Dec. 17, 1968 R. R. CANDOR ETAL 3,416,334

WASHING AND/OR DRYING MACHINE

Original Filed Sept. 21, 1966 2 Sheets-Sheet 1

FIG-1

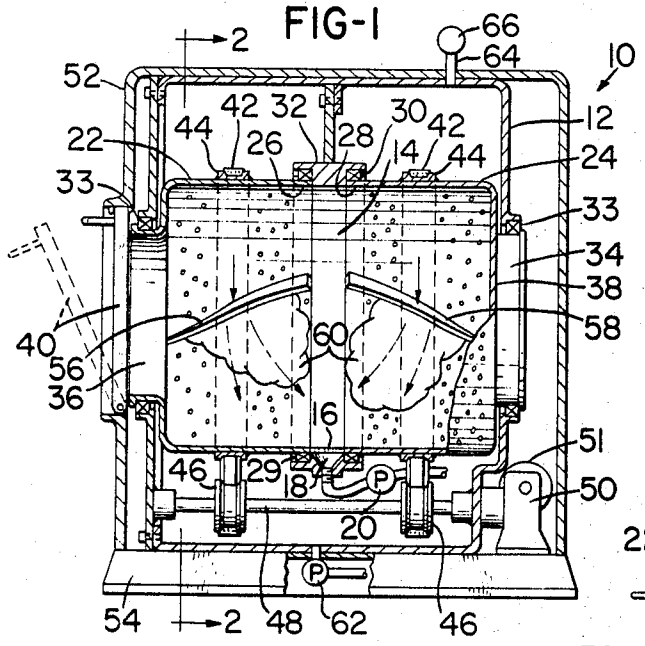


FIG-4

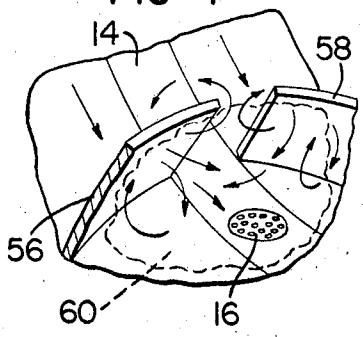


FIG-3

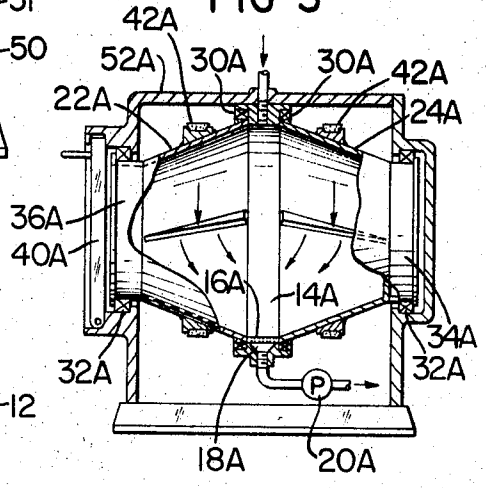


FIG-2

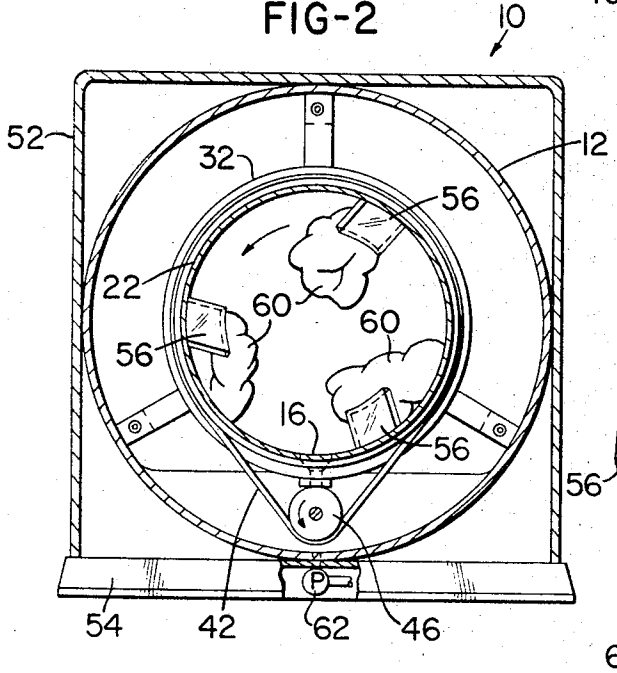
