

May 6, 1958

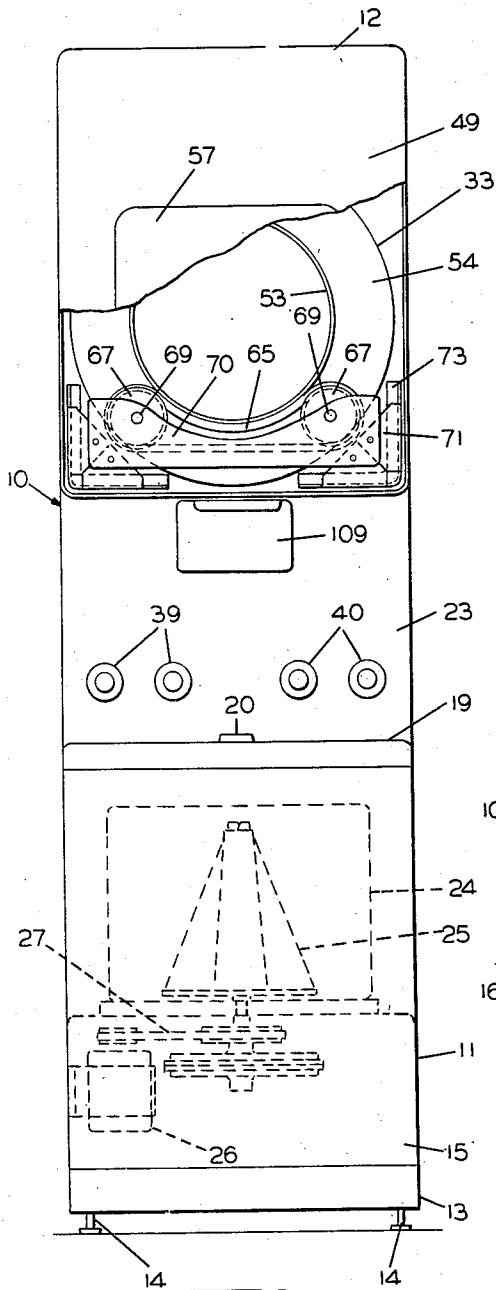
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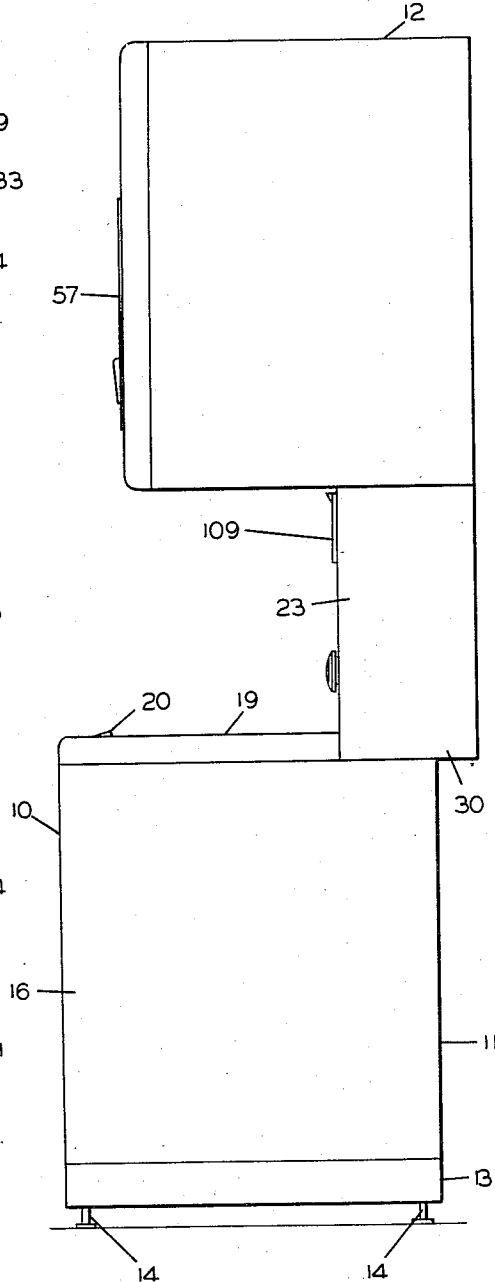
COMBINATION WASHING AND DRYING MACHINE

