Feb. 24, 1953 E. E. HALLANDER 2,629,242

VENTILATED AND AUTOMATICALLY CONTROLLED DRY CLEANING APPARATUS

Filed March 24, 1948 5 Sheets-Sheet 1

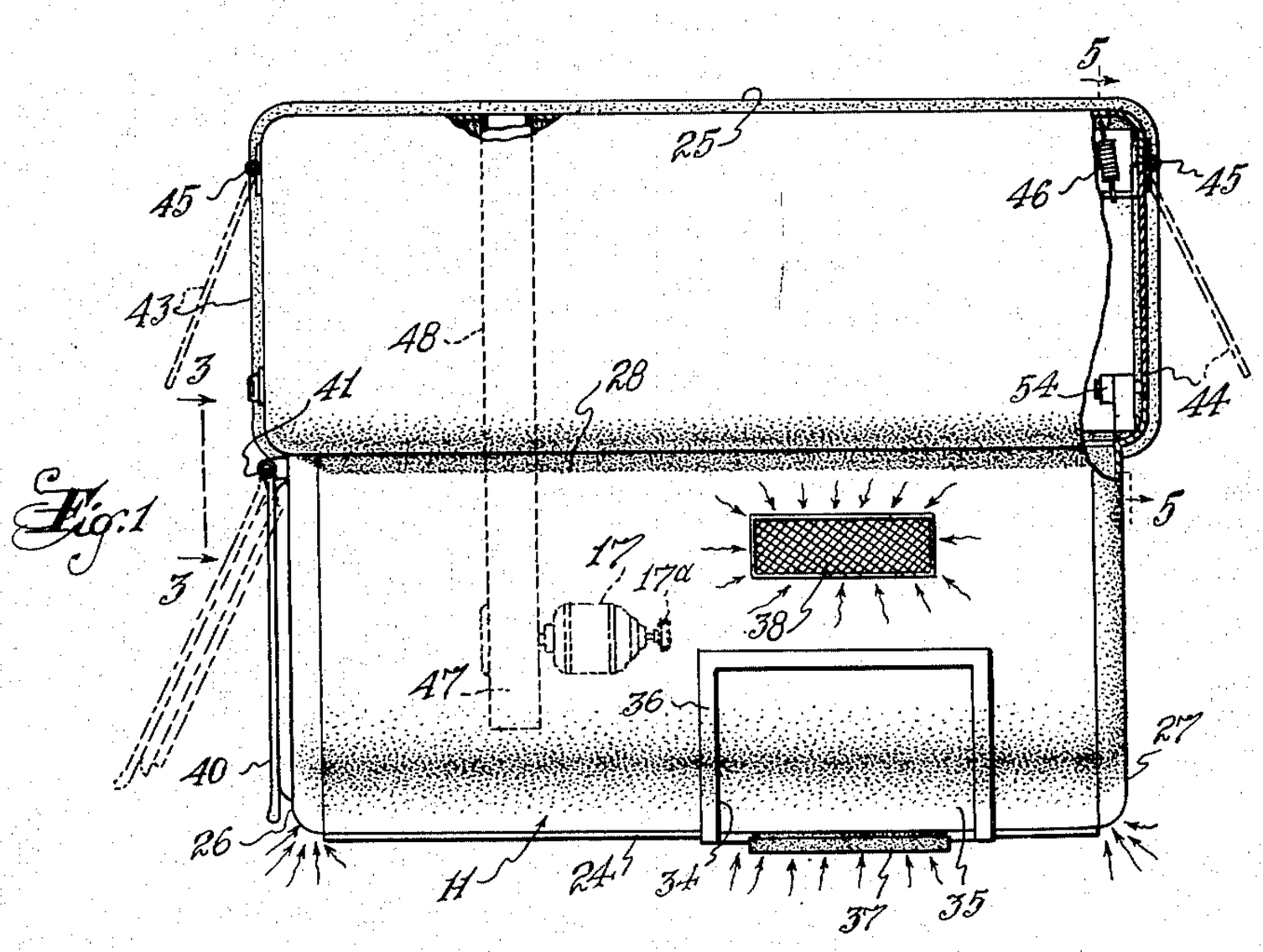