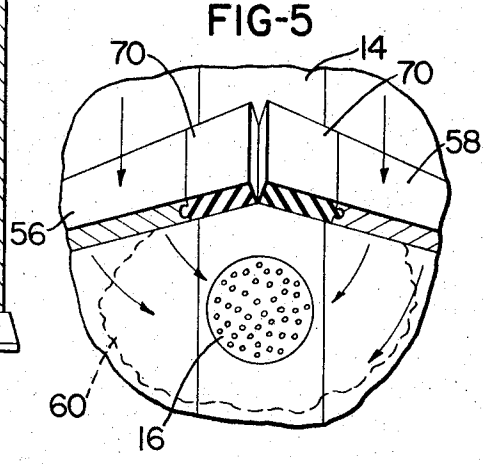


FIG-5



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WASHING AND/OR DRYING MACHINE

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FIG-6

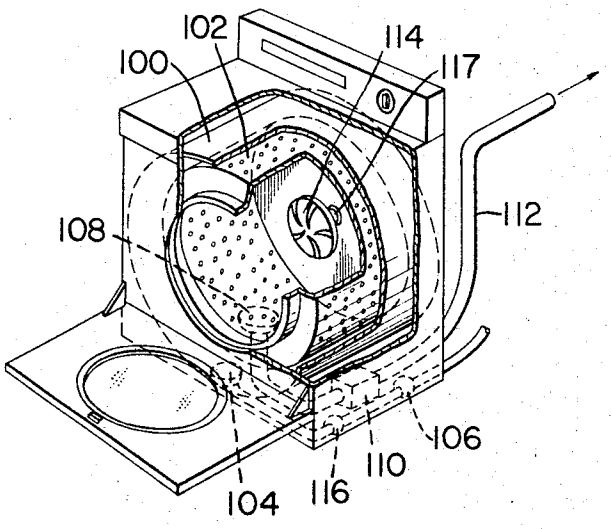


FIG-7

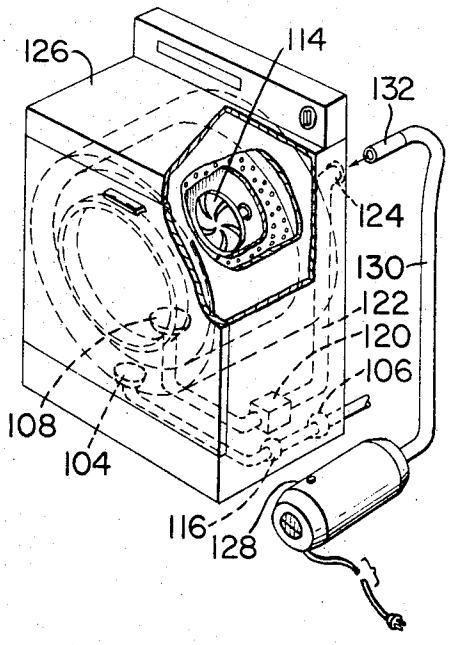
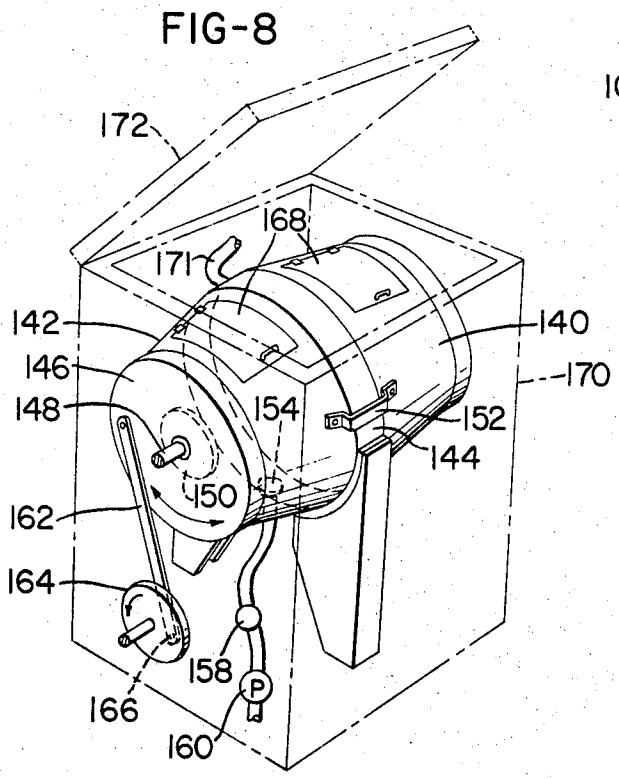