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4 Sheets-Sheet 1



**Fig. 1**



**Fig. 2**

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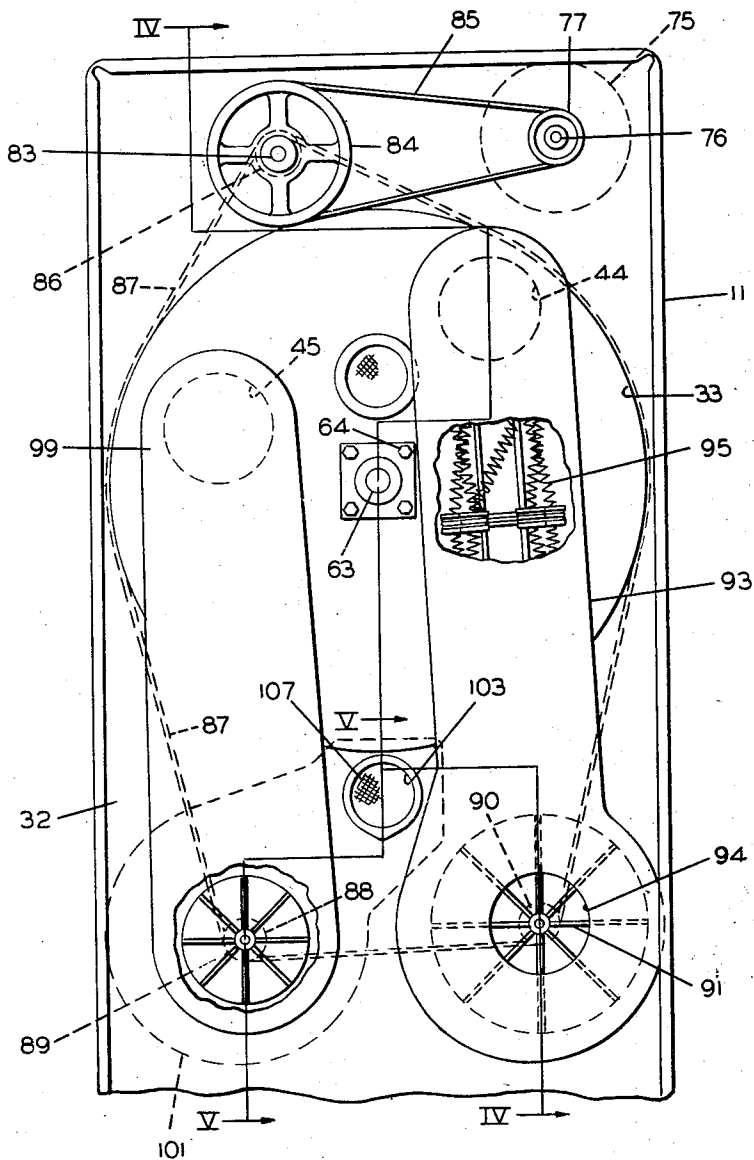


