May 31, 1960 L. H. MADDOCK-CLEGG 2,938,366

WASHING MACHINES FOR WASHING CLOTHES AND SIMILAR ARTICLES

Filed Oct. 8, 1957 4 Sheets-Sheet 1

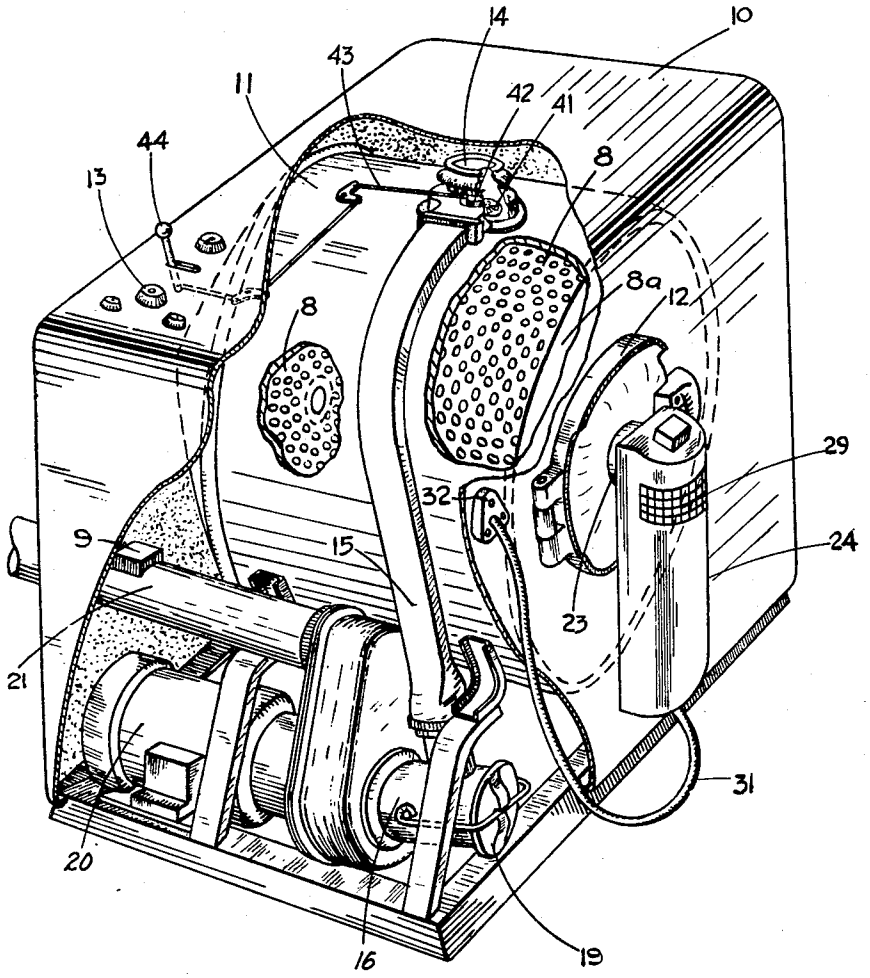


Fig. 1

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Filed Oct. 8, 1957 4 Sheets-Sheet 2

