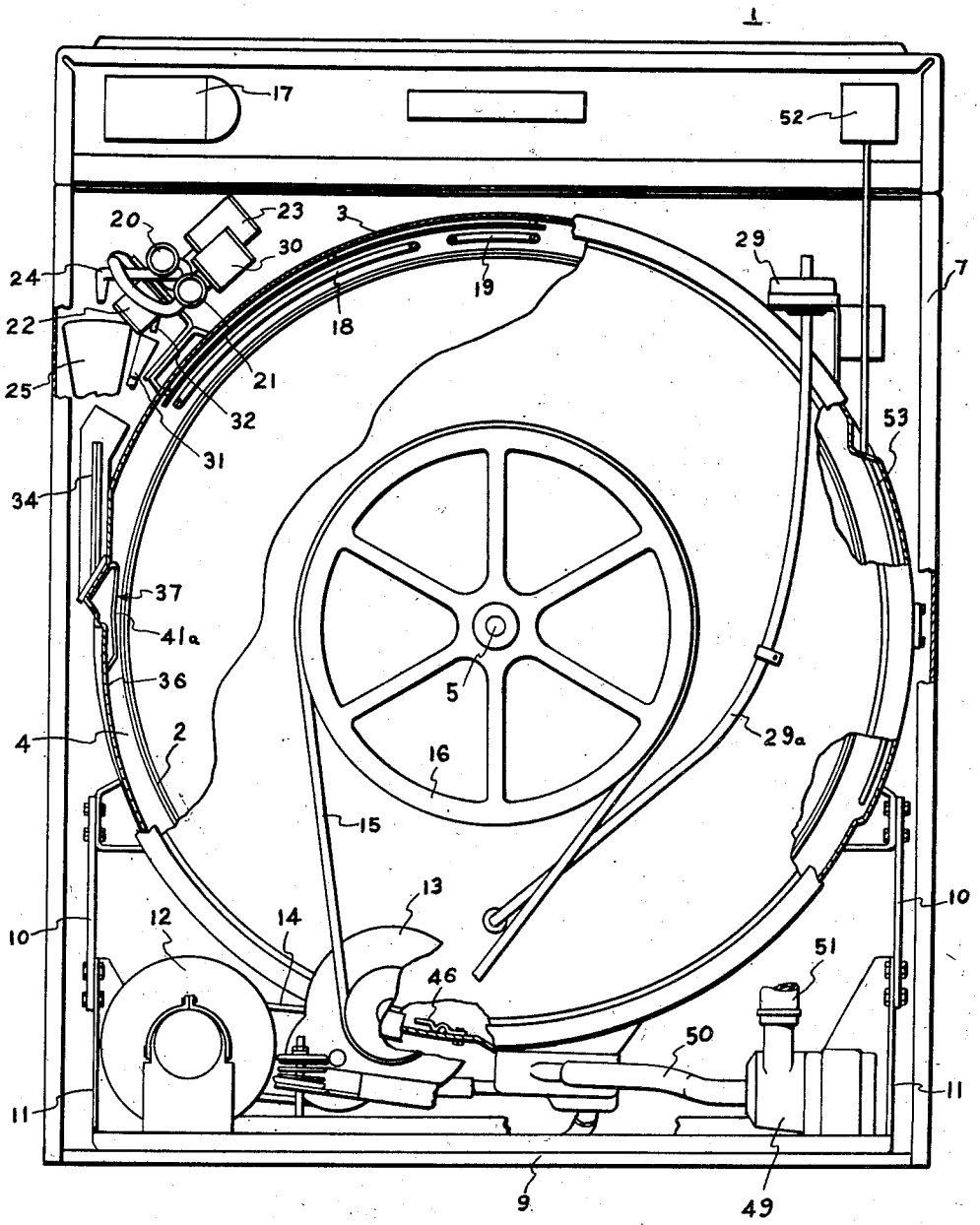
Feb. 25, 1958 J. W. TOMA 2,824,385

WATER SPREADER FOR CLOTHES DRYING MACHINE

Filed Sept. 14, 1956 4 Sheets-Sheet 1