Fig. 3

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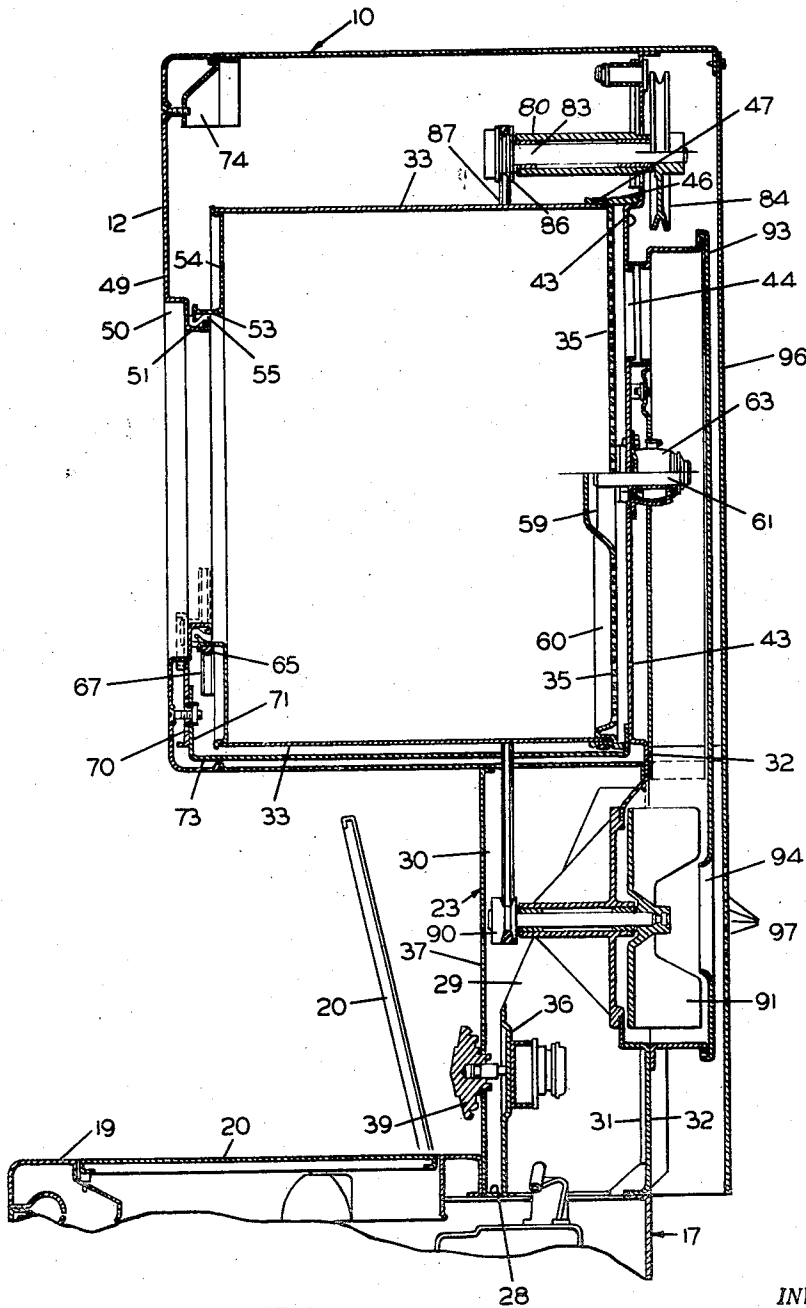
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## COMBINATION WASHING AND DRYING MACHINE

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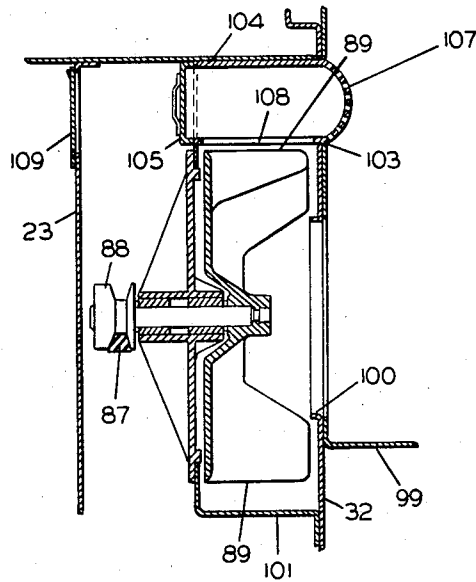
P. E. GELDHOF

2,833,137

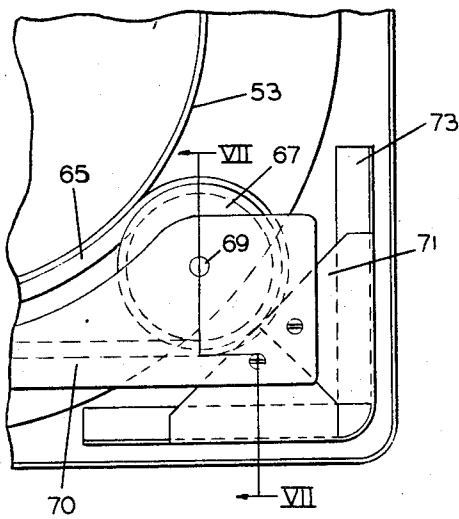
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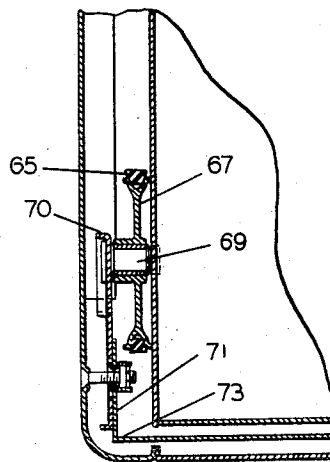
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**Fig. 5**



**Fig. 6**



**Fig. 7**

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## COMBINATION WASHING AND DRYING MACHINE

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Application May 27, 1953, Serial No. 357,797

6 Claims. (Cl. 68—19)

This invention relates to improvements in laundry machines and more particularly relates to an improved form of unitary washing and drying machine and is a continuation-in-part of my application Serial No. 328,082, filed December 26, 1952 now Patent No. 2,793,518 dated May 28, 1957.