FIG-8



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3,416,334

WASHING AND/OR DRYING MACHINE

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Continuation of application Ser. No. 544,192, Sept. 21, 1966. This application Sept. 22, 1967, Ser. No. 669,970
10 Claims. (Cl. 68—20)

ABSTRACT OF THE DISCLOSURE

This disclosure relates to a laundry machine having a stationary laundry supporting portion disposed intermediate two movable laundry supporting portions with the stationary laundry supporting portion having a foraminous nozzle inlet means connected therewith whereby movement of the movable portions will move wet laundry and the like across the formainous part of the stationary portion and have the moisture thereof removed by means causing a large volume of air to flow from the confining means through the wet laundry and into the nozzle inlet means.

This application is a continuation of application 544,192 filed Sept. 21, 1966, now abandoned.

This invention relates to a washing, dry cleaning, and/or drying machine for laundry and other materials.

Washing, dry cleaning and drying of laundry and other materials, according to this invention, advantageously may be performed by forcing air through the laundry by applying a vacuum to a portion of the laundry and withdrawing air from such portion along with liquid, such as water and/or moisture or vapor to remove the liquid, moisture and vapor as desired. An advantage may be obtained in the operation of such apparatus, and in the practice of the method by providing a nozzle construction past which the laundry and other materials may be moved in direct contact with the nozzle, efficiently to impart or produce the vacuum adjacent the laundry.

Another advantage of this invention provides a movable laundry containing casing adjacent to a stationary nozzle construction, over which the laundry can be moved in direct contact with the nozzle construction.

Other embodiments for applying a pressure differential or vacuum to the laundry and other articles are provided by this invention, as is evident from this description, the appended claimed subject matter, and/or the accompanying drawings, in which:

FIGURE 1 is a diagrammatic vertical cross section of an embodiment of this invention.

FIGURE 2 is a diagrammatic cross section transverse to FIGURE 1, taken along the line 2—2 of FIGURE 1.

FIGURE 3 shows another embodiment of this invention diagrammatically in a vertical cross section.

FIGURE 4 is an enlarged diagrammatic perspective view showing the action of baffles moving laundry and the like past the nozzle construction and forcing such laundry, over and past the nozzle construction.

FIGURE 5 is another embodiment, somewhat similar to that shown in FIGURE 4, showing flexible extensions for the baffle construction to extend over the nozzle construction.

FIGURE 6 is a diagrammatic perspective view showing another embodiment of this invention.

FIGURE 7 is a diagrammatic perspective view of another embodiment of this invention.

FIGURE 8 is a diagrammatic perspective view of another embodiment of this invention.