Fig. 1

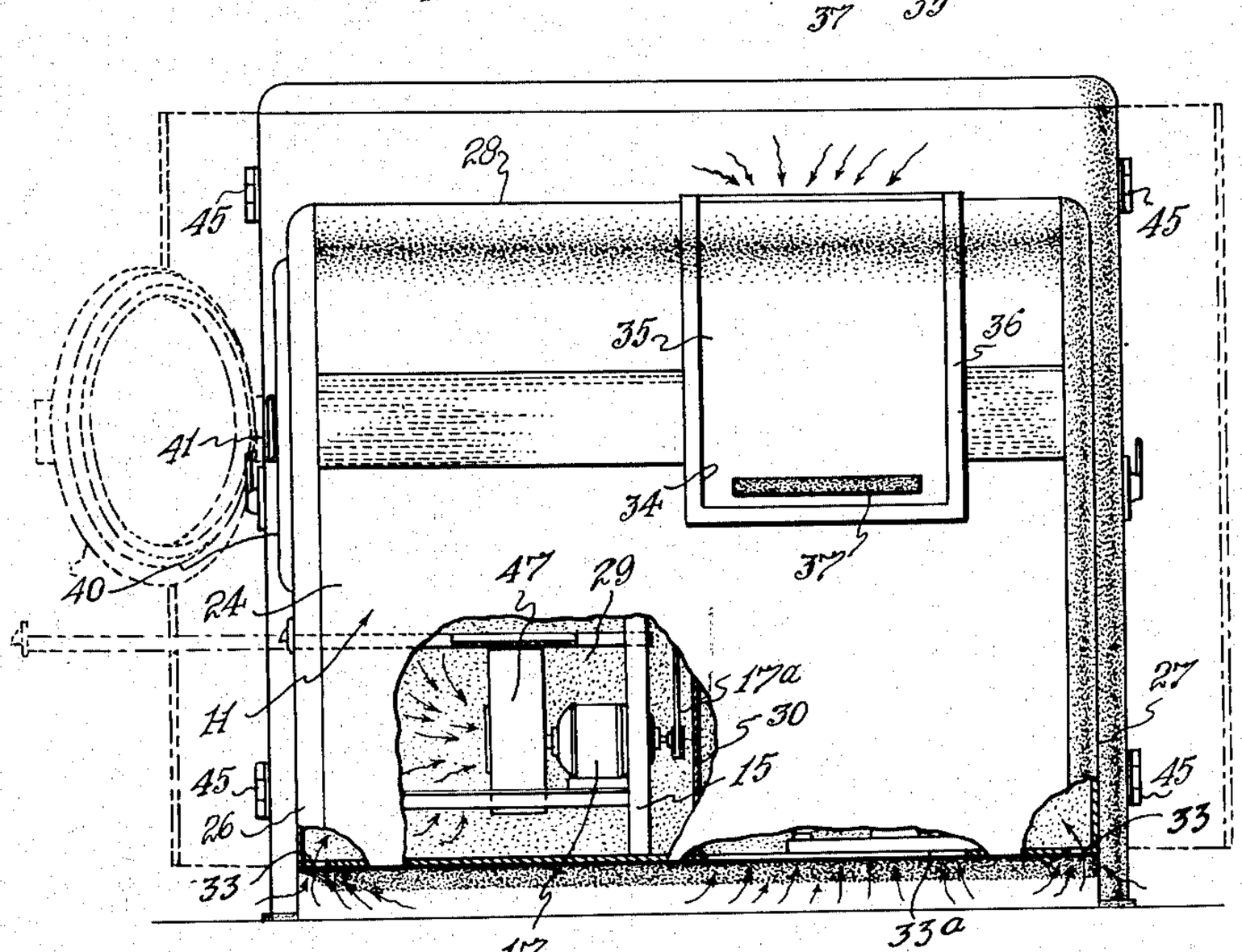

Fig. 2

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Fig. 12

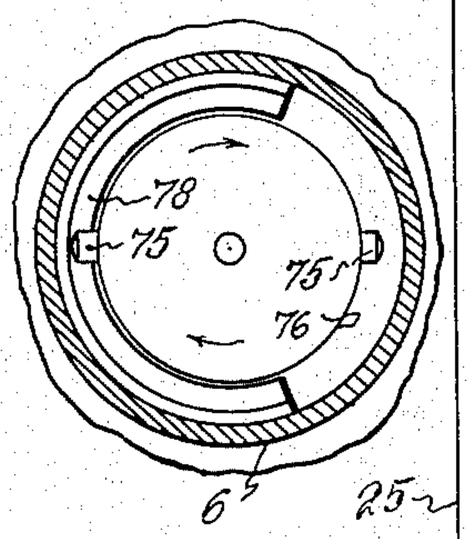


Fig. 3