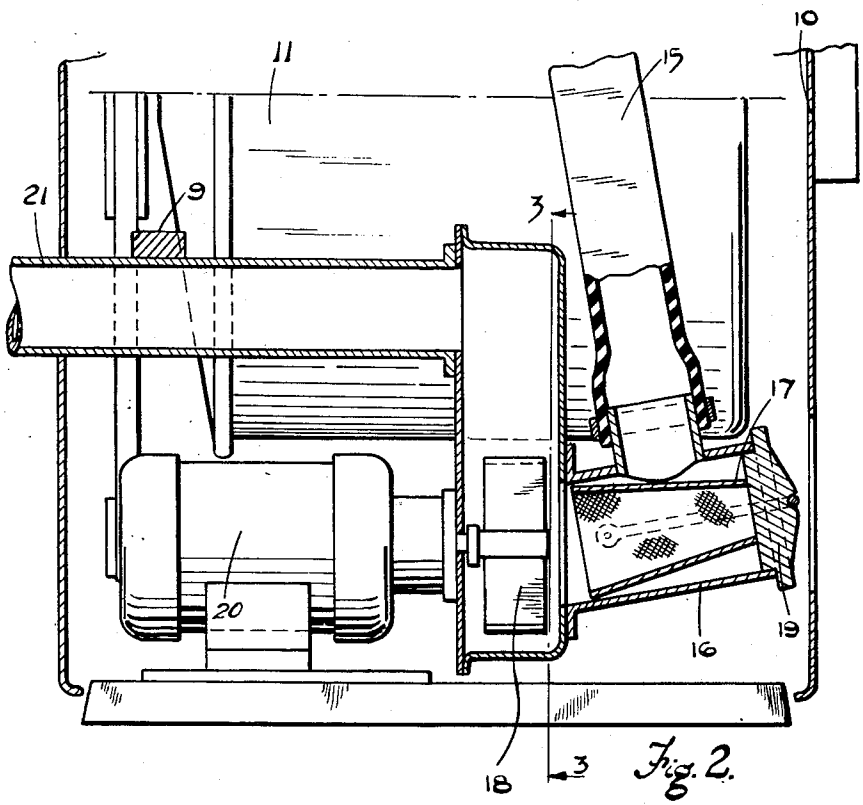


Fig. 2.

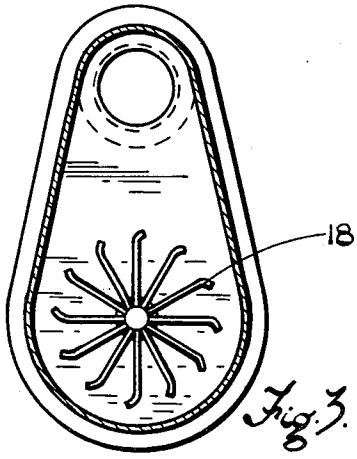


Fig. 3.

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WASHING MACHINES FOR WASHING CLOTHES AND SIMILAR ARTICLES

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Fig. 4.

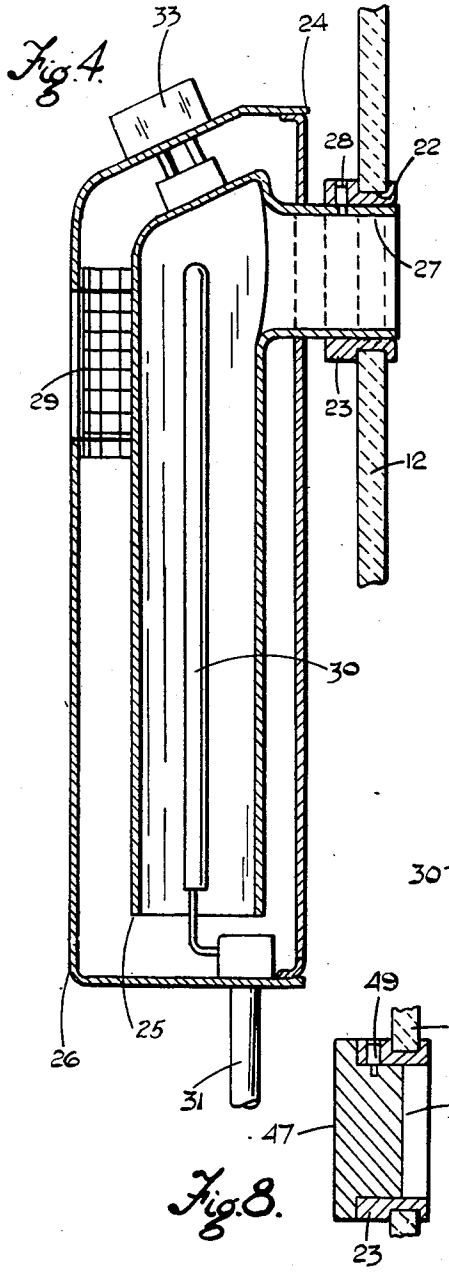


Fig. 5.