A principal object of my invention is to provide a novel and improved form of laundry machine for separately washing and drying clothes and arranged with a view toward utmost compactness, accessibility and ease of operation.

Another object of my invention is to provide a combination washing and drying machine consisting of separate washing and drying compartments, arranged one above the other wherein the heavier of the compartments rests on the ground while the lighter compartment is spaced thereabove and wherein the lighter of the compartments has a drier drum rotatably mounted therein with means for circulating the air into and out of said drier drum in the space between the compartments.

A further object of my invention is to provide a simplified form of combination washing and drying machine having two vertically spaced compartments, the upper of which forms a drying compartment and has air circulating means therefor located in the space between the compartments to maintain the upper of the compartments of less depth than the lower compartment to increase the stability of the machine and afford free access to the lower of the compartments from the top thereof.

A still further object of my invention is to provide a simplified form of combination washing and drying machine including a cabinet having a lower compartment for washing with an upwardly opening top cover, and an upper compartment for drying, spaced above the lower of said compartments a distance sufficient to afford free opening of said cover, wherein the controls for washing and drying are in the space between said compartments and the air circulating means for the drying compartment are spaced beneath the drying compartment in the space between said compartments and within the extended margins of the upper of said compartments so as to increase the stability of the machine and afford free access to the lower of said compartments from the top thereof.

A further and more detailed object of my invention is to provide a laundry machine for washing and drying clothes including a cabinet having a lower compartment for washing and a vertically spaced upper compartment for drying having a drier drum rotatably mounted therein, with blower means in the space between said compartments and beneath said drier drum for the circulation of air into and out of said drier drum, and wherein a single endless belt having driving engagement with said blower means and with the periphery of said drier drum is provided to drive said blower means and drier drum from a motor located within the limits of the said drying compartment.

A still further and important object of my invention is

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to provide a novel and improved form of a combination of washing and drying machine comprising two vertically spaced compartments one supported on the other, with an intermediate inwardly recessed compartment disposed therebetween, wherein the air circulating means for circulating air into and out of the drying compartment are disposed within the intermediate compartment, and wherein the exhaust duct from the exhaust blower means is within said intermediate compartment and has a lint screen therein and removable from the front of said intermediate control compartment, and communicating with the rear thereof, but accessible from the front of said intermediate compartment for cleaning.

These and other objects of my invention will appear from time to time as the following specification proceeds and with reference to the accompanying drawings wherein:

Figure 1 is a front end view of a laundry machine constructed in accordance with my invention;

Figure 2 is a view in side elevation of the machine shown in Figure 1;

Figure 3 is a fragmentary rear end view of the machine shown in Figures 1 and 2 with the rear cover thereof removed and with the intake and outlet ducts for the drier drum broken away, to illustrate the heating means in the intake duct and the suction blower in the outlet duct;

Figure 4 is a fragmentary sectional view taken substantially along line IV—IV of Figure 3;

Figure 5 is a fragmentary sectional view taken substantially along line V—V of Figure 3;

Figure 6 is an enlarged detail fragmentary front end view of the drier compartment with the front end plate for the machine broken away, in order to more clearly illustrate the support for the front end portion of the drier drum; and

Figure 7 is a transverse sectional view taken substantially along line VII—VII of Figure 6.

In the embodiment of my invention illustrated in the drawings, I have shown a combined washing and drying machine comprising a cabinet 10 of a unitary structure having two vertically spaced laundry compartments 11 and 12, the lower compartment 11 being shown as a washing compartment, and the upper compartment 12 being shown as a drying compartment, and spaced above the lower of said compartments a distance sufficient to afford access to the lower compartment from the top thereof.

The lower compartment 11 is shown as having a base 13 supported on the floor on feet 14, 14, which may be adjustable to level the machine with respect to the floor. The lower compartment also has a front wall 15 and parallel side walls 16, 16 and connected together by a back wall 17 (see Figure 4).

A top 19 for the lower compartment 11 is shown as having a cover 20 hinged thereto adjacent the front wall of an intermediate inwardly spaced air circulating compartment 23, opening toward said compartment into the space between the compartments 11 and 12 for access to a clothes container 24. The clothes container 24 may be of a well known form of washing and extracting clothes container suitably journaled within the compartment 11 for rotation with respect thereto about a vertical axis, when extracting water from the clothes in said container.