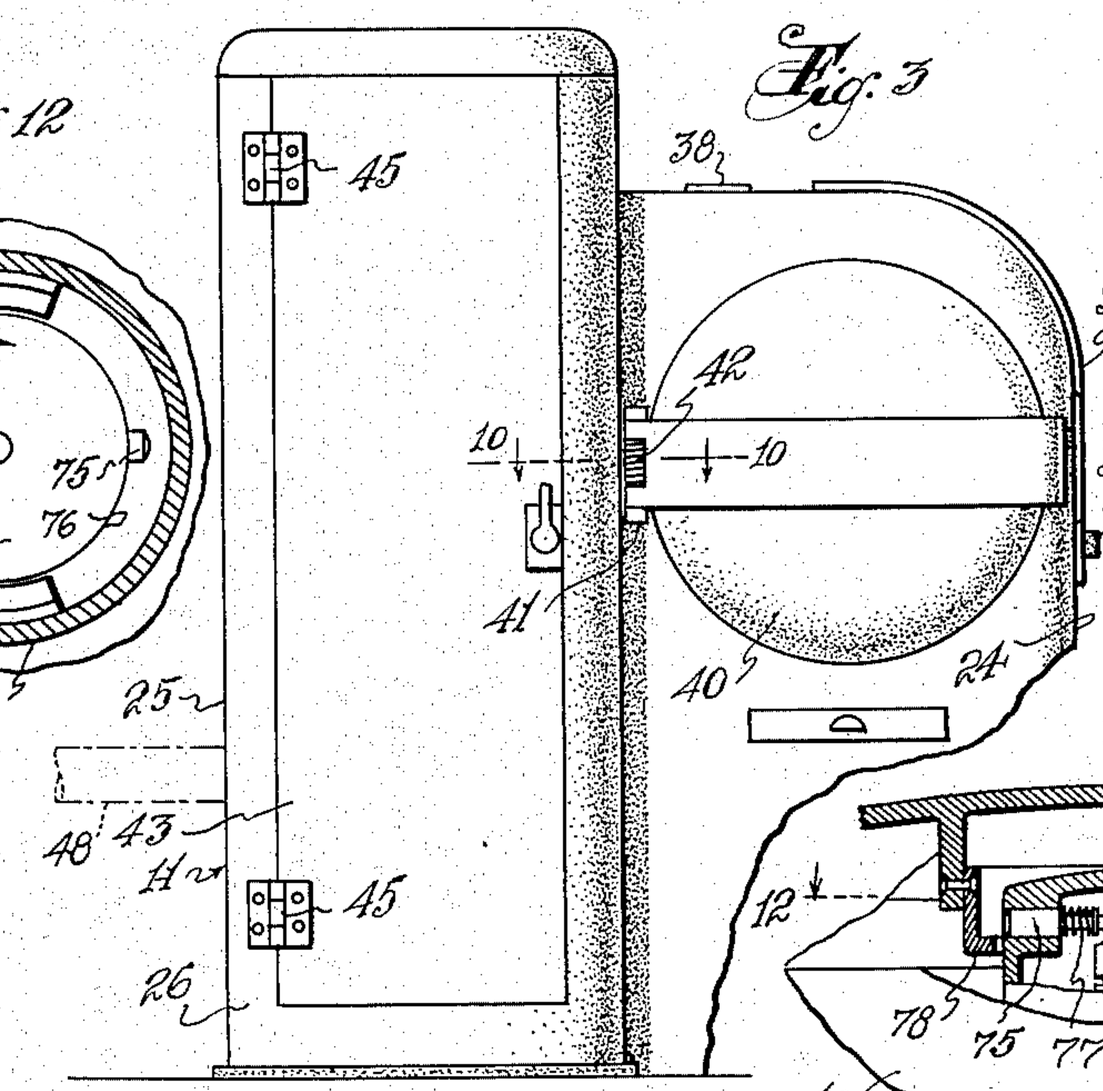


Fig. 10

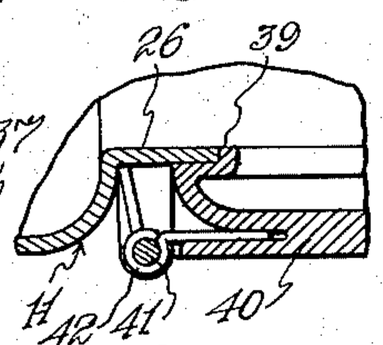


Fig. 11

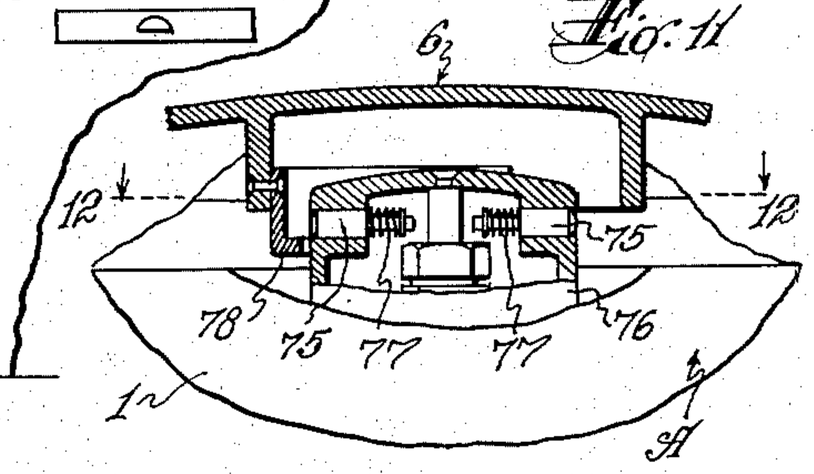
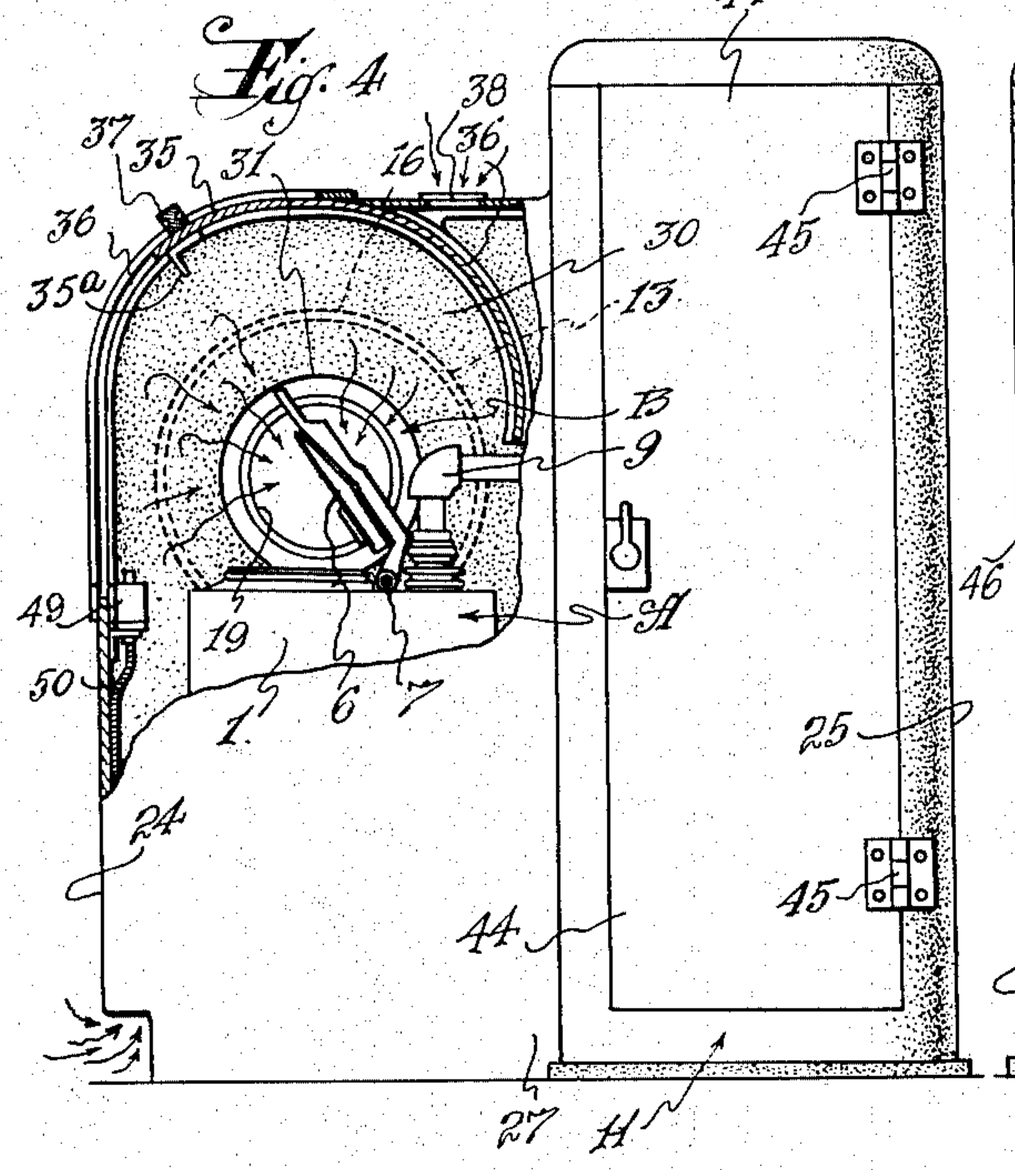