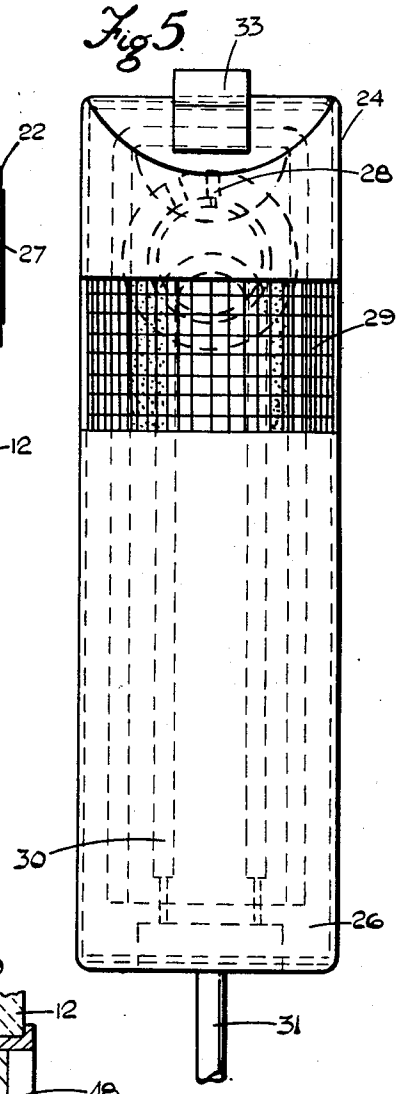


Fig. 8.




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WASHING MACHINES FOR WASHING CLOTHES AND SIMILAR ARTICLES

Filed Oct. 8, 1957 4 Sheets-Sheet 4

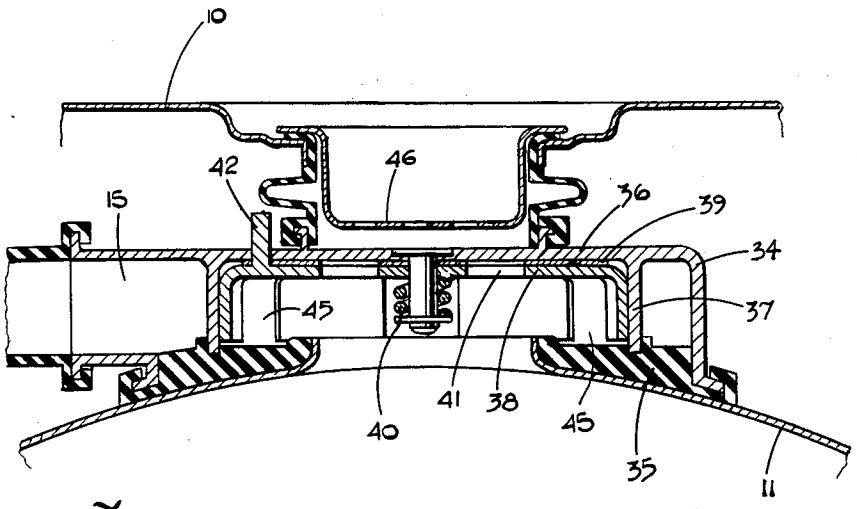


Fig. 6.

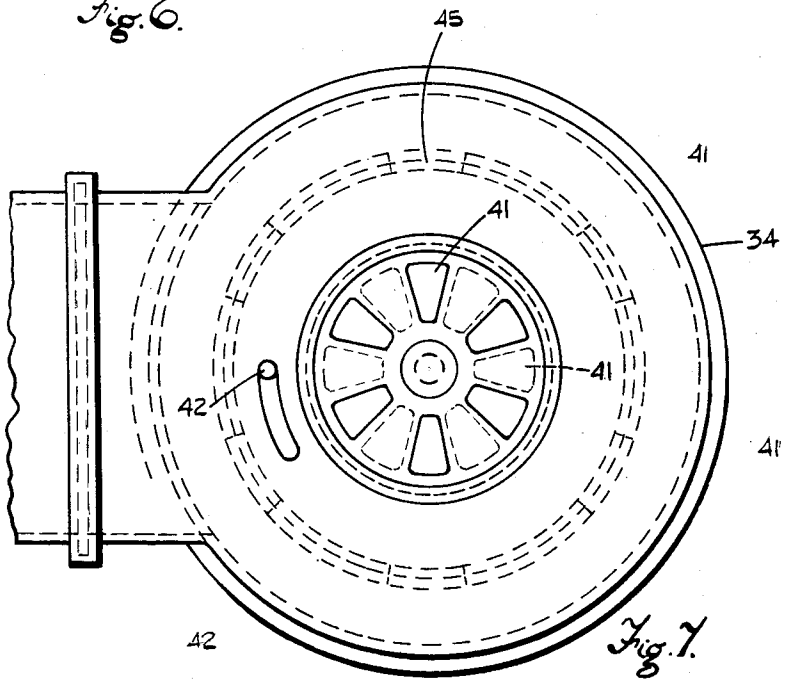


Fig. 7.