The clothes container 24 is shown as having an oscillatable agitator 25 reciprocally supported therein and driven by a motor 26 and belt 27, as clearly shown and described in Patent No. 2,521,159, which issued jointly to me and Luther Ringer on September 5, 1950, and no part of my present invention so not herein shown or described in detail.

The top 19 of the washing compartment 11 is shown in Figure 4 as having a downwardly recessed rear end

portion 28, upon which is mounted the air circulating compartment 23 and drier compartment 12. Spaced gusset plates 29, 29 extend upwardly along each side of the recessed rear end portion of the washing compartment 11 and form reinforcing supports for depending side walls 30, 30 of the drying compartment 12. The gusset plates 29, 29 have inturned rear end portions 31, 31 extending along and secured to a rear plate or partition 32 extending upwardly within the clothes drying compartment 12 and forming a support for the rear end portion of a drier drum 33 and also forming an air circulating bulkhead, confronting a rear peripheral wall 35 of the drier drum 33. The gusset plates 29, 29 likewise each have an inturned flange 36 extending parallel to a front wall 37 of the compartment 23, on which may be mounted the control mechanism for both the washer and drier.

As herein shown, a plurality of knobs 39, 39 and 40, 40 are connected with the control mechanisms for the drier and the washing machine, and are mounted on the outside of the plate 37 to operate associated control mechanisms on the flanges 36, 36. The knobs 39, 39 may control operation of the drier, while the knobs 40, 40 may control operation of the washer, in a well known manner, so is not herein shown or described in detail.

The vertical partition 32 is shown as having a circular recessed portion 43 confronting the rear wall 35 of the drier drum 33 and forming a bulkhead therefor. The recessed portion or bulkhead 43 is shown as having an air circulating opening 44 therein for the circulation of heated air into the drier drum 33 through the rear perforate wall 35 thereof. Said bulkhead likewise has a lateral spaced air circulating opening 45 leading therethrough and confronting the perforate wall 35 of the drier drum 33, for the exhaust of spent air therefrom. A seal 46 is shown as being secured to and encircling the rear end portion of the drier drum 33 and as extending over a shouldered portion 47 of the partition 32, forming the outer margin of the circular recess 43. The seal 46 slidably engages said shouldered portion and seals the perforate wall 35 of the drier drum 33 through the bulkhead, to assure the passage of air into and out of the drier drum 33 through the intake and outlet openings 44 and 45.

A front wall 49 of the drier compartment 12 has a clothes receiving opening 50 therein, which is defined by an inwardly extending stepped flange 51. The stepped flange 51 is shown as being coaxial with the axis of rotation of the drier drum 33 and the inner portion thereof is shown as extending within an outwardly extending annular flange 53 extending from a front wall 54 of the drier drum 33 and lapping the inwardly stepped portion of the stepped flange 51. A sealing member 55 is shown as being mounted on the outer periphery of the inwardly stepped portion of the stepped flange 51 and as being secured thereto. The seal 55 has slidable sealing engagement with inner periphery of the flange 53 to seal the clothes receiving opening of the drier drum 33 to the clothes receiving opening 50 of the front wall 49.

A door 57 is shown as being hinged to the front wall 49 of the drier compartment 12 to close the opening 50. The door 57 may be sealed to the clothes receiving opening by suitable sealing means (not shown) as in Patent No. 2,619,737, which issued to Peter E. Geldhof and Harold E. Morrison on December 2, 1952, and no part of my present invention, so not herein shown or described further.

The perforate rear wall 35 of the drier drum 33 is provided with a central hub 59, and is reenforced by a plurality of arms 60, 60 extending therefrom to the outer wall of the drier drum as in my aforementioned joint patent with Harold E. Morrison No. 2,619,737. The central hub 59 is shown as having a shaft 61 mounted therein, and extending rearwardly therefrom through the bulkhead 43. A bearing member 63, herein shown as

being a self aligning bearing of a well known construction, is shown as being bolted to the rear wall of the bulkhead 43 and as forming a bearing support for the shaft 61, supporting the drum 33 for rotation about a horizontal axis and accommodating limited axial movement of the drum 33 and shaft 61 during rotation thereof.