FIG. 1



INVENTOR.
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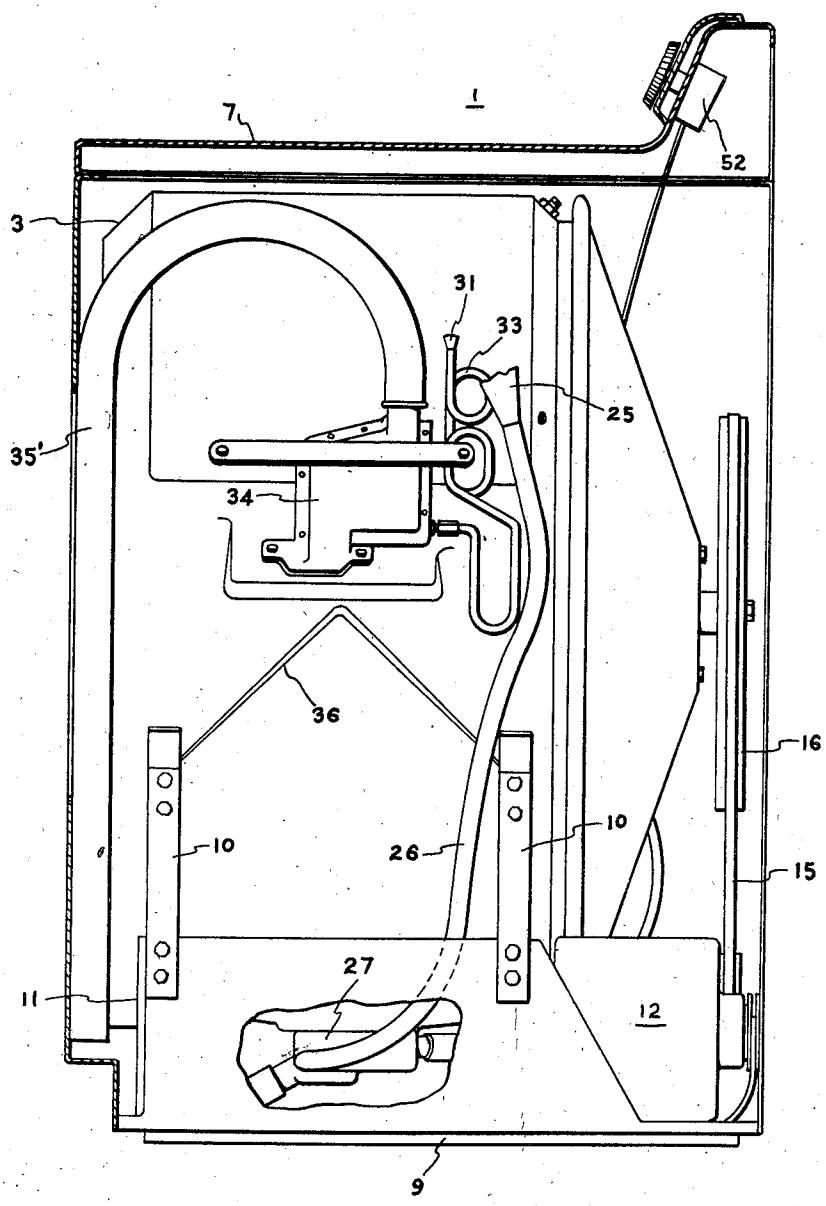
HIS ATTORNEY