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United States Patent Office 2,938,366 Patented May 31, 1960



2,938,366

# WASHING MACHINE FOR WASHING CLOTHES AND SIMILAR ARTICLES

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2 Claims. (Cl. 68—17)

This invention relates to a washing machine for washing clothes and similar articles and is concerned with that particular kind of machine which comprises an outer casing, a basket adapted to contain the clothes or other articles and mounted for rotational movement within the casing about a substantially horizontal axis, the basket having an opening at one end thereof, the casing being provided with a door which is disposed in alignment with the open end of the basket, said door serving to permit of the clothes or the like being positioned in and removed from the basket, the machine further incorporating means for supplying washing liquid to and discharging washing liquid from the basket, together with means for imparting rotational movement, for example, unidirectional rotation, to the basket for the purpose of effecting the washing of the articles therein.

Machines of the foregoing kind as hitherto made have not been adapted to effect drying of the clothes either to the extent to enable them to be ironed or to the extent of effecting complete drying, the machines as normally constructed serving merely to remove surplus water by centrifugal action whereupon a subsequent drying, usually by some form of airing operation, is necessary.

One of the objects of the present invention is to provide an improved machine of the foregoing kind which is capable of effecting drying of the clothes or other articles after the completion of the washing operation, at least to an extent such that they are in a condition for ironing.

A further object of the present invention is to provide clothes or fabric drying equipment which can readily be applied to existing as well as to new machines of the foregoing kind and wherein the construction is such as to enable a machine embodying such equipment to be provided in which the overall space occupied by the machine is not increased or significantly increased as compared with that occupied by a machine not provided with the present invention. This is a feature of importance, having regard to the fact that machines of this kind are commonly used in kitchens or other parts of houses with restricted overall space.

A further object of the invention is to provide clothes or fabric drying equipment for attachment to existing washing machines wherein observation of the washing and drying operations can be continued through a transparent panel, notwithstanding the fact that the drying equipment is fitted to the machine.

In accordance with the present invention we provide for attachment to a washing machine clothes or fabric drying equipment comprising an air supply duct which is open at one end to the atmosphere and which is connected or adapted to be connected at its other end to a hole provided in the door of the machine, an air heater for heating the air passing through said air supply duct, a second air duct connected or adapted to be connected to the machine so as to be in communication with the periphery of the washing basket, air suction means connected to said second duct and means for closing said hole or the adjacent end of the first mentioned duct when connected thereto against the ingress of washing liquid from the interior of the machine when the machine is being used for washing, the arrangement being such that when the equipment is in its operative relationship with respect to the machine, pre-heated air which flows into the interior of the basket through the door hole at one end of said basket is sucked out from the periphery of the basket by said air suction means through said second duct, from which it is discharged from the machine.



The objects of the invention may be realized by the means described in detail in the following specification.

The invention will appear more clearly from the following detailed description when taken in connection with the accompanying drawings showing by way of example a preferred embodiment of the inventive idea.

In the drawings:

Figure 1 is a perspective view of a washing machine fitted with drying equipment in accordance with the present invention, part of the machine being broken away to show the equipment more clearly.

Figure 2 is a fragmentary sectional side elevation showing a part of the drying equipment fitted to a washing machine.

Figure 3 is a fragmentary sectional elevation taken on the line 3—3 of Figure 2, showing the form of air suction means.

Figure 4 is a sectional side elevation of the air supply duct and its associated heater.

Figure 5 being a front elevational view thereof.

Figure 6 is a fragmentary sectional view showing a valve fitted at the entrance to the second air duct and

Figure 7 is a plan view thereof.

Figure 8 is a sectional view of a plug used for closing the door opening.

Referring firstly to Figure 1, a washing machine for washing clothes and other fabrics comprises the usual outer casing **10** of generally rectangular configuration, in the upper part of which is disposed an inner cylindrical casing **11** which is adapted to receive the washing liquid. The axis of said cylindrical casing **11** is horizontal and within said inner casing is mounted a clothes receiving basket **9** of hollow cylindrical configuration and adapted for rotation about a horizontal axis. Said basket **9** is open at one end *9a* adjacent the front side of the machine and the outer casing **10** of said machine is provided with the usual door **12** hinged about a vertical axis adjacent one lateral side thereof, said door being provided centrally with a circular transparent panel in alignment with at least the center portion of the basket opening.