It should here be noted that the self aligning bearing 63 and shaft 61 are relatively short compared with the overhanging length of the drier drum 33 and thus enable the horizontal depth of the drying compartment 12 to be reduced considerably from the depth of former driers. In order to attain this reduced depth, the forward end portion of the drier drum 33 is shown as being rotatably supported on a traveling endless belt 65, having supporting engagement with the undersurface of the flange 53.

The endless belt 65 is shown in Figures 1 and 6 as being trained about spaced idler pulleys 67, 67 at opposite sides of the drier drum 33 in the lower end portion of the compartment 12, adjacent opposite sides thereof. The pulleys 67, 67 are shown as being rotatably mounted on shafts 69, 69, secured to and extending inwardly from a transverse plate 70.

The transverse plate 70 is shown in Figures 1, 6 and 7 as extending across the front of the drier drum 33 inwardly of the end wall 49 of the drying compartment 12, and as being bolted on its opposite ends to end gusset plates 71, 71.

The gusset plates 71, 71 are shown as being mounted on and extending across the forward end portions of angle brackets 73, 73, secured to the partition 32 at their rear ends and extending forwardly therefrom beyond the forward end of the drier drum 33. The angle brackets or supports 73, 73, also form an attaching means for the lower end portion of the front plate 49 of the drier compartment. The upper end portion of the front plate 49 of the drier cabinet is shown as being attached to brackets 74, 74 extending inwardly from the top wall of the compartment 12 (see Figure 4).

A motor 75 is shown in Figure 3, as being mounted within the drying compartment 12 inside of the partition 32 adjacent the upper end thereof and at one side thereof. The motor 75 may be suitably secured to the partition 32, and is shown as having a motor shaft 76 extending through the partition 32 and having a pulley 77 mounted thereon to the rear or outside of said partition. A bearing bracket 80 is shown as extending inwardly through the partition 32. The bearing bracket 80 may be supported on the partition 32 and forms a bearing support for a counter-shaft 83. A drive pulley 84 is shown as being keyed or otherwise secured to the rear end of the counter-shaft 83 on the rear or outside of the partition 32.

The pulley 84 is driven from the drive pulley 77 of the motor 75 as by a belt 85.

The drier drum 33 is shown as being driven from a pulley 86 keyed or otherwise secured to the inner end of the counter-shaft 83 by means of an endless belt 87 trained from the pulley 86 around the periphery of said drier drum. The endless belt 87 is also trained downwardly from the periphery of the drier drum 33 into driving engagement with a drive pulley 88 for a suction blower 89 for withdrawing spent air from the outlet 45 in the bulkhead 43. The endless belt 87 is likewise trained about a drive pulley 90 for a suction blower 91, for forcing air into the inlet opening 44 in the bulkhead 43, as will now be described.

An intake air duct 93 is shown as being mounted on the rear end portion of the partition 32 and as extending inwardly to and along the recessed bulkhead 43. The intake air duct 93 encloses the blower 91 and extends upwardly therefrom along the bulkhead 43 to and around the intake opening 44 in said bulkhead and has communication with the drier drum 33 through said intake opening and perforate rear wall 35 of said drier drum. The intake air duct 93 has an inlet opening 94 in communication with the blower 91 for the inlet of fresh air

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into said intake duct, to be drawn therealong by the blower 91. The intake air duct 93 is shown in Figure 3 as having a suitable heating means therein, herein shown as being an electric heating element 95. The heating element 95 may be of a type shown in my joint patent with Harold E. Morrison No. 2,619,734 and is no part of my present invention, so need not herein be shown or described further. It is obvious however, that a gas chamber (not shown) may be within or have communication with the intake air duct 93 to heat the air by gas if desired.

The back of the drying compartment 12 and the control and air circulating compartment 23 are shown as being closed by a back plate 96 which may have louvers or intake air openings 97 therein, confronting the intake opening 94 of the air intake duct 93, to accommodate air at room temperature to be drawn to and along the heating element 95 by the blower 91 (see Figure 4).