Feb. 25, 1958 J. W. TOMA 2,824,385

WATER SPREADER FOR CLOTHES DRYING MACHINE

Filed Sept. 14, 1956 4 Sheets-Sheet 2

FIG. 2



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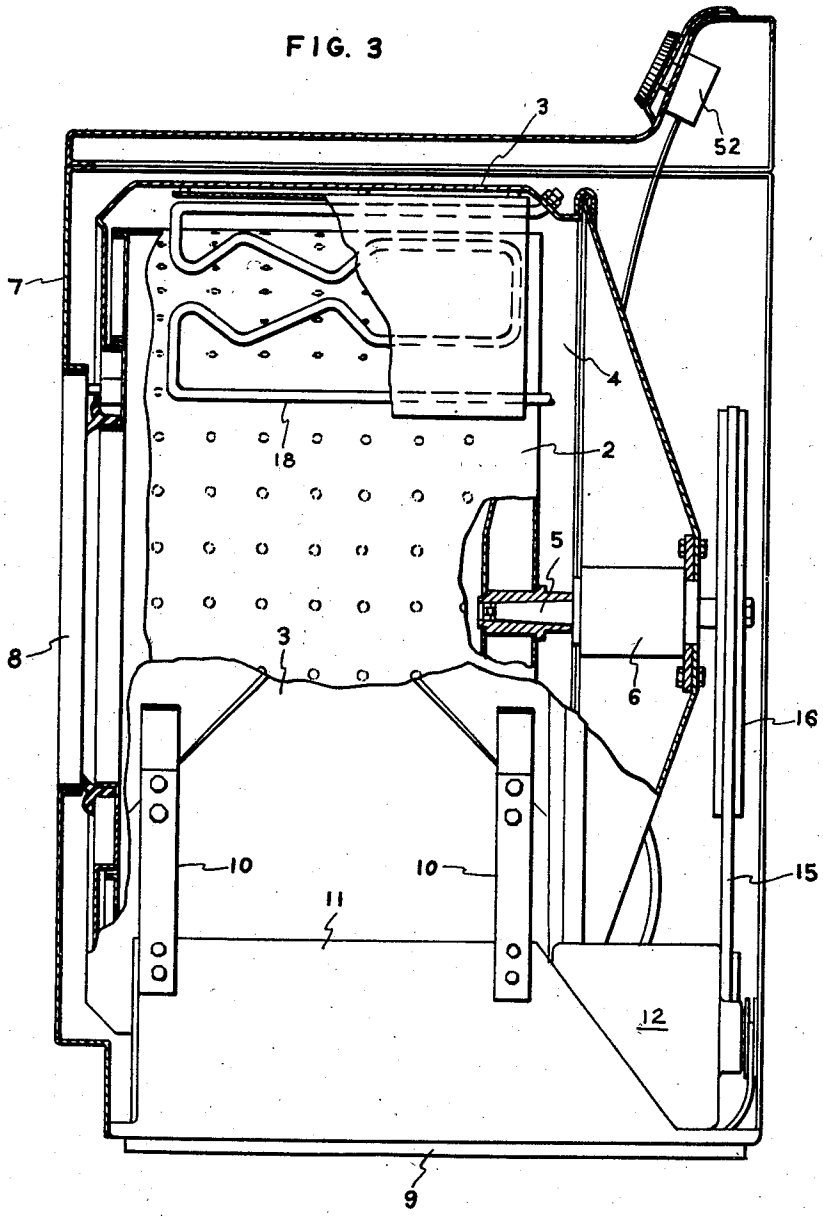
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WATER SPREADER FOR CLOTHES DRYING MACHINE

Filed Sept. 14, 1956 4 Sheets-Sheet 3

FIG. 3



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Feb. 25, 1958 J. W. TOMA 2,824,385