The machine would be provided with the usual electric motor (not shown) for effecting rotational movement of said basket at two different speeds, namely, a lower washing speed in the course of which the articles are tumbled inside the basket and a higher centrifuging speed during which the excess rinsing water is centrifugally extracted.

The machine would further be provided with means for supplying hot and cold water thereto, together with, as is customary with this particular form of machine, automatic electrically operated control means controlled by a settable timing device whereby the washing, rinsing, and centrifuging operations may be performed automatically at predetermined time intervals once the operation of the machine has been initiated, the machine controls being grouped together as indicated generally by reference numeral **13** at the back of the top of the machine.

At the top of the machine would be provided the usual opening **14** for supplying a predetermined quantity of

washing material such as soap powder through the top of the inner casing **11** into the interior thereof, said opening being in the form of a short tube extending between the inner and outer casings. The outer end of said soap supplying opening would be closed by a spring loaded hinged lid.

Extending from one side of said soap supplying opening is an air duct **15** constituting the second duct above referred to, such duct being of curved configuration so as to lie around the exterior of the adjacent side of the inner cylindrical casing **11** and being of elongated, for example, rectangular form in cross section as may be seen from Figure 1.

Said duct **15** extends to a position within the interior of the outer casing **10** near the base of the machine and there communicates with the periphery of a substantially horizontally extending tube **16**, one end of which extends to the front of the machine. Said tube **16** contains a removable filter **17** of gauze type for collecting on its exterior lint from the clothes so as to prevent it from passing to the suction fan **18** on the suction side of which the inner end of the filter tube **16** is connected. Said filter **17** is mounted on one end of a plug **19** housed removably in the adjacent front well of the outer casing, access to the filter being obtained through a service door in the outer casing of the machine.

The fan **18** is of the known type in which the inflow is directed axially and discharge directed peripherally and is driven by its own motor **20**, which is in axial alignment therewith, the discharge port of the fan **18** being connected to one end of a discharge tube **21**, the opposite end of which would be arranged externally of the room in which the machine is located for the purpose above described. Said fan **18** would be arranged to deliver the air along said pipe **21** at a sufficient pressure as to effect discharge therefrom against the pressure of the surrounding atmosphere.

The door **12** which, in this particular embodiment, is provided with a transparent panel through which the washing operations may be viewed is formed centrally with a hole **22** (see Figure 4). Mounted in said hole **22** and in alignment with the axis of rotation of the washing basket is a socket member **23** provided with slots of the bayonet type so as to be adapted to receive one end of an air supply duct **24**, this duct being the first mentioned air supply duct above referred to.

Said duct **24** is of generally elongated configuration comprising concentric inner and outer ducts **25** and **26**, the inner duct **25** being formed adjacent one side of one end thereof with a laterally directed opening **27**, which is adapted to be detachably connected to the door panel socket **23** aforesaid, the laterally directed opening having an outwardly projecting pin **28** which may be entered into the slot of the bayonet connection provided in the socket **23**. The two concentric ducts **25** and **26** are in communication with each other at the free or in situ lower end of the inner duct **25**, as may be seen in Figure 4, and the outer duct **26** has an air inflow opening **29** at the upper end thereof.

Within the inner duct **25** is arranged an air heater **30**, this being of the electric resistance type provided with a flexible lead **31**, which may be connected by means of a plug **32** to an electric socket conveniently provided on the front of the machine casing **10**. The arrangement is such that during the washing operation the air supply duct or unit **24** is removed completely from the machine and the socket member **23** closed by a removable liquid tight plug **47** (see Figure 8) having a closed end **48** and being provided with a pin or spigot **49** for entering the bayonet connection in the socket **23**.

During the drying operation the unit **24** would be mounted in position so that it extends in a downward radial direction in relation to the center of the door **12**, as shown in Figure 1, and we may provide means (not shown) for locating said unit **24** in this vertically depending position. Alternatively, the unit **24** may extend across a substantially vertical diameter of the door but in either case the arrangement may be such that the door can be opened with the unit **24** attached thereto.

The outer duct **26** of the unit **24** may, if desired, be provided with some form of heat insulating covering, although this is not essential in view of the provision of this outer duct which serves to insulate the heater **30** from the surrounding atmosphere.