An outlet air duct 99 is shown in Figure 3 as extending vertically along the back of the partition 32 and bulkhead 43, and as forming a communicating duct between the outlet or exhaust opening 45 in the bulkhead, and an outlet opening 100 in the partition 32, spaced beneath the bulkhead 32 and drier drum 33. It should here be noted with reference to Figures 4 and 5 that the exhaust blower 89 is located on the forward or inner side of the partition 32. The exhaust blower 89 is shown as being mounted within an exhaust duct 101, extending along the forward or inner side of the partition 32, angularly inwardly and upwardly toward the center thereof, and communicating with an exhaust opening 103 leading through the partition 32, to discharge spent air through the rear of said partition. The exhaust duct 101 and exhaust opening or passage 103 is shown as having a cylindrical passageway member 104, slidably mounted therein for insertion and withdrawal therefrom and having a forward closed end 105 and a rear open end portion across which extends a lint screen 107 (see Figure 5). The wall of the passageway member 104 has an air circulating opening 108 therein for the passage of air thereto and out through the lint screen 107. The lint screen 107, if desired may open through the rear wall 97.

The front wall 37 of the air circulating and control compartment 23 is shown as having a door 109 therein, affording communication with the cylindrical passageway member 104 and the lint screen 107, to accommodate the ready removal of the lint screen from the forward end of the control and the air circulating compartment 23.

It may be seen from the foregoing that the intake and exhaust blowers 91 and 89 being spaced beneath the drier drum 33 and within the air circulating compartment 23, and driven from the inner or forward side of the partition 32, substantially reduce the horizontal depth of the drier over former driers heretofore in use and make it possible to have the drier compartment supported on and above the washing compartment, without unbalancing the machine and also space the front wall of the drier compartment 12 backwardly of the front wall of the washing compartment 11 a distance sufficient to afford free access to the washing compartment.

It may be further seen that the horizontal depth of the drying compartment 12 is further reduced by supporting the front end of the drier drum on the endless belt 65, making it possible to journal the rear end of the drier drum on the relatively short shaft 61 and self-aligning antifriction bearing 63 therefor, mounted on the bulkhead.

It may also be seen that with the short self-aligning bearing support for the rear end of the drier drum and the endless belt supporting the forward end of the drier drum, and with the exhaust and intake blowers 89 and 91 arranged on opposite sides of the partition 32 beneath the drier compartment 11, that a standard sized household drier drum may be contained in the shortened drier compartment.

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It may still further be seen that a unitary laundry machine has been provided wherein the heavier washing machine is at the bottom of the compartment and the lighter drier is supported thereon in vertically spaced relation with respect thereto, and that the stability of the machine is increased by shortening the drier compartment and locating the air circulating blowers in the space between the washing and drying compartments on opposite sides of the bulkhead and support for the drier drum.

It will be understood that various modifications and variations of the present invention may be effected without departing from the spirit and scope of the novel concepts thereof.

I claim as my invention:

1. In a laundry machine for washing and drying clothes and the like, a cabinet having two vertically spaced laundry compartments, one supported on the other, the lower of which has an upwardly opening cover in its top for access thereto and the upper of which is spaced vertically from the lower of said compartments a distance sufficient to afford access to the lower of said compartments, the upper of said compartments having a drier drum rotatably mounted therein having a perforate rear wall for the circulation of air therethrough, means circulating air through the perforate rear wall of said drier drum comprising a rear wall for the upper of said compartments extending vertically from the lower of said compartments and supported thereon and supporting the upper of said compartments in vertically spaced relation with respect to the lower of said compartments, air ducts extending along the outer side of said rear wall and having communication with said drier drum through said rear wall, and a suction blower in the space between said compartments disposed above the lower of said compartments and forwardly of said rear wall and having communication with one of said ducts through said rear wall, for establishing a circulation of air through said ducts and drier drum.

2. In a laundry machine for washing and drying clothes, a cabinet having two vertically spaced laundry compartments, one supported on the other, the upper of said compartments having a drier drum rotatably mounted therein having a perforate rear end wall for the circulation of air therethrough, a rear support wall for said drier drum and the upper of said compartments, supporting the upper of said compartments on the lower of said compartments and extending upwardly from the lower of said compartments vertically along the perforated rear end wall of said drier drum, inlet and outlet air ducts extending vertically along the rear side of said rear wall and having communication with said perforate wall of said drier drum through said rear wall, a blower in the space between said compartments on the forward side of said rear wall in communication with said outlet air duct and disposed above the lower of said compartments, an exhaust air duct leading along the forward side of said rear wall in the space between said compartments and enclosing said blower, an exhaust passageway for said exhaust air duct leading outwardly through said rear wall, a lint screen in said exhaust passageway, and a door in the space between said compartments, affording access to said lint screen, to accommodate removal thereof for cleaning.