Referring first to FIGURES 1 and 2, a laundry apparatus or the like, according to this invention, may include

a confining means or washing machine **10** for receiving wet laundry or the like. Such washing machine may include, in FIGURES 1 and 2, a stationary liquid retaining tub construction **12** within which a stationary ring-like nozzle construction **14** is located. The stationary nozzle construction **14** may be in the form of a vertically disposed ring construction, the major or upper portion of which may be unperforated. However, the lower part of the ring nozzle construction may have a perforated portion or bare air inlet means **16**, which forms an effective nozzle part of the ring construction. The remainder of the ring construction may include a funnel construction **18** on the outside of the perforated portion **16**, and which is connected to a vacuum pump **20** capable of withdrawing large volumes of air through the perforated portion **16** to remove liquid and vapor of said liquid from laundry which may be placed over such perforated portions or bare inlet means **16**.

A pair of cylindrical, cylindraceous, or cuplike members **22** and **24** may be placed with their rims **26** and **28** adjacent the stationary ring nozzle construction **14**. The cylindrical members **22** and **24** may be perforated, to permit the flow of water or other liquid therethrough, from the outer casing portion or liquid confining means **10** into the inner cup portions **22** and **24**, and vice versa.

The members **22** and **24** may be sealingly secured and supported adjacent the ring nozzle construction **14** and may be provided with carrying and supporting constructions to maintain the cup portions **22** and **24** aligned with each other, and with ring nozzle construction **14**. To this end, sealing and bearing members **29** and seals **30** may surround the cup rims **26** and **28**. A flange construction **32** surrounds the cylindrical stationary nozzle construction **14** and the sealing and bearing members **29**. Additional sealing and bearing constructions may be provided at **33** and may support the outer end ring constructions **34** and **36**.

The ring construction **34** may be at the rear end of the machine and may be provided with an imperforate wall **38**, if desired. The ring construction **36** may be a clothes removing and inserting open ring portion, through which the laundry may be inserted and removed from the apparatus. The usual door construction **40** may be provided for the apparatus, which may be of the character now well known and which is capable of sealing the ring construction **36** to prevent the outward splashing of water as the machine operates.

The members **22** and **24** may be rotated by any suitable means, such as by a pair of belts **42**, which engage pulley constructions **44** on the cup members **22** and **24**. Other pulley constructions **46** may be provided on the shaft **48**. The belts **42** may pass over the pulley constructions **44** and **46**, to rotate the members **22** and **24** at any desired speed. The shaft **48** may be driven by any suitable drive means **50**, which may be a motor **51** with gear reduction means, or may be a gear reduction means which is connected to a motor, not shown, as desired.

The tub **12** may be encased in a casing **52**, which is supported on a base **54**.

Slanting baffles **56** and **58** may be provided on the interior of the members **22** and **24**. These baffles **56** and **58** are so shaped that they tend to urge the laundry **60** inwardly into the ring or nozzle construction **14**, in a manner to cause the laundry to pass over the perforations or perforated portions **16**, FIGURES 4 and 5, so that a direct vacuum may be produced on the laundry as it passes the nozzle construction **16**, **18**, so that a vacuum is produced at the proper time during the washing cycle, as desired. The perforated air inlet means **16** may be sufficiently bare so that the laundry **60** can come into substantially direct contact with such inlet means.

A suitable drainage pump **62** may be connected to the bottom of the tub **12**, to withdraw the liquid from the tub **12**, when desired. Suitable liquid introducing means **64**, may include automatic valve means **66** for introducing the desired quantity of liquid at proper temperature and volume and under the control of automatic controllers, now well known, which control the desired proportion of hot and/or cold water or dry cleaning liquid.

In the operation of the apparatus of FIGURES 1 and 2, laundry to be washed or cleaned may be introduced through the opening **36**, after the door construction **40** has been opened. Thereafter, the door construction may be closed. Liquid may be introduced through the inlet **64**, under the automatic control of the valve means **66** to the proper level. The members **22** and **24** may be rotated at a relatively slow speed, in a manner to agitate the liquid and the laundry **60** within the members **22** and **24** for a sufficient length of time to produce the desired washing or cleaning action. During this time the vacuum pump **20** and the drainage pump **62** are not in operation.