Thus, with the unit **24** mounted on the door of the machine and the fan **18** and heater **30** switched on, preheated air will be sucked out of the periphery of the inner casing **11**, i.e. through the periphery of the washing basket which is provided in the usual manner with a large number of peripheral holes, the heated air entering the interior of the inner casing **11** and basket along the central longitudinal axis thereof from the air supply duct unit **24**.

We may, if desired, provide a timing switch (not shown) for controlling the operation of the fan driving motor **20** so that once the drying operation has been initiated, it continues for a predetermined time and is then automatically arrested without any further intervention on the part of the user. This timing switch would serve to control the circuits of both the fan motor **20** and the heater **30** and may be so arranged as to cut off the heater circuit a short while before, instead of simultaneously with, the fan motor circuit so as to utilize residual heat in the heater and thereby carry out the drying operation with the maximum economy. This arrangement also avoids undue overheating of the heater element which might otherwise occur if the heater were energized with the fan **18** not running.

As a further precaution, we also provide in association with the circuit to the heater **30** a thermally responsive trip switch **33**, which is connected to the heater **30** in the known manner in order to cut off the heating current in the event of the heater temperature rising too high. A second thermally responsive trip switch **9**, is provided on the discharge side of the fan **18** and is similarly connected to the heater circuit.

The machine would be provided in the known manner with a manually operated two-position master control switch which, in one position, sets the machine for washing, followed by centrifugal spin drying of the clothes, and in another position sets the machine for hot air drying of the clothes in the manner already described, and the timing switch above referred to would be arranged in series with this master control switch, the arrangement being such that the master control switch would be set to the hot air drying position so as to drive the basket at washing, i.e. tumbling, speed and under the control of the timing switch.

Referring now to Figures 6 and 7, there is shown therein a valve arrangement adapted to provide connections between the interior of the inner casing **11** and the soap inlet to the machine or, alternatively, the interior of the second duct **15**. Said valve comprises an outer cup shaped member **34**, which is stationarily mounted in a rubber moulding **35** affixed to the top of the inner casing **11**. Said cup shaped member **34** has a flat base portion **36** and a downwardly depending cylindrical wall portion **37**. Mounted for rotational movement about a vertical axis within said cylindrical wall portion **37** is a further cup shaped member **38**, also provided, as shown, with a flat base portion and a cylindrical wall portion. Affixed to the upper side of the flat base portion of the member **38** is a sealing washer **39** and the two relatively movable members **34** and **38** are urged into contact over their flat base portions by means of the spring **40**. In both the flat base portions of the two members **34** and **38** are cut a plurality of spaced apertures **41**, the arrangement being such that the two series of apertures may be placed in alignment with each other by rotating the inner member **38** by means of the upwardly projecting member **42**, said

member 42 being connected by means of a suitable linkage 43 to an operating lever 44, as shown in Figure 1. The cylindrical wall portions of the two members 34 and 38 are also each provided with a series of spaced apertures or slots 45 and these may also be brought into alignment with each other by rotating said inner member 38 with respect to the outer member 34. The arrangement is such that with the two series of apertures 41 in the flat base portions of the members 34 and 38 in alignment with each other, the other two series of apertures 45 in the cylindrical wall portions of said members 34 and 38 will not be in alignment with each other. Thus, in one position of the rotatable inner member 38 a connection is made between the interior of the cylindrical casing 11 and the exterior casing 10 of the machine so that soap powder or other washing material may be admitted into the casing 11 via the soap container 46 formed over its bottom surface to a grid-like configuration. Since the washing basket 8 is disposed within the interior of the casing 11 the said two series of apertures 41 when in alignment with one another provide the outer casing 10 with an inlet opening which is adapted to supply soap to the washing basket within the inner casing 11. When it is desired to initiate the drying operation, the valve operating lever 44 is moved to rotate the inner valve member 38 so that the two series of apertures 41 are moved out of alignment, thus bringing into alignment the two series of apertures 45. In this position a connection is made between the interior of the casing 11 and the interior of the duct 15 thereby placing the end of duct 15 adjacent the aforementioned soap inlet opening in communication with the interior of the casing 11 and thus with the interior of the washing basket 8 through the open end 8*a* thereof which is adjacent the front side of the machine as already mentioned. Such connection of the duct 15 to the interior of the washing basket 8 serves to effect drying in the manner above described.