WATER SPREADER FOR CLOTHES DRYING MACHINE

Filed Sept. 14, 1956 4 Sheets-Sheet 4

FIG. 4

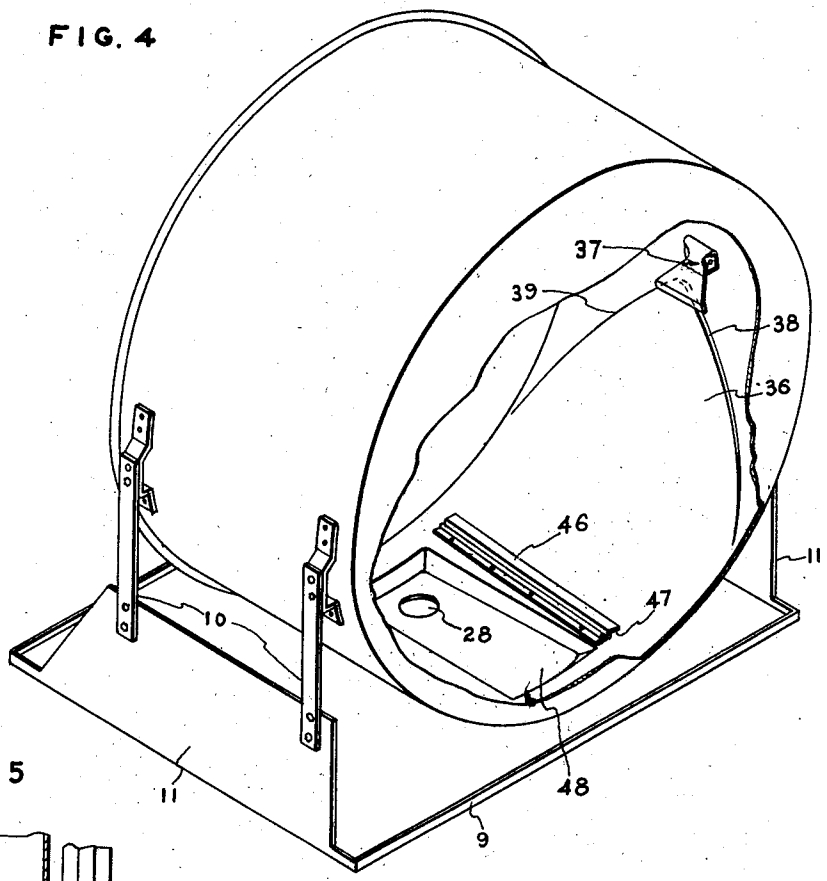
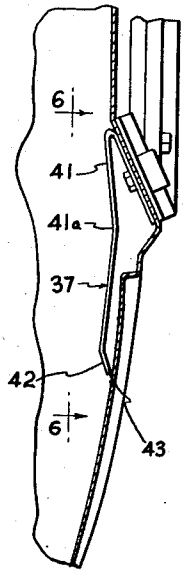


FIG. 5



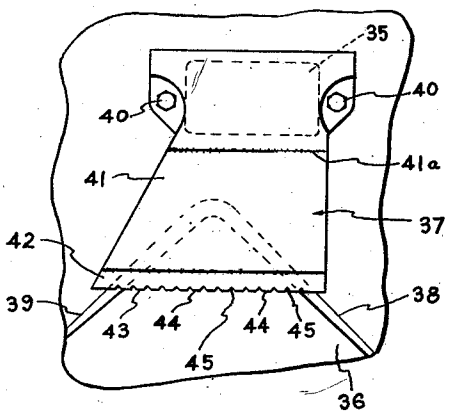


FIG. 6

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United States Patent Office 2,824,385 Patented Feb. 25, 1958

2,824,385

WATER SPREADER FOR CLOTHES DRYING MACHINE

John W. Toma, Louisville, Ky., assignor to General Electric Company, a corporation of New York

Application September 14, 1956, Serial No. 609,854

2 Claims. (Cl. 34—75)

My invention relates to a clothes drying machine and more particularly to such machines in which cold water is flowed down a wall of the drying chamber during the drying operation to condense the moisture extracted from the clothes. It will be understood that by clothes drying machines I mean both clothes dryers and combination washer-dryers since my invention may be applied to both. My invention is in fact described in detail hereinafter as applied to a combination washer-dryer.

To obtain good drying results in a machine in which cold water is flowed down a wall of the drying chamber to act as the moisture condensing medium, it is desirable that the cold condenser water be spread in a wide sheet over the chamber wall. This not only provides a large condensing area but also tends to bring substantially all of the condenser water into contact with the moist air within the chamber for good heat transfer therebetween. In order to spread the condenser water over a wide area various arrangements have been used heretofore, but none of these arrangements have proven wholly satisfactory. Either they have resulted in an uneven distribution of the water across the the wall of the chamber, or else they have been subject to clogging, or in some cases both. For example, perforated troughs or tubes have commonly been used for the distribution of condenser water and these troughs or tubes have been subject to both clogging and uneven distribution. Any foreign matter contained in the condenser water tends to plug the perforations and often there is a greater discharge of water from the perforations at the inlet end of the troughs or tubes than from the perforations at their outer ends.

Accordingly, it is an object of my invention to provide an improved arrangement for introducing cold condenser water onto the wall of the drying chamber of a clothes drying machine, which arrangement is effective to distribute the water into a wide even sheet over the wall without being subject to clogging.

Another object of my invention is to provide a new and improved water spreader element for use in a clothes drying machine, which element may be used with a single water inlet aperture into the drying chamber to distribute condenser water evenly over the wall of the drying chamber.