Fig. 4



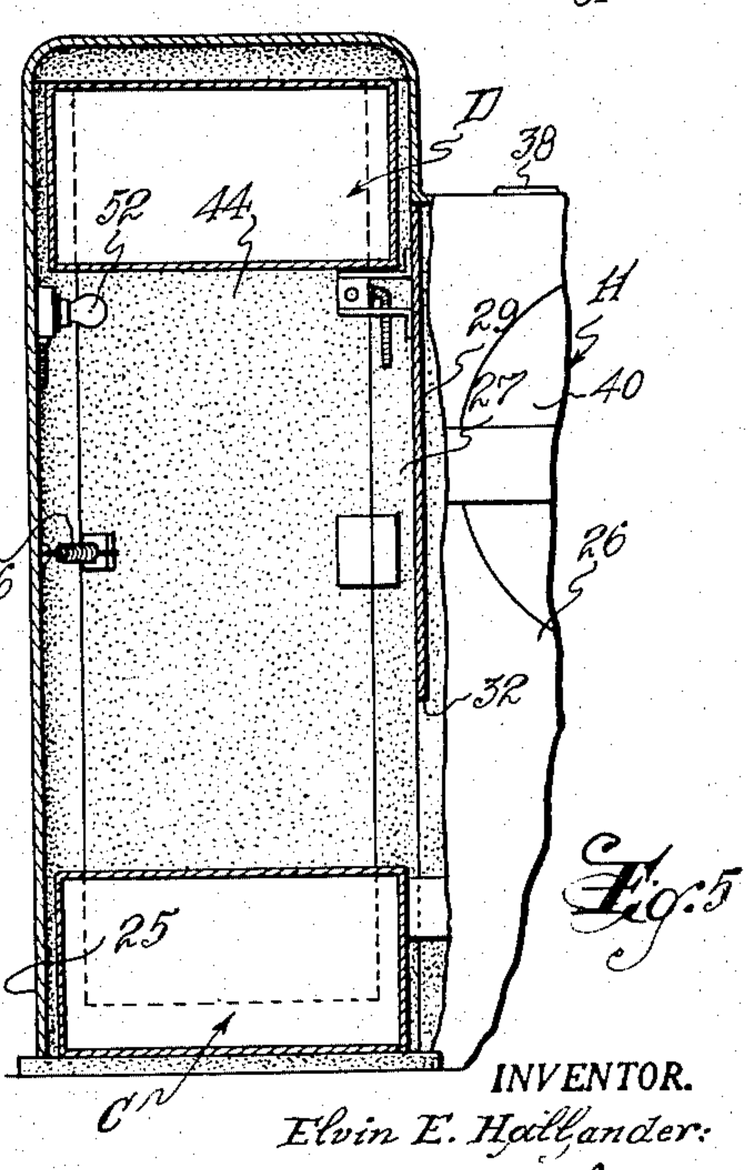


Fig. 5

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VENTILATED AND AUTOMATICALLY CONTROLLED DRY CLEANING APPARATUS

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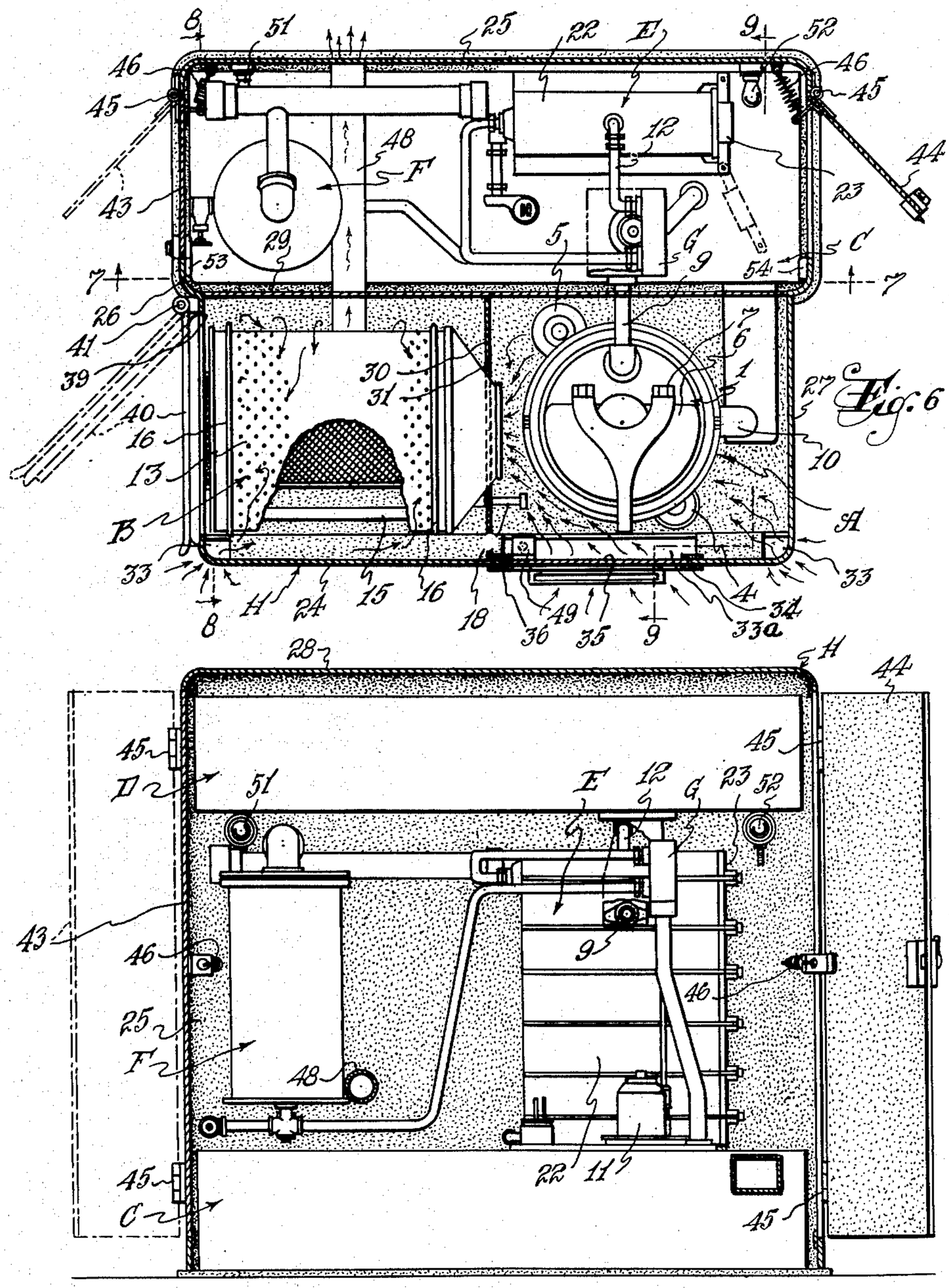