3. In a laundry machine for washing and drying clothes, a cabinet having two vertically spaced laundry compartments, one supported on the other, the upper of said compartments having a drier drum rotatably mounted therein having a perforate rear end wall, means circulating air through the perforate wall of said drier drum comprising a rear support wall for said drum and the upper of said compartments extending upwardly from the lower of said compartments and supporting the upper of said compartments on the lower of said compartments in vertically spaced relation with respect thereto and confronting the perforate rear end wall of said drier

drum, intake and outlet air ducts extending vertically along the rear side of said rear wall and having communication with the perforate wall of said drier drum through said rear wall, a blower in the space between said compartments on the forward side of said rear wall in communication with said outlet duct through said rear wall, an exhaust air duct enclosing said blower and leading therefrom along the forward side of said rear wall, an exhaust passageway from said exhaust air duct leading outwardly through said rear wall, and a duct member movably mounted in said exhaust passageway having an opening in the wall thereof for the circulation of air through an end thereof and also having a lint screen at the discharge end thereof, and means accommodating removal of said lint screen from the front of said cabinet.

4. In a laundry machine for washing and drying clothes, a cabinet having two vertically spaced laundry compartments, the upper of said compartments having a drier drum rotatably mounted therein having a perforate rear wall for the circulation of air therethrough, a rear supporting wall for said drier drum and the upper of said compartments supporting the upper of said compartments on the lower of said compartments and mounted on the lower of said compartments and extending upwardly therefrom to the top of the upper of said compartments, air ducts extending along the outer side of said rear wall and having communication with said perforate wall of said drier drum through said rear wall, a blower in one air duct on the rear side of said rear wall and located in the space between said compartments, for drawing air into said air duct and drier drum, another blower on the forward side of said rear wall in the space between said compartments and in communication with said second air duct for withdrawing air from said drum, an exhaust duct extending along the forward side of said rear wall and enclosing and leading from said second blower, an exhaust passageway leading from said exhaust duct through said rear wall, and a lint screen in said passageway mounted in the space between said compartments in accessible relation from the front of said cabinet for cleaning.

5. In a laundry machine for washing and drying clothes, a cabinet having two vertically spaced laundry compartments, the upper of said compartments having a drier drum rotatably mounted therein having a perforate rear wall, a rear supporting wall for said drier drum and the upper of said compartments supporting the upper of said compartments on the lower of said compartments in vertical spaced relation with respect thereto and con-

fronting the perforate rear wall of said drier drum, air ducts extending along the outer side of said rear wall for the circulation of air through said wall and the perforate rear wall of said drier drum, a suction blower mounted in one of said air ducts and located in the space between said compartments on one side of said rear wall, a second suction blower located in the space between said compartments on the opposite sides of said rear wall and having communication with the other of said air ducts, means for driving said drier drum and blowers comprising a motor mounted in the upper of said compartments and disposed forwardly of said air ducts, and a single belt driven by said motor and engaging the periphery of said drum and having driving engagement with said blowers in a vertical plane disposed forwardly of said rear wall.

6. A clothes drier comprising a cabinet, a drier drum rotatably mounted in said cabinet, said drier drum having a perforate rear wall for the circulation of air therethrough, a bulkhead confronting the perforate wall of said drier drum and extending downwardly beneath said cabinet and supporting said cabinet and drier drum in vertically spaced relation with respect to the ground, a plurality of air circulating openings in said bulkhead in communication with the perforate wall of said drum, an air duct in communication with one opening in said bulkhead, a heating element in said air duct, a blower on the outside of said bulkhead and disposed beneath said cabinet for drawing air into said air duct and drier drum through the perforate wall thereof, another air duct communicating with another opening in said bulkhead and leading downwardly therefrom into the space beneath said cabinet, and a blower associated with said last mentioned air duct on the opposite side of said bulkhead from said first blower, to withdraw air from said drier drum and exhaust air to the atmosphere.

#### References Cited in the file of this patent

##### UNITED STATES PATENTS

1,165,487	Johnson	July 11, 1939
2,495,535	Morrison	Jan. 24, 1950
2,540,724	Geldhof et al	Feb. 6, 1951
2,552,855	Johnston	May 15, 1951
2,555,268	Chamberlin	May 29, 1951
2,566,488	Gould	Sept. 4, 1951
2,609,623	Miller	Sept. 9, 1952
2,615,320	Belaieff	Oct. 28, 1952
2,677,897	Herbster	May 11, 1954