When it is desired to remove the main portion of liquid from the tub **12**, the pump **62** is operated, to remove such major portion of the liquid. The tub **12** may then be refilled, if desired, for a proper number of washing or rinsing operations. The vacuum pump **20** may be operated, preferably after liquid has been removed by pump **62** to impose a vacuum on the nozzle construction **16**, **18**, so that a large volume of air is sucked through the laundry, which is then gradually moved across the perforated portion **16** by the baffles **56** and **58** at first to remove excess moisture or liquid from the clothes and eventually to produce a drying action and evaporative action on the laundry as it passes the perforated portion **16**.

Because of the intimate connection of the vacuum action at the perforated portion **16** and the laundry immediately adjacent thereto, a very efficient wringing and drying action is produced on the laundry.

If desired, the cup-like members **22** and **24** may be intermittently or partially rotated so that the baffles **56** and **58** carry an accumulation of clothes over the nozzle **16** and then the cup-like members **22** and **24** may be stopped for an interval of time to permit a stationary vacuum action on the clothes. Then the rotation of the cups **22** and **24** may be resumed to agitate and redistribute the clothes. Then the baffles may again be stopped to place a second accumulation of clothes over the nozzle **16**. This may be repeated several times.

In the embodiment shown in FIGURE 5, the baffles **56** and **58** are sufficiently close to the nozzle construction **14**, **16** so that the laundry is efficiently forced into the zone and immediately over the nozzle construction **16**, as is obvious from FIGURE 4.

If desired, flexible tongues **70**, FIGURE 5, may be dovetailed into the baffles **56** and **58** so that the laundry is given a more intimate and squeezing action as the baffles **56** and **58** pass over the nozzle construction **16** of FIGURE 5.

In the embodiment of FIGURE 3, a casing **52A** may be provided with a stationary ring-like nozzle construction **14A** which has a perforated portion **16A** and a funnel **18A** with a vacuum pump **20A**, which may be a combined air pump and liquid pump, if desired. Cup-like members **22A** and **24A** may be provided with sealing and bearing constructions at **30A** and **32A** to seal the cup rims to the ring **14A**. Belts **42A** may be provided and a door construction **40A** may cooperate with the ring construction **36A** at one end. A closed ring construction **34A** may be provided at the other end.

In general, all of the members which are indicated by reference characters having a suffix A are intended to be substantially the same in general construction as has been shown and described in connection with FIGURES 1 and 2. However, the members **22A** and **24A** are not perforated in FIGURE 3, but are imperforate, and retain the liquid in them without the aid of an additional tub such as tub **12** of FIGURES 1 and 2. By this construction it is possible to provide substantially the same action, without the use of the additional tub **12A** of FIGURES 1 and 2. The belts **42A** may be driven by shaft and pulley constructions similar to those of FIGURES 1 and 2.

The air inlets in the air inlet means **16** and **16A** may be slanted in the direction of the movement of the laundry **60** over such inlet means **16**. The slanting direction of the inlets prevents the edges of the inlet openings from producing any cutting action on the laundry. In addition, if desired, such edges of the inlet openings may be slightly rounded or otherwise rendered smooth, to prevent any such cutting action on the laundry.

It is thus to be seen that a laundry apparatus or the like has been provided at **10** which has a confining means **12** for receiving wet laundry or the like. Such confining means **12** may have a plurality of laundry supporting portion means **22**, **24** and **14**, each portion means supporting such laundry in the confining means **12**. One of the portions **14** defines a bare nozzle inlet means **16** that is in substantially sealed relation with the laundry supported thereon and aligned therewith. Means **50** are provided for causing relative movement between said one portion means **14** and the other portion means **22**, **24**, to align different accumulations of laundry with the nozzle means **16**. Means or pump **20** is provided to cause a large volume of fluid in said confining means to pass through said laundry into said nozzle inlet means when said laundry is aligned with said nozzle inlet means to tend to remove moisture from said laundry in an unimpeded flow between the layer **60** of laundry supported on such one portion **14** and aligned with the bare inlet means **16**.