Fig. 6

Fig. 7

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VENTILATED AND AUTOMATICALLY CONTROLLED
DRY CLEANING APPARATUS

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Fig. 8

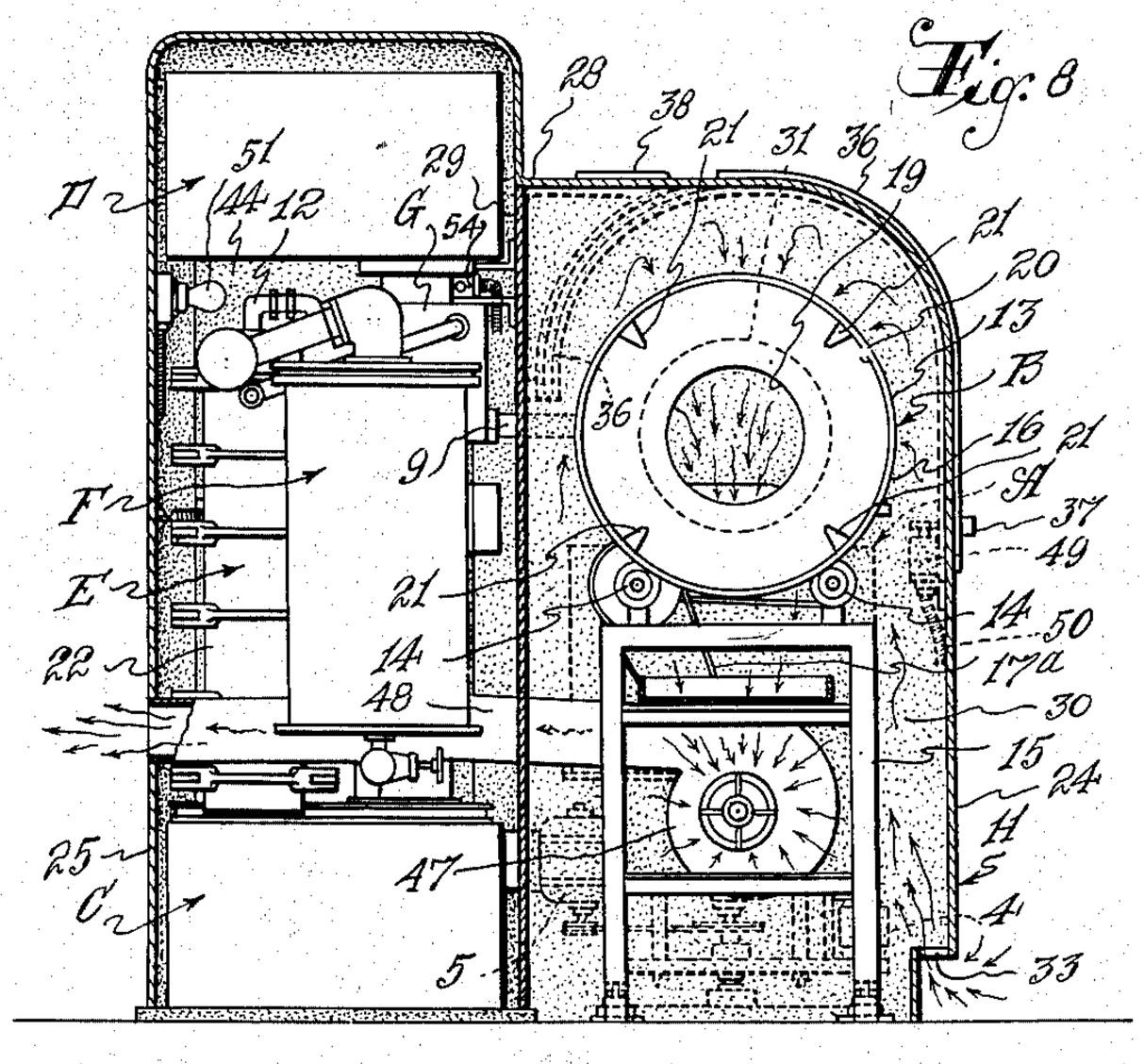
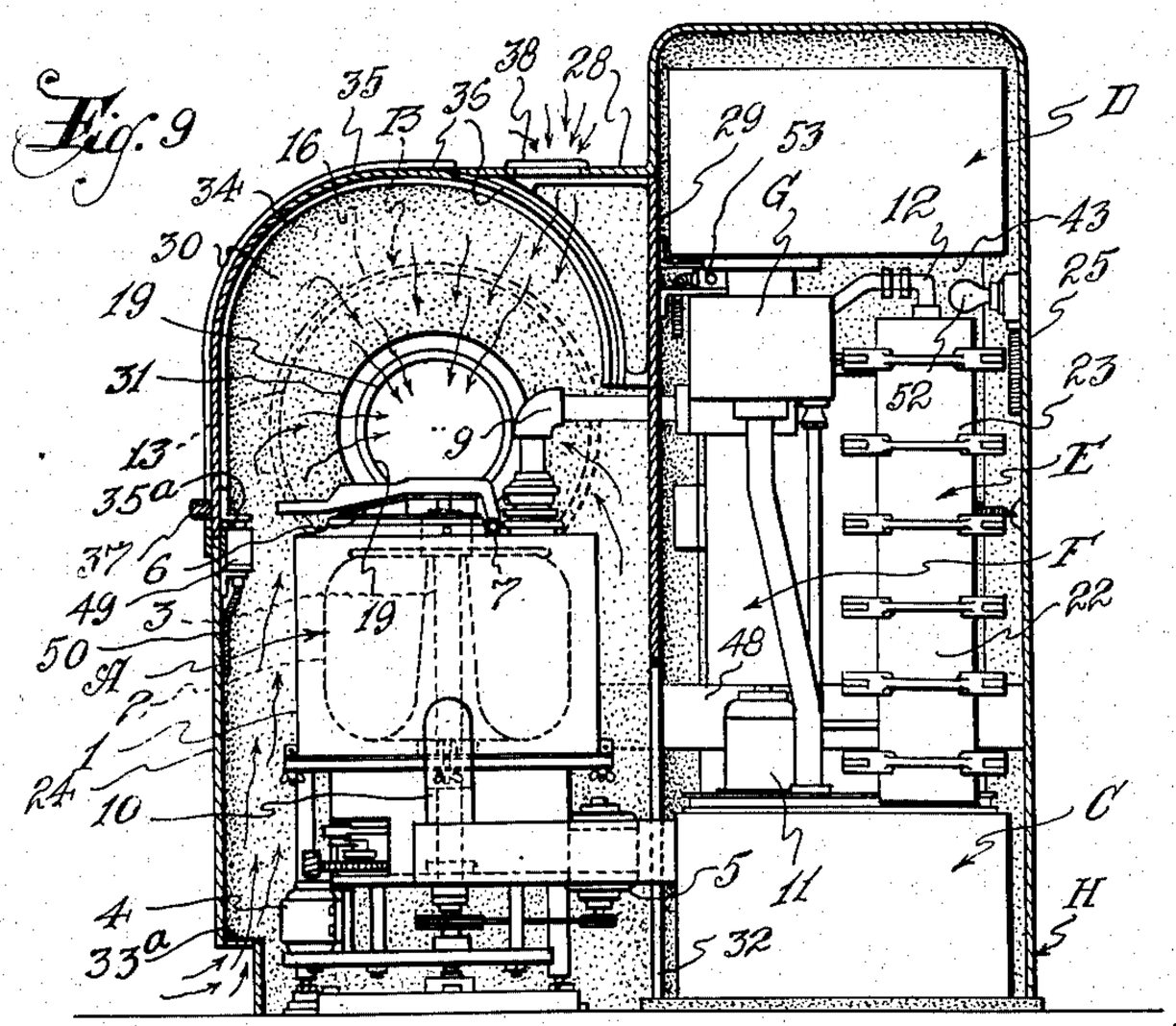