In carrying out my invention I provide a clothes drying machine having an imperforate tub or casing which defines a drying chamber. Suitable clothes tumbling means are disposed within the drying chamber and a heater is provided for heating the clothes being tumbled so as to extract moisture therefrom. In order to condense the moisture extracted from the clothes the machine is further provided with means for flowing cold condenser water down a wall of the tub on the inner surface thereof. This condenser means includes a condenser water inlet aperture through the wall of the tub and a cold water inlet tube which is connected with the inlet aperture. By my invention there is connected to the tub wall adjacent the inlet aperture a spreader element which is effective to distribute the water entering through the aperture across the wall so as to form a wide condensing sheet thereon. This spreader element includes an upper vertically extending portion which covers the aperture so as to deflect the condenser water downwardly, and a lower portion which acts as a barrier across the downward flow so as to spread the water in a horizontal direction. The lower portion includes a horizontally extending, serrated discharge edge which touches the wall so as to form the barrier for spreading the water, and the spaces between the teeth of the serrated edge provide for the discharge of the condenser water down the wall in a plurality of small closely spaced streams. These closely spaced streams then spread out as they leave the serrated discharge edge and thereby a wide even sheet of condenser water is formed flowing down the tub wall.

The subject matter which I regard as my invention is particularly pointed out and distinctly claimed in the concluding portion of this specification. My invention, however, both as to organization and method of operation, together with further objects and advantages thereof, may be best understood by reference to the following description taken in conjunction with the accompanying drawings in which:

Fig. 1 is a rear elevational view of a combination washer-dryer including my new and improved water spreading arrangement in one form thereof, the view being partially broken away and partially in section in order to illustrate details;

Fig. 2 is a side elevational view of the machine of Fig. 1 with the side panel removed;

Fig. 3 is a side elevational view of the machine with certain surfaces broken away and partially in section in order to illustrate details;

Fig. 4 is a perspective view of the imperforate tub structure of the machine with the clothes basket removed;

Fig. 5 is a fragmentary vertical sectional view showing the improved water spreading means included in the machine; and

Fig. 6 is a fragmentary sectional view taken on line 6—6 of Fig. 5.

Referring now to the drawings I have shown therein a combination washer-dryer 1 which is so constructed and arranged that it proceeds through a sequence of operations first washing the clothes placed therein and then drying them. During the drying portion of the machine operation the clothes are heated so as to extract moisture therefrom and this moisture is condensed by flowing a sheet of cold condenser water down a wall of the drying chamber. As will be explained hereinafter, by my invention I have provided in the machine 1 new and improved means whereby the condenser water is spread over the wall in a wide even sheet.

The machine 1 is of a horizontal axis type, that is, it includes a clothes basket 2 which is rotatable about a generally horizontal axis. The basket 2 is mounted within an outer imperforate tub 3 and the cylindrical side wall of the basket is provided with a plurality of perforations or holes to allow communication between the basket and the chamber 4 defined by the tub. The basket is rotatably supported from the tub 3 by a horizontally extending shaft 5 which is mounted in an elongated bearing 6 (Fig. 3) hung from the rear wall of the tub structure. The shaft 5 as well as supporting the basket 2 also serves to drive it during the operation of the machine. The basket is loaded and unloaded through an opening in the front wall thereof which is aligned respectively with openings in the tub 3 and the outer appearance cabinet 7 of the machine. A hinged door 8 mounted on the appearance cabinet seals around the tub opening so as to close off the chamber 4 during the operation of the machine.

The imperforate tub or casing 3 and the appearance

cabinet 7 are both mounted on a suitable base structure 9 at the bottom of the machine. The tub specifically is mounted thereon by means of a plurality of brackets or arms 10 which are secured to upstanding plates 11 fixedly attached on the base. In addition to the tub and the appearance cabinet, the base 9 also mounts the basket drive means. The drive means comprise a motor 12 and a multi-speed transmission 13 (see Fig. 1). The motor 12 drives the transmission assembly 13 by means of a belt 14 and the transmission assembly in turn drives the basket 2 through a belt 15. The belt 15 specifically turns a basket drive pulley 16 which is mounted on the outer end of the basket drive shaft 5. Transmission assembly 13 is shiftable between two different gear ratios so that the basket 2 may be driven at one speed for tumbling clothes and at a second or higher speed for centrifugally extracting water from the clothes. The clothes tumbling speed may, for example, be about 45 R. P. M. and the centrifugal extraction speed about 200 R. P. M. The means whereby the transmission is shifted between the lower and higher speeds preferably comprises a solenoid operated plunger (not shown).