FIGURE 6 discloses a washing machine of the type disclosed in the patent to R. R. Candor, No. 3,231,909, patented Feb. 1, 1966, modified as herein disclosed. The stationary imperforate tub **100** may contain the perforate rotatable drum **102** which may be similar respectively to the stationary tub **10**, etc., and the rotatable drum **11**, etc., of said Candor patent. A liquid outlet **104** for the tub **100** may be provided that may be similar to outlet **540**, FIGURE 11, of said patent, etc., and such outlet **104** may be connected to a liquid propelling pump **106** to remove liquid from the tub **100** when desired. A vacuum nozzle **108** may be placed adjacent the rotatable perforated drum **102** which may be connected to a vacuum pump **110** to apply a vacuum to the clothes within the drum **102**. The pump **110** may be vented to the atmosphere, or elsewhere, as desired, through conduit **112**.

A vertical disc type of agitator **114** may be rotatable within the drum **102** by means of a shaft **117** which may be coaxial and telescoped with the shaft of the rotatable drum **102**. Such disc type agitator **114** is well known, per se, and therefore is not further described.

The agitator **114** may be rotated while laundry is in the drum **102** and water or other liquid is in the imperforate tub up to a level to submerge the agitator **114**, and with the drain valve **116** closed. During this time the drum **102** may be stationary, if desired.

Many of the parts disclosed in connection with FIGURE 11 of said Candor patent may be omitted in the simplified embodiment of FIGURE 6 of this application, as is obvious.

After the desired agitation and washing or rinsing action has been performed and completed in the drum **102** by the agitator **114**, the agitator **114** may be stopped and the liquid may be removed from the tub **100** by the liquid pump **106** after the valve **116** is opened. Thereafter the wet laundry may have the liquid remaining in such laundry removed by operation of the vacuum pump **110** and the nozzle **108**. During this time, the nozzle **108**

may first remove unvaporized liquid from the laundry and later remove vaporized liquid from the laundry. Such liquid and/or vapor may be discharged through the conduit **112** to a suitable drain or outside outlet as desired.

FIGURE 7 shows an embodiment substantially similar to that shown in FIGURE 6. Similarly shown parts may be substantially identical with those shown in FIGURE 6, so that descriptions thereof are omitted to avoid undue repetition.

However, instead of the vacuum pump **110** and conduit **112** of FIGURE 6, the nozzle **108** of FIGURE 7 may be connected to a moisture condenser **120** which may be connected to a conduit **122** which may be provided with a plug-in outlet or connection **124** at the rear, side or top of the cabinet **126**.

A "vacuum cleaner" **128**, or other vacuum producing unit, may have its suction conduit **130** provided with a plug-in connector **132** which may be plugged in to the outlet or connector **124**. When so connected the vacuum cleaner or vacuum unit **128** may produce a vacuum in the nozzle **108** to produce the same operations described in connection with FIGURE 6.

The vacuum unit **128** may be of the character disclosed in copending application of Robert R. Candor et al., Ser. No. 403,014, filed Oct. 12, 1964. Insofar as common subject matter is concerned, the operations of this application and said copending application may be similar. Reference is made to such application for continuity and more detailed description of such common subject matter. matter.

FIGURE 8 shows an embodiment somewhat similar to combination of features of FIGURES 3, 6 and 7 of this application.

The movable cup-like members **140** and **142** and the stationary ring-like nozzle construction **144** may be substantially the same as cup-like members **22A**, **24A** and nozzle construction **14A** of FIGURE 3. However, the rear ring construction **34** of FIGURE 3 may be changed to the rear ring construction **146** of FIGURE 8. This ring construction **146** may be imperforate, but may be provided with a rotatable agitator shaft **148**, which may be similar to rotatable shaft **117** of FIGURE 6. Such shaft **148** may rotate the disc type agitator **150**, which may be the same as the agitator **114** of FIGURE 6.