Fig. 9



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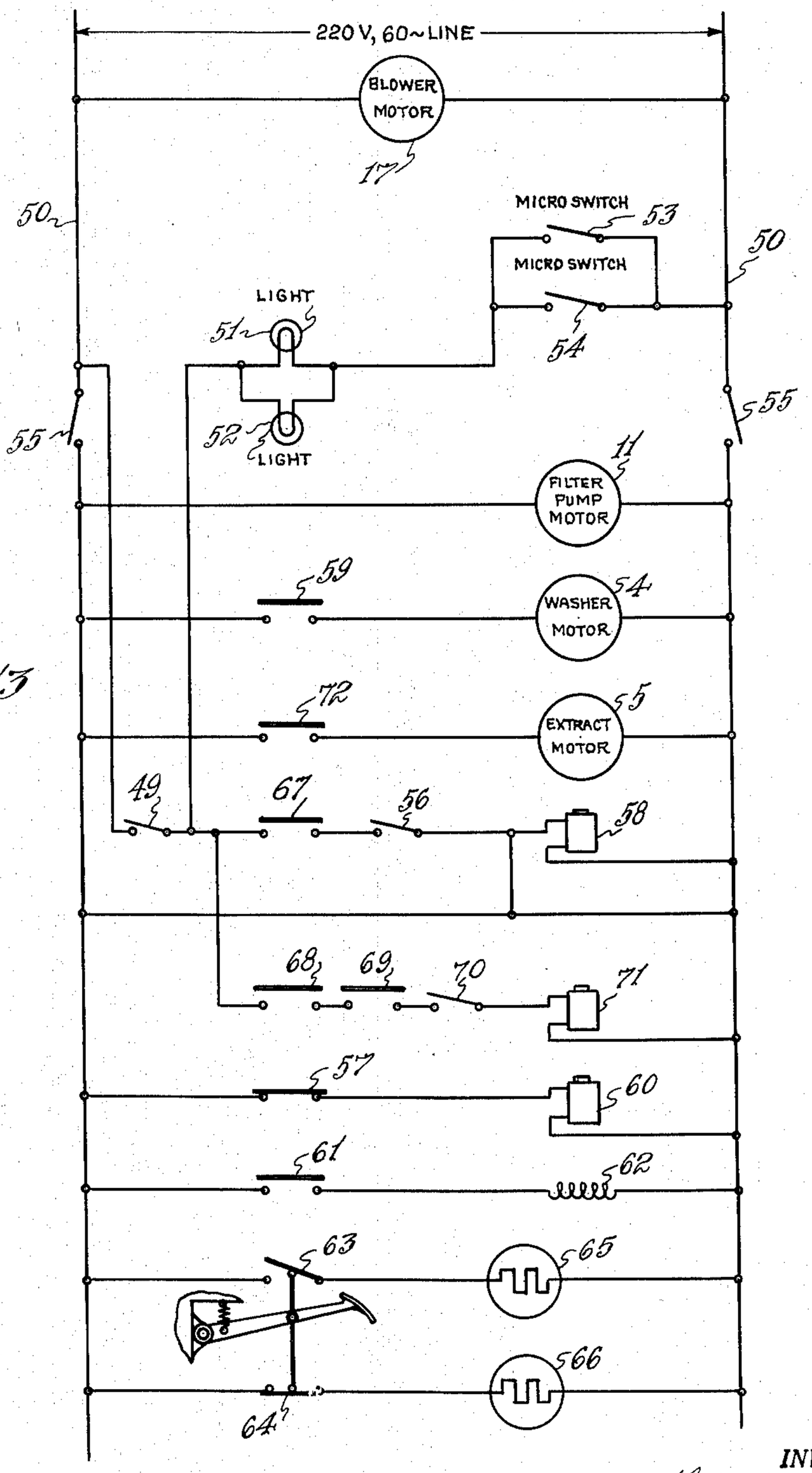

Fig. 13

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Patented Feb. 24, 1953 2,629,242

UNITED STATES PATENT OFFICE

2,629,242

VENTILATED AND AUTOMATICALLY CONTROLLED DRY CLEANING APPARATUS

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Application March 24, 1948, Serial No. 16,826

4 Claims. (Cl. 68—19)

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This invention relates in general to dry cleaning apparatus of the type which comprises a washer and extractor, a drier, a filter and a still for the cleaning fluid or solvent. In dry cleaning apparatus of this character, there is used a solvent or cleaning fluid which is highly volatile and sometimes toxic, and this fluid or solvent is distilled and contained in tanks from which it is pumped into the washer, and, after the washing operation, is drained from the washer to a drain tank from which it is pumped into a filter wherein foreign matter removed from the washed clothing is filtered from the solvent. After the washing operation, the washed garments are subjected to centrifugal action in the extractor to remove the solvent from the garments, after which the garments are transferred from the extractor to the drier where the solvent remaining in the garments is evaporated and the garments are deodorized.

During these operations, substantial quantities of the cleaning fluid are thrown off into the ambient atmosphere and unless properly disposed of are dangerous, and a prime object of my invention is to provide a novel and improved construction and arrangement of the various units of the apparatus, a housing to enclose them, and means for causing circulation of air through said housing and to force or withdraw the solvent fumes or vapors from the housing to a remote point of exhaust, whereby to ensure maximum safety for the operator and servicemen as well as maximum efficiency in the deodorization of the garments.

In such combination, it is necessary to provide doors in the housing for insertion and removal of the garment to be cleaned and for access to the units for operation, inspection and repair, and therefore, another object of my invention is to provide novel and improved means automatically controlled by opening or closing of any of such doors to ensure that when any of the doors are open escape of solvent fumes or vapors therethrough shall be prevented.

A further object is to provide a novel and improved safety control system for dry cleaning apparatus of this character, whereby the operation of the washer and extractor and the valves for controlling the supply and drain of solvent to and from the washer shall be automatically controlled and operation of the apparatus shall not be permitted until the door through which the garments are inserted into the washer, that is, the loading door, shall have been closed.

Other objects, advantages and results of the

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invention will be brought out by the following description in conjunction with the accompanying drawing, in which:

Figure 1 is a top plan view of dry cleaning apparatus embodying my invention, portions being broken away for clearness in illustration;

Figure 2 is a front elevational view of the apparatus, with portions broken away;

Figure 3 is an elevational view of one end of the apparatus, with portions broken away;

Figure 4 is a similar view of the other end of the apparatus, with portions shown in vertical section;

Figure 5 is a vertical sectional view, approximately on the plane of the line **5—5** of Figure 1;

Figure 6 is a horizontal sectional view through the housing, and a top plan view of the washer-extractor, drier, filter and still units;

Figure 7 is a longitudinal vertical sectional view, approximately on the plane of the line **7—7** of Figure 6;

Figure 8 is a transverse vertical sectional view, approximately on the plane of the line **8—8** of Figure 6;

Figure 9 is a similar view, approximately on the plane of the line **9—9** of Figure 6;

Figure 10 is an enlarged fragmentary horizontal sectional view, approximately on the plane of the line **10—10** of Figure 3;

Figure 11 is an enlarged fragmentary vertical sectional view through the upper portion of the washer-extractor;

Figure 12 is a fragmentary horizontal sectional view, approximately on the plane of the line **12—12** of Figure 11, and

Figure 13 is a schematic illustration of the automatic control system including the electrical wiring.

Specifically describing the invention, and with particular reference to Figures 1–9, inclusive, I have schematically illustrated the apparatus as including a combined washer and extractor A, a drier B, a drain tank C for the used solvent, a tank D for the clean solvent, a filter E and a still F, these parts being arranged in closely related relation with each disposed roughly at one corner of an imaginary square.

Any suitable types of these various units may be utilized, but I prefer to use a combined washer and extractor wherein the garments or materials are first washed in an oscillating basket or container and are then drained or partially dried by rapid continuous rotation of the container after the solvent has been drained from the washer. As shown, this washer and extractor includes a

main casing or tub 1 in which the basket 2 is mounted on a vertical shaft 3 which is journaled in the frame of the machine and is driven with an oscillating motion from an electric motor 4 and is continuously rotated for the extracting operation by an electric motor 5. Any suitable means may be utilized for effecting the proper driving connections between the motors 4 and 5 and the shaft 3, but one possible system of gearing is shown in United States Patent No. 2,223,998, dated December 3, 1940. The casing or tub has a cover 6 which is pivotally connected at 7 to the top of the casing so that it may be normally closed, as shown in Figures 6 and 9, and clamped by suitable latches 8, or may be opened or swung upwardly, as shown in Figure 4.