As mentioned above, the machine 1 is a combination washer-dryer, that is, it proceeds through a cycle of operations first washing and damp drying the clothes and then, if desired completely or fluff drying the clothes. The clothes basket 2 is driven at its lower speed both for washing the clothes and for tumbling them during the drying operation. It is driven at higher speed for extracting both wash and rinse water from them by centrifugal extraction. The machine during its sequence of operation is under the control of a suitable timer operated sequence control 17 which energizes and deenergizes the various electrical components of the machine in a predetermined sequence. Since the sequence control forms no part of the present invention, it will not be described herein. However, a sequence control and circuit suitable for use in the illustrated machine are described and claimed in the copending joint application of myself and John E. Ryan, S. N. 584,658, filed May 14, 1956 and assigned to the same assignee as the present invention.

To heat the clothes during the drying portion of the machine operation and also to heat the wash water during the washing portion of the operation when desired, there is provided in the machine a heater assembly including two heaters 18 and 19. These heaters are mounted within the upper portion of the chamber 4 defined by the tub 3 so that when energized, they heat the basket 2. The heating elements 18 and 19 are preferably of the sheathed type as shown. When they are energized during the washing cycle, they heat the water by first heating the basket. Then as the basket dips into the wash water at the bottom of the tub, it in turn heats the water. In other words, the rotating basket serves as an effective heat transfer means between the heating element and the water or other washing liquid. When the heaters are energized during the drying cycle, the heat transferred to the basket is then passed on to the clothes to cause vapor migration out of the clothes. In other words the heat passed to the clothes causes the moisture contained in the clothes to evaporate out of them. Since the outer cylindrical shell of the basket is perforated, some of the heat from the heating elements passes directly to the clothes by radiation to aid in the moisture removal action.

The means whereby water is admitted to and discharged from the tub 3 during the operation of the machine are particularly shown in Figs. 1 and 2. The water supply means includes connections 20 and 21 through which hot and cold water are supplied to the machine respectively. For the washing operation a valve controlled by a solenoid 22 admits hot water to the machine and a valve controlled by a solenoid 23 admits cold water to the machine. The hot and cold water valves under the control of the solenoids 22 and 23 discharge through a common outlet conduit 24. From the conduit 24 the inlet water passes through a suitable air gap into a funnel 25 and the funnel 25 discharges into a line 26 which leads to a sump 27 mounted at the bottom of the tub. The sump 27 is connected to the interior of the tub, i. e. the chamber 4, by a suitable aperture 28 in the tub bottom (see Fig. 4) and when water is supplied to the sump from the inlet water valves, the water rises upwardly into the tub through aperture 28 thereby filling it. In the illustrated machine a pressure actuated sensing device or water level control 29 (Fig. 1) controls both the inlet water solenoids 22 and 23 to maintain the proper water level in the machine during the washing operation. This sensing device is connected to the interior of the tub 3 by a suitable conduit 29*a*.

The machine 1 is of the type which uses cold water during the drying cycle for condensing the moisture extracted from the wet clothes. Specifically in the machine 1 cold condenser water is flowed down a wall of the tub 3 during the drying operation so as to condense the moisture. The condenser water is admitted to the machine 1 from the cold water conduit 21 during the drying cycle by means of a solenoid actuated valve which is controlled by a solenoid 30 (Fig. 1). The solenoid 30 is energized during the drying operation so that the valve controlled by it passes water at a slow rate sufficient to condense the moisture extracted from the clothes. As shown, the condenser water valve discharges into a funnel 31 through a separate conduit 32. An air gap between the conduit 32 and the funnel prevents supply line contamination. From the funnel 31 the condenser water flows through a line 33 (Fig. 2) into a vent trap device 34 and from the trap device 34 it flows through an aperture 35 (Fig. 6) into the interior chamber 4 of the tub. The vent trap device 34 is intended to seal off the interior of the tub during the drying operation while venting it to a suitable vent hose 35' during the washing operation. In the illustrated vent trap the flow of condenser water during the drying operation acts as the sealing means, and the arrangement of the trap to effect this result and in fact, the venting system as a whole is described and claimed in the copending application of Walter J. Raczinski, S. N. 538,891, filed October 6, 1955, now Patent No. 2,800,008, and assigned to the same assignee as the present invention.