The cup-like members **140** and **142** may be drivingly connected together in any desired manner. By way of example, they may be connected by one or more connecting brackets **152** which do not engage the stationary nozzle construction **144** but transfer the rotating or oscillating action of the cup-like members **140** and **142** to each other and also support each other by the action of said brackets **152**.

The vacuum nozzle inlet means **154** may be the same as nozzle inlet means **16A** of FIGURE 3 and may be connected to a suction conduit, having a valve **158** and a suction pump **160** which discharges to a suitable drain, vent, or the like.

In all of the embodiments of this application, the vacuum pumps and suction pumps therein disclosed may be provided with valves on their inlet sides to maintain liquid levels, control vacuum actions, etc., as desired.

The rear ring construction **146** and cup-like members **140** and **142** may be oscillated by connecting rod **162** which may be drivingly connected to the rear ring construction **146** and to an oscillating drive means, such as the rotatable drive disc **164** with its eccentric connection **166** with the connecting rod **162**. This produces an oscillating action in the cup-like members **140** and **142**.

The cup-like members **140** and **142** may have hinged covers **168** with suitable fastening means. The cabinet **170** may have a top cover **172** so that this embodiment may be filled and emptied from the top. Liquid fill means **171**, etc., may be provided.

A new, unobvious, and useful washing, dry cleaning and/or drying machine has been provided by this invention.

What is claimed is:

1. A laundry apparatus or the like comprising a confining means for receiving wet laundry or the like, said confining means having a plurality of portion means, each portion means supporting said laundry in said confining means, one of said portion means defining a nozzle inlet means that is in substantially sealed relation with the laundry supported thereon and aligned therewith, means for causing relative movement between said one portion means and the other portion means to align different accumulations of laundry with said nozzle inlet means, said means for causing said relative movement between said one and other portion means causing the moving portion means to directly contact said accumulation of laundry and move the same from one side of said nozzle inlet means to the other side thereof while said laundry is in said contacted condition, and means for tending to cause a large volume of fluid in said confining means to pass through said laundry into said nozzle inlet means only when said laundry is aligned with said nozzle inlet means to tend to remove moisture from said laundry in an unimpeded flow between the layer of laundry supported on said one portion means and said nozzle inlet means.

2. A laundry apparatus as set forth in claim **1** wherein said one portion means is stationary while said other portion means move relative thereto.

3. A laundry apparatus as set forth in claim **2** wherein said other portion means has means to tend to compress said laundry against said one portion means in aligned relation with said nozzle inlet means.

4. A laundry apparatus as set forth in claim **3** wherein said last-named means comprises baffle means carried by said other portion means.

5. A laundry apparatus as set forth in claim **4** wherein said baffle means includes flexible extensions thereof adapted to extend over said one portion means.

6. A laundry apparatus as set forth in claim **1** wherein said other portion means is foraminous.

7. A laundry apparatus as set forth in claim **1** wherein said portion means cooperate together to provide a liquid retaining chamber in said confining means.

8. A laundry apparatus as set forth in claim **1** wherein said one portion means is stationary and said other portion means comprise two portion means on opposite sides of said one portion means and movable relative thereto.

9. A laundry apparatus as set forth in claim **8** wherein said portion means cooperate together to define a drum-like structure.

10. A laundry confining means having a stationary nozzle means with a stationary nozzle having a bare air inlet means exposed to the interior of said confining means, moving means for moving wet laundry over said bare air inlet means while said bare air inlet means is stationary relative to said moving wet laundry and is in substantially sealed relation therewith, said moving means directly contacting said wet laundry while moving the same from one side of said bare air inlet means to the other side thereof, and means to cause a large volume of air to pass through said laundry and into said bare air inlet means while said wet laundry is aligned and sealed therewith.

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WILLIAM I. PRICE, *Primary Examiner.*

U.S. Cl. X.R.

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