The solvent or cleaning fluid is supplied to the washer from the tank D through a suitable valve, junction box G and a pipe 9, while the used solvent is drained from the tub to the drain tank C through a pipe 10. A filter pump operated by an electric motor 11 is provided for pumping the solvent from the drain tank C into the filter through the valved junction box G and a pipe 12. Suitable pipe connections are provided between the junction box G and the still F. It will be understood that the junction box G will have passages through it controlled by valves so that the liquid may be caused to flow through the box in the desired direction, but inasmuch as the details of construction of these parts form no part of my invention, they are not specifically illustrated.

The drier B is mounted at one side of the washer-extractor A and includes a drum 13 mounted to rotate about a horizontal axis in any suitable manner as by rollers 14 journaled on a frame 15 and receiving peripheral tracks 16 on the drum. Certain of these rollers 14 are driven by any suitable means, for example, from an electric motor 17 mounted on the frame 15 and connected by belt and pulley connection 17*a* to at least one of the rollers 14, a suitable control clutch being provided, the handle of which is designated 18, to start and stop rotation of said driving roller and thus start and stop rotation of the drum. At one end the drum has a coaxial receiving opening 19 adjacent the top of the washer-extractor, and at its other end the drum is provided with an opening 20 of a diameter substantially the same as the interior of the drum to constitute a discharge opening. The drum is perforated and has a plurality of internal agitators or ribs 21 which will cause shaking or tumbling of the articles in the drum during rotation thereof. The drum 13 is arranged with its receiving opening 19 in close juxtaposition to the charging opening of the washer and extractor A so that articles can be lifted from the extractor and transferred directly through the opening 19 into the drum. Usually this is a manual operation, but during the transfer of the articles some of the vapors from the solvent escape into the atmosphere. The details of construction of the drier B are disclosed and claimed in my copending application Serial No. 778,424, filed October 7, 1947, and need not be further described here.

The filter E is described and claimed in detail in my copending application Serial No. 771,904, filed September 3, 1947, issued April 3, 1951 as Patent No. 2,547,205, and includes a main casing 22 in which are mounted a plurality of filter elements which are insertable into and removable from the casing through an opening at one end of the casing that is normally closed by a door 23

which may be swung into open position as shown by dot and dash lines in Figure 6.

In accordance with the invention, the washer and extractor, the drier, the filter and the still are enclosed in a common housing or casing H that includes front and rear walls 24 and 25, respectively, end walls 26 and 27 and a top wall 28. The casing is divided into two sections by a vertical partition 29. In one section are located the filter E and still F, while in the other section the washer-extractor and the drier are housed. This latter section is divided transversely by a partition 30 that extends from the partition 29 to the front wall 24 between the washer-extractor and the drier, said partition being formed with an opening 31 through which projects the receiving end of the drier drum 13. The portion of the partition 29 between the transverse partition 30 and the end wall 27 is provided with an opening 32 extending upwardly from its lower edge approximately midway of the height of the partition, as best shown in Figure 9, so as to provide communication between the two sections of the housing. The housing also has air inlet openings 33 and 33*a* in the lower portions of its front wall to permit air to be drawn into the housing around the washer-extractor and the drier.

In the front wall and closely adjacent to the opening of the washer-extractor and the receiving end of the drier drum 13 is a loading opening 34 through which articles may be inserted into the washer-extractor, said opening having a suitable door 35 which is preferably a flexible sliding door whose ends are slidable in guideways 36. The door has a hand grip 37 for operating it. In the top wall of the casing and juxtaposed to the upper edge of the door opening 34 is a ventilating opening 38 that is preferably covered by a suitable grating or screen, said opening being normally fully opened and unobstructed, particularly when the loading door 35 is closed.

The end wall 26 of the housing is closely adjacent the discharge end of the drying drum 13 and has a door opening 39 and a door 40 therefor, said opening being in alinement with the drum and the door extending transversely of said opening in closely spaced relation to the end of the drum so as normally to prevent articles from falling out of the drum when the door is closed. The door thus serves both as a closure for the door opening 39 and to prevent accidental dislodgment from the drum of the articles under treatment. Any suitable door may be used, but preferably as shown, the door comprises a circular plate hingedly connected at 41 to the housing and having a suitable spring 42 for normally actuating the door into its closed position. In Figures 6 and 10 the door is shown in closed position by solid lines and in Figure 6 the door is illustrated as partially open by dot and dash lines.

The end walls 26 and 27 of the housing at the section of the housing that encloses the filter E and still F, have the respective doors 43 and 44 that are hingedly connected to the housing by hinges 45 and are normally swung into the positions to close their respective openings by tension springs 46. These doors are intended primarily for access to the filter and still to permit inspection, adjustment or repair, and particularly to allow insertion and removal of the filter elements into and from the filter casing 22, the opening of the door 44 being juxtaposed or facing the opening of the filter door 23.

The invention provides for a constant circulation of air through the housing during operation of the apparatus and past the operator's face while he is performing any of the acts incident to operation of the machine, for example, loading and unloading the washer-extractor, unloading the drier, changing the filter elements, and adjusting the parts, so that substantially fresh air shall be present for breathing by the operator at all times and the operator shall be protected from the obnoxious vapors of the solvent. Thus, a centrifugal fan or other air pumping device **47** is located within the lower portion of the housing, conveniently on the frame of the drier B beneath the drier drum so that it may be driven by the same motor **17** which operates the drum. The inlet of this centrifugal pump communicates with the interior of the housing close to the floor and beneath the drier drum, as best shown in Figures 2, 8 and 9, while the outlet of the pump is connected to a conduit **48** which leads outwardly through the rear wall of the casing into the atmosphere, for example outside the building, or to any point remote from the operator of the machine.

It will thus be evident that so long as the motor **17** is operating, a current of air will be drawn through the bottom openings **33** and **33***a* of the housing and the top ventilating opening **38** when all of the doors of the housing are closed, whereby the solvent vapors will be carried off. When any of the doors of the housing are opened, fresh air will be drawn through the door into the housing, and through the pump exhaust pipe **48** so as to constantly carry away solvent vapors from the face of the operator who may be working through the door.

Another feature of the invention is automatic control and safety means actuated by the loading door **35**. This means is schematically illustrated in Figure 13 wherein a normally open door-operated microswitch **49** (see also Figure 9) is connected in circuit with the line wires **50**, electrical controls for the washer motor **4** and the extractor motor **5** (which will be more fully described hereinafter), and in addition thereto electric lights **51** and **52** adjacent the respective rear doors **43** and **44** of the housing and the respective microswitches **53** and **54** actuated by said doors for controlling said lights, blower motor **17** is connected across the line wires **50** as is also the filter pump motor **11**, and both thereof are controlled by the main double pole starting switch **55**. Thus, when the loading door switch **49** is open and the main starting switch **55** is closed, only the blower motor and the filter pump motor can be operated, but when the loading door switch is closed by closing of the loading door and the starting switch is closed, the whole system becomes operative. The rear door switches **53** and **54** are normally open when the doors are closed and closed when the doors are open, so should one of the rear doors be open and the lamps **51** and **52** fail to light, the operator will know that the loading door switch is still open and thus be warned that he does not have full protection from the ventilating system. In this connection, it will be understood that when all of the rear doors and the loading door are opened, the velocity of air flow is so decreased that the solvent vapors are not efficiently carried away, it being necessary that both of the rear doors be closed when the loading door is open to ensure maximum protection.

