the drawing rolls and the spindles. The collection tubes are themselves manifolded so to speak into a larger central duct which runs for the entire length of and inside the spinning frame, and a suction fan connected to one end of this central duct serves to draw the air and collected lint and broken strand ends into a filter box where the lint and broken strand material are caught by a filter screen, the filtered air being then discharged.

For driving the spindles of the spinning frame a motor of considerable size is required. This motor is usually located at the end of the frame and the heat given off by the motor adds considerably to the heat load of the room and thereby also to the air conditioning system especially during the summer when heat must be removed. The same is true as regards the amount of heat given off by the motor and fan unit which supplies the necessary power to operate the suction system for clearing the spinning frame of lint and broken ends.



An object of the present invention is to provide an improved arrangement for controlling the amount of heat, originating in the motors which power the spinning frame and in the motor and fan for powering the suction system for clearing the frame, that is removed from or left to circulate in the room.

In general this objective is attained by locating the suction fan and filter unit at the same end of the spinning frame as the motor which drives the frame cylinder which in turn drives the spindles, and establishing a suction pressure limited to this general area and a related exhaust duct system by which a variable amount of the heat present in such area can be removed. In the event that it is practical to establish an under-the-floor exhaust duct system for conveying away the heat from this area, an entrance to the duct system can be made through the floor in the vicinity of the frame drive motor, and the air discharged from the suction fan, i.e. the filtered air, is preferably directed downwardly in the direction of the motor and floor opening. In the event that an under-the-floor exhaust duct system is not practical, an exhaust duct system can be arranged overhead in the spinning room, in which event the air entrance to the overhead duct system would be constituted by a hood arranged above the motor and suction fan area. Consequently, by varying the suction pressure in the exhaust duct system, the amount of heat in the vicinity of the drive motor and suction fan discharge that is removed from or left to circulate in the room can be correspondingly varied. Moreover, if desired, the motor alley area and inlet to the exhaust system can be partly enclosed such as by means of upright walls between the spinning frames in order to exercise a more positive control over the air exhausted from this area.

As previously indicated, generally speaking, heat must be removed from the room during summer while it is usually necessary to supply heat during the winter season. Consequently, the suction pressure and air handling in the exhaust duct system will be higher in summer than in winter, and, during the latter season, it may even become necessary to drop the suction pressure and air handling to zero, in which case no air will be taken out through the exhaust duct system. One exception to the general rule of heat removal during summer arises in regards to textile work rooms where air conditioning with refrigeration is employed. In this instance, the maximum suction pressure and air handling by the exhaust duct system will be used in very hot weather until the total heat of the outside air exceeds the total heat of the air in the room at which point the amount of air exhausted will be decreased by, for instance, an outdoor wet bulb control similar to the same conventional control that would be, at such time, closing the outside dampers of the air conditioning system in the room.

One practical method of varying the suction pressure in the exhaust duct system would be by means of a thermostat type of control, based upon the change in exterior temperatures. Another type of control possible would be to couple it with the fresh air and return dampers of the air conditioning system associated with the room so as to proportion the amount of air taken out of the room through the exhaust duct system in relation to the amount of air being brought in by the air conditioning system. The suction pressure variation itself can be obtained by changing the speed of the suction fan associated with the exhaust duct system or by the use of vortex dampers in the duct, or by any other functionally equivalent means.

In spinning rooms where the drive motors of two frames are located together to form what is called a double motor alley, a suction fan and drive motor unit therefor individual to each frame can be employed but it is preferred to utilize a single suction fan and motor unit of novel construction, also claimed herein per se, which serves to operate the lint and broken end collection system of both frames. This suction fan is provided with an air intake and filter section and clean-out compartment for each spinning frame, the whole being contained within a common housing, and the discharge from the suction fan being directed in such manner as will best result in its flow into the exhaust duct system.

The foregoing as well as other objects and advantages inherent in the invention will become more evident from the following detailed description of one practical embodiment thereof and the accompanying drawings wherein:

Fig. 1 is a somewhat diagrammatic view of a portion of a spinning room containing a plurality of spinning frames, the adjacent end portions only of two such frames being illustrated in side elevation in order not to unduly complicate the drawings, this view also showing the double motor alley area between the frames, a floor outlet from such area and an under-floor exhaust duct connected to that outlet;

Fig. 2 is a vertical transverse section through one of the spinning frames taken on line 2—2 of Fig. 1;

Fig. 3 is a vertical section taken on line 3—3 of Fig. 4 of the suction and filter unit located in the motor alley area and which serves both spinning frames for removing loose particles and broken ends;

Fig. 4 is a horizontal section through the suction and filter unit taken on line 4—4 of Fig. 3; and

Fig. 5 is a vertical section through the suction and filter unit taken on line 5—5 of Fig. 4.