With the machine in a condition for drying, the only projection beyond the front wall of the machine is that offered by the removable air heater unit 24, i.e. a projection of some 2" to 3" only, which in no way interferes with the free passage of the operator past the front of the machine, which is a feature of importance where, as is commonly the case, space is restricted. At the same time the invention can readily be applied to existing as well as to new machines of the particular form described.

The starting switch for the main or basket driving motor (not shown) would preferably be of the centrifugal type so arranged as to prevent the heater circuit being closed until the basket driving motor has reached a predetermined speed at which the circuit to the starter windings is opened so as to avoid overloading of the supply circuit which might otherwise occur if the basket driving motor is started from rest simultaneously with the switching on of the heater circuit.

Provision would also preferably be made for ensuring that in the event of the main basket driving motor ceasing to operate the current supply to the resistance heater is cut off so that undesirable overheating of the clothes consequent on stoppage of the main motor is avoided. Further, an additional refinement in association with the air heater circuit may be a glow lamp adapted to provide a visual indication to the operator when the air heater is switched on.

To facilitate the application of the invention to existing machines, the motor 20, fan 18, and filter assembly 17 may all be constructed as a sub-assembly adapted for mounting on the machine chassis.

With the present invention it is found possible after spin or centrifugal drying in the known manner to dry in a condition for ironing some 8 lbs. of clothes in a machine of the specific form referred to adapted for domestic use within the period 50–70 minutes, while, if desired, by continuing the drying operation the clothes may be completely dried, and the design of the heater may be such as to give an air delivery temperature to the basket of the order of 250° F. and an exhaust temperature into the discharge pipe 21 of the machine of about 110° F.

What I claim then is:

1. In a washing machine having an outer casing, a washing basket rotatable about a horizontal axis within said casing and a door in the casing providing access to the basket, the provision of fabric drying equipment comprising in combination a detachable air supply duct open at one end to the atmosphere and adapted to be connected at its other end to a hole provided in the door of the machine, an electrically operated air heater disposed within said air supply duct for heating the air passing therethrough, a second air duct fixed in position within said outer casing, said outer casing having an inlet opening adapted to supply soap to the washing basket, one end of said second air duct having an air supply opening communicating with the surrounding atmosphere and being adapted at its other end to communicate with the interior of the washing basket adjacent said soap inlet, valve means for controlling the communication of said other end of said duct with said washing basket interior, said valve means operating to close said soap inlet when the second air duct is in communication with the interior of the washing basket and to close said second air duct when the soap inlet is open, air suction means connected to said second air duct, and means for closing said hole in the door of the machine when said air supply duct is removed therefrom.

2. In a washing machine having an outer casing, a washing basket rotatable about a horizontal axis within said casing and a door in the casing providing access to the basket, the provision of fabric drying equipment comprising in combination a detachable air supply duct open at one end to the atmosphere and adapted to be connected at its other end to a hole provided in the door of the machine, an electrically operated air heater disposed within said air supply duct for heating the air passing therethrough, a second air duct fixed in position within said outer casing, said outer casing having an inlet opening adapted to supply soap to the washing basket, one end of said second air duct having an air supply opening communicating with the surrounding atmosphere and being adapted at its other end to communicate with the interior of the washing basket adjacent said soap inlet, valve means for controlling the communication of said other end of said duct with said washing basket interior, said valve means operating to close said soap inlet when the second air duct is in communication with the interior of the washing basket and to close said second air duct when the soap inlet is open, an air filter unit connected to said second air duct, access to said air filter unit being obtained through an aperture provided in the front of the casing, air suction means connected to said air filter unit and in communication with said second air duct through said filter unit, an exhaust duct fixed within said casing and connected at one end to said air suction means and having an aperture for discharging air externally of the casing, and a removable plug for closing said hole in the door of the machine when said air supply duct is removed therefrom.

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

UNITED STATES PATENTS

| | | |
|---|---|---|
| 2,555,268 | Chamberlin | May 29, 1951 |
| 2,608,003 | Tucker | Aug. 26, 1952 |
| 2,629,810 | Ditlow | Feb. 24, 1953 |
| 2,737,799 | Knipmeyer | Mar. 13, 1956 |
| 2,827,783 | Handley | Mar. 25, 1958 |