The control system also includes a timing mechanism or clock for each of the washer and extractor motors. The clock for the washer motor includes two contacts **56** and **57**, the latter of which is normally closed while the former is normally open. The contacts **56** control a relay **58** whose contactor **59** is in circuit with the washer motor **4**; while the contacts **57** control a relay **60** whose contactor **61** is connected in circuit with a solenoid **62** that controls a detent for a foot pedal operated switch mechanism that includes two microswitches **63** and **64** that are connected in circuit, respectively, with a time delay relay **65** for controlling the filling of the washer tub and a time delay relay **66** that controls the draining of the washer tub. The contactor **67** of the time delay relay **65** is connected in circuit with the contacts **56** and the washer motor relay **58**, while the contactor **68** of the time delay relay **66** is connected in series circuit with a contactor **69** actuated by the relay **60**, contacts **70** of the extractor clock or timing mechanism for the extractor motor and a relay **71** whose contactor **72** is connected in series with and controls the extractor motor **5**.

It is desirable to provide means to prevent opening of the cover **6** of the washer-extractor while the extractor is operating, and for this purpose I provide a plurality of weighted latches **75** mounted in the upper end of the article-holding basket **76** so as to be normally retracted, as shown in Figure 11, when the machine is not operating, but to be thrown centrifugally horizontally outwardly against the influence of retracting springs **77** when the extractor is in operation, as shown in Figure 12. The cover has an inwardly projecting arcuate locking flange **78** into engagement with which the centrifugal latches **75** are actuated when the extractor is operated, as shown in Figure 12, so as to hold the cover **6** against any attempt to swing it upwardly into open position.

In operation of the apparatus, the loading door **35** will normally be open and the other doors will be closed, as shown in Figure 4, and the articles to be cleaned are inserted into the washer-extractor through the loading door opening. After the washer-extractor has been loaded, the starting switch **55** is closed, after which the washer clock is set so as to close the contacts **56** and open the contacts **57** and the extractor clock is set so as to close the contacts **70**; then the loading door **35** is pulled into closed position, as shown in Figure 9, so that the microswitch **49** will be closed by the finger **35***a* on the loading door. The starting switch **55** remaining closed, the foot pedal switch is then operated so as to open the normally closed microswitch **64** and close the normally open microswitch **63**, these switches being held in this position by the relay **60**. Thereupon, the filling of the washer tub is started and continues until the washer clock unwinds, opening the contacts **56** and closing the contacts **57**, which releases the foot pedal so that the switch **64** is closed and the switch **63** is opened. While the time delay relay **66** is operating its contacts **68**, the tube is draining. After the draining period, the contacts **68** close to energize the relay **71** of the extractor motor and actuate the contactor **72** to start said motor. While the extractor motor is running, the extractor clock unwinds and finally opens contacts **70** to deenergize the relay **71** and stop the motor. Then the loading door is opened and the cleaned articles are removed from the extractor and deposited

into the drier drum 13. During all of this time, it will be observed that the blower or exhaust pump 47 is in operation so as to continuously draw fresh air past the operator's face into the housing and protect him against inhalation of the solvent vapors, and at the same time, the air currents will be drawn through the drier so as to dry and deodorize the articles. Then the articles may be removed from the drier through the door 40. Thereupon, operations may be repeated, that is, the washer-extractor may be reloaded, the washer and extractor clocks reset, the foot pedal switch mechanism operated to open the switch 64 and close the switch 63, etc.

While I have shown and described the now preferred embodiment of my apparatus, it should be understood that this is primarily for the purpose of illustrating the principles of the invention and that many modifications and changes may be made in the details of construction and arrangement of the parts within the spirit and scope of the invention.

Having thus described the invention, what I claim is:

1. Dry cleaning apparatus comprising a washer-extractor having an opening with a closure for insertion and removal of articles, a perforate drier drum having a charging opening adjacent said opening of the washer-extractor and also having a discharging opening, a housing completely enclosing said washer-extractor and said drier drum and having front, rear, side and top walls in spaced relation to said washer-extractor and said drier drum to permit free circulation of air therearound, said housing having an opening in its front wall and a door therefor to permit manual access simultaneously to said extractor closure and to said charging opening of said drier drum so that the articles can be inserted by the hands of an operator into said washer, removed from said extractor and transferred into said charging opening of the drier drum within the housing and by the operator's hands extended through said opening in the housing, said housing also having another opening and a normally closed door therefor in juxtaposition to said discharge opening of said drier drum to permit removal of articles from said discharge opening, constantly open fresh air inlets in the walls of said housing, an outlet for foul air from the housing, suction means within the housing, having its inlet communicating directly with the interior of the housing and its discharge connected to said outlet of the housing, and means for causing continuous operation of said suction means so that when said doors are closed fresh air will be drawn into said housing through said fresh air inlets, circulated around said washer-extractor and through said drier drum and constantly exhausted from said housing through said outlet, while when said doors are open said suction means will suck fresh air into said housing

through both of said doors and thus draw cleaning fluid fumes away from said door openings and out of said housing through said outlet while the articles are being handled.

2. Dry cleaning apparatus as defined in claim 1 wherein said washer and extractor are rotatable about a vertical axis, said perforate drier drum is rotatable about a horizontal axis and has said charging and discharging openings at opposite ends thereof, said discharging opening is closed by said normally closed door when the latter is in closed position, and with the addition of a partition between said drier drum and said washer-extractor having an opening in register with said charging opening of the drum to cause air to circulate into said drum through said charging opening.

3. Dry cleaning apparatus as defined in claim 1 wherein said housing is approximately rectangular in plan and said washer extractor is located in one front corner of said housing, said drier drum is mounted in the other front corner of the housing and with the addition of a solvent still and a solvent filter each located in one of the rear corners of said housing in spaced relation to the walls of the housing, an opening and a door therefor and means for normally closing it in each end wall of said housing for access to said filter and to said still, respectively, said suction means when all of said doors are closed, exhausting the foul air from the housing around said filter and said still and said suction means when the last-mentioned doors are open drawing fresh air through said doors into the housing and thus drawing cleaning fluid fumes away from openings into said housing.

4. Dry cleaning apparatus as defined in claim 1 wherein there are electric motors for said washer-extractor, a common normally open switch controlling the circuits of both of said motors, and the door of the first-mentioned opening has means for closing said switch to start said motors when said door is closed and for permitting opening of said switch to stop said motors when the door is opened.

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