With reference now to the drawings and in particular to Figs. 1 and 2, the floor of the spinning room is indicated at 10 upon which stands a plurality of spinning machines. In the particular arrangement of machines illustrated, which is quite common, the machines are arranged in rows in the room there being a plurality of machines to each row and the machines of each row being arranged generally in end-to-end relation and with sufficient space between the ends of adjacent machines in a row to accommodate the drive motors for the machine spindles of two frames. The end portions only of adjacent spinning frames in one row are indicated at **11** and **11'**, and all structural detail not essential to an understanding of the invention have been omitted. The spools **12** containing the roving to be processed are mounted vertically between the creel boards **13**, and the roving **14** from the same is drawn by and between rolls **15** for winding upon spindles **16**. The latter are driven in pairs at each side of the machine by means of endless tapes **17** which are driven off a cylinder **18** that extends for the full length of each machine in the so-called underframe portion. Each of the cylinders **18** is driven by a motor located in the motor alley area **19** between the frames, the motor for spinning frame **11** being indicated at **20** and the motor for spinning frame **11'** being indicated at **20'**. The motor alley area can, if desired, be at least partially walled in by means of side panels **21** and **22** which extend upward from the floor at the sides of each frame to a height of a few feet, the panels being preferably removable when necessary for access to the drive motors.

The air suction apparatus for collecting loose particles and broken ends from the spinning frames **11, 11'** comprises central collection ducts **23, 23'** which can be rectangular in cross-section extending for the full length of the frame beneath the creel boards **13**. The end of the duct **23** at the end of the spinning frame **11** and the end of the duct **23'** at the end of spinning frame **11'** remote from the ends shown in the drawing are closed and the



opposite ends of the ducts **23, 23'** are connected to inlets **24, 24'** of a combined suction and filter unit **25** situated in the motor alley area and above the drive motors **20, 20'**. The unit **25** functions to maintain a suction in collection ducts **23, 23'**, to filter the fiber laden air which flows into the same, and to discharge the cleaned air downwardly in the direction of the drive motors **20, 20'**, in a manner to be described later in further detail.

Connected to each of the ducts **23, 23'** by means of tubings **26, 26'** are a plurality of cylindrical collection tubes or flutes **27, 27'**, each containing a plurality of horizontally extending, spaced slots or orifices **28, 28'**. These slots **28, 28'** are located at the places on the spinning frame where the broken ends usually occur which is between the output side of the rolls **15** and the guides **29** through which the strands **14** pass to be wound upon the spindles **16**. A separate slot **28, 28'** is provided for each strand such as a roving strand or the like being processed and is located below and in line with the path which the strand follows, as clearly seen in Fig. 2, so that upon a break in any strand, the free end of the strand will be drawn by suction through its corresponding slot and will continue to be so sucked in until the operator notices the break and reties the strand so as to continue the spinning thereof. The broken strand end passes through the tube **27** or **27'** and tubing **26** or **26'** into the central collection duct **23** or **23'** and through the latter into the filter unit **25**. It is preferable to make the tubes **27, 27'** of such length as will service several strands, there being a slot **28** or **28'** for each strand, and the several tubes being each connected by tubing **26, 26'** to the central collection ducts **23, 23'**. The multiple number of air suction slots distributed throughout the length of each spinning frame in addition to their function of picking up broken strand ends also serve to continuously draw in a considerable quantity of loose particles along the entire length of the spinning frame and these particles also are likewise carried through the collection duct system to the filter unit **25**.

The filter unit **25**, the details of which are also claimed in this application, is featured by a single fan which serves to establish the suction in the duct systems of both spinning frames **11, 11'** and a filter compartment individual to the air intake from each frame, all contained within a common housing located in the motor alley area above the spindle drive motors for the frames. With reference now to Figs. 1 and 3–5 which show the details of construction of the filter unit **25**, the suction fan **31** is seen to be of the axial intake, tangential exhaust type. The scroll of the fan in which is enclosed the impeller **33** is mounted within a housing **34**, and the tangential exhaust duct **30** from the fan scroll passes out through the bottom wall of housing **34**, in a vertically downward direction and terminates just below the top edges of the side plates **21, 22** which partially enclose the double motor alley area. The shaft of impeller **33** extends through a side wall of housing **34** and has a pulley **35** mounted thereon which is coupled by belt **36** to another pulley **37** on the shaft of an electric motor **38** mounted atop the housing **34**. The axial intake to the suction fan is shown at **39**.

As previously indicated, the filter unit **25** includes two filter sections, there being one filter section for each spinning frame. As is clearly visible from Fig. 4, air having lint particles and broken ends entrained therein coming to the filter unit **25** through duct **23** enters through intake **24** into that part **34*a*** of the housing **34** which lies inside of three screen panels **40, 41** and **42** which are joined together at their edges and extend from the bottom to the top of housing **34**. These three screen or filter panels thus form a filter compartment **34*a*** screened off from the remainder of housing **34** in which is trapped all of the fibrous material incoming through the collection duct **23** from spinning frame **11**. In a similar manner, air having lint particles and broken ends entrained therein coming to the filter unit **25** through duct **23'** enters through

intake 24' into that part 34*b* of housing 34 which lies inside of three screen panels 40' 41' and 42' which are also joined together at their edges and extend from the bottom to the top of housing 34. These three screen panels thus form a second filter compartment 34*b* screened off from the remainder of the interior of housing 34 in which is trapped all of the fibrous material incoming through the collection duct 23' from spinning frame 11'. The filtered air, after passing through the screens 40—42 and 40'—42' flows into the axial intake opening 39 to the scroll 32 and is then discharged by the impeller 33 through the tangential outlet duct 30. A cleanout door 43 is preferably provided in the end wall of housing 34 leading to the filter compartment 34*a* to facilitate removal of the fibrous material which collects therein, and a similar cleanout door 43' is provided at the opposite end wall of housing 34 for access to filter compartment 34*b*.

The housing 34 may be supported in the position shown in Fig. 1 by any suitable means, not illustrated. Such support may be by way of lateral connections to the end structure of the spinning frames 11, 11', or the housing may be carried by a suitable framework built up from the floor of the spinning room.

With reference again to Fig. 1, the opening in the floor 10 in the double motor alley area 19 to draw a variable amount of air therefrom and discharge the same to the outside, is indicated at 44, and the duct 45 leading therefrom is manifolded into a larger exhaust duct 46 in which is located a suction fan 47 driven by electric motor 48 which is arranged to operate at a variable speed in order to effect a variation in the duct station and hence also the amount of air drawn into the duct from the motor alley area 19 of the spinning room. It will be noted that the duct 46 extends to the left of the particular duct 45 illustrated and the intention is that this leads to a similar air exhaust arrangement provided for the motor alley areas of other pairs of spinning frames located in the same row. In a similar manner, like motor alley area exhaust systems will be provided for the spinning frames in the other rows of frames located in the spinning room.

In accordance with the invention, the suction in duct 46 is to be varied in accordance with a change in room temperature and climatic conditions so that during the summer months the suction is increased thereby removing most if not all of the heat given off by frame spindle drive motors 20, 21' and the exhaust from the filter unit 25 in the motor alley area 19, the heated air being drawn down through the floor opening 44 into the exhaust ducts 45, 46. Conversely, in the winter, the suction in duct 46 is decreased and may even drop to zero to the end that most, if not all, of the heat given off by the motors 20, 21' and the exhaust from filter unit 25 will be allowed to distribute itself throughout the room area. In the seasons between mid-summer and mid-winter, the suction in the exhaust duct 46 will, of course, be suitably maintained between these two extremes of operation.

The control over the exhaust suction in duct 46 can be directed manually or the system can be made to operate automatically by some means which vary in accordance with the change in temperature, the control being predicated either upon a change in outdoor temperature or a change in temperature within the work room. As previously indicated, an automatic control may also be predicated upon, i.e. tied to, operation of the fresh air and return dampers of a conventional air conditioning system installed to condition the air in the room, such dampers being themselves controlled as a function of the change in outside temperature. One mode of automatic control and which is illustrated schematically in Fig. 1



could comprise either a wet or dry bulb thermostat 49 responsive to the outdoor temperature, the thermostat response being used to control the action of a speed controller unit of conventional design and therefore illustrated simply by the block 50 which in turn controls the speed of motor 48 and fan 47 and thereby controls the amount of air suction in the duct 46. In the case of an air conditioning system employing refrigeration associated with the room, the air removed from the room via the exhaust duct system would generally increase with an increase in outside temperature but would be decreased when the total heat in the outside air exceeded the total heat of the air in the room. In lieu of varying the speed of the fan, the fan speed could be kept substantially constant and the duct suction varied by means of controllable dampers in the duct and when the minimum air quantity was reached, the exhaust fan could be cut off.

The arrangement which has been described in relation to room exhausts at double motor alley locations between adjacent spinning frame is, of course, equally applicable to single unit frames having the spindle drive motor for the frame and the suction and filter unit for clearing the frame of loose fibrous particles and broken ends. It will also be understood, in conclusion, that other variations in the particular construction and arrangement of parts and applications of the invention to textile machines other than spinning frames, such as slubbers, drawing frames and roving frames are possible without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. A suction fan and filter unit comprising a housing, a motor driven suction fan mounted within said housing, a pair of mutually separate filter compartments in said housing, the walls defining each such compartment being constituted at least in part by filter screens, the intake to said suction fan being in communication with the air discharge side of said filter screens, a separate inlet to each compartment for air to be filtered and a clean-out door for each filter compartment providing access thereto.

2. A suction fan and filter unit comprising a housing, a motor driven suction fan of the centrifugal type including impeller and scroll components, said fan being mounted within said housing and having an axial inlet to said impeller component and a tangential outlet from said scroll component thereof, the interior of said housing being sub-divided by screen walls into a pair of mutually separate filter compartments, the axial inlet to said impeller component being in communication with the air discharge side of said filter screens, a separate inlet to each filter compartment for air to be filtered, and a clean-out door for each filter compartment providing access thereto.


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