The condenser water entering the tub chamber 4 through the inlet aperture 35 is then flowed down the inner surface of the side wall of the tub in order to condense the moisture being extracted from the clothes as a result of the heat supplied from the heaters 18 and 19. Specifically the water is flowed down the lower quadrant of the tub immediately below the inlet aperture, that is the lower left hand quadrant of the tub as viewed in Fig. 1 or the lower right hand quadrant of the tub as viewed in Fig. 4. In order to distribute the water evenly across the quadrant in a thin sheet there is provided an inverted V-shaped raised area 36 on the tub and a water spreader element 37 which covers or overlies the aperture 35 and the upper end of the raised portion 36. The construction of the spreader element 37 and its arrangement relative to the tub wall, and particularly relative to the raised inverted V-shaped portion 36, comprise one important aspect of my invention.

Referring now to Figs. 4 and 5 it will be noted that the upper end of the raised portion 36 of the tub wall extends upwardly to a point immediately below the condenser water inlet aperture 35. Also, it will be noted that the sides 38 and 39 of the raised portion are somewhat higher near its apex than near its lower end. In other words the inverted V-shaped portion 36 extends slightly further above the rest of the side wall, i. e. protrudes slightly further into the chamber 4, nearer its apex than near its bottom. This configuration may be clearly seen in both Figs. 1 and 4, and as explained below it aids in producing the even distribution of the condenser

water across the tub wall. Since the inverted V-shaped portion **36** resembles a chevron in appearance, it will hereinafter be referred to as the chevron **36** for ease of description.

As will be seen by reference to Figs. 5 and 6 the water spreader element **37** extends from a point above the condenser water inlet **35** to a point slightly below the apex of the chevron **36**. The spreader element is attached to the side wall of the tub by means of a pair of bolts **40** and it includes an upper generally vertically extending portion **41** which overlies the aperture **35**. As the condenser water enters the tub through the aperture **35** it tends to flow against this flat upper portion **41** of the spreader element and be deflected downwardly thereby. In other words the flat upper portion **41** of the spreader element deflects the flow downwardly toward the apex of the chevron **36**.

The flat portion **41** of the spreader element extends generally downwardly to a point somewhat below the apex of the chevron **36**, being angled slightly along the line **41***a* to allow for the curvature of the wall of the tub; and at the lower end of the flat portion the spreader element is provided with an inclined portion or flange **42** which at its bottom edge **43** contacts the surface of the chevron **36**. This edge **43** acts as a barrier to the downward flow of the condenser water and thereby spreads the water in a horizontal direction. In other words it acts as a dam to turn the flow horizontally across the chevron.

In order to pass the flow onto the tub wall as it is spread horizontally, this lower discharge edge **43** of the spreader element is serrated or notched. In other words the discharge edge **43** comprises a plurality of closely spaced, flat headed teeth **44** which contact the surface of the chevron and a plurality of spaces **45** between the teeth whereby water may escape from the spreader. The serrated aspect of the edge **43** may be clearly seen in Fig. 6. When condenser water is entering the machine through aperture **35** so that it is spread horizontally by the spreader **37**, it then escapes from the discharge edge by passing through the spaces **45** between the teeth **44**. As a result a plurality of small closely spaced streams of water are discharged from the spreader onto the surface of the chevron **36**. These streams spread out quickly as they leave the discharge edge **43** and as a result a wide even sheet of water is formed flowing down the surface of the chevron or in other words down the surface of the tub wall.

Besides the streams of water discharged onto the surface of the chevron the spreader element **37** is also effective to discharge a stream of water onto each of the sides **38** and **39** of the chevron. As is clearly shown in Fig. 6 the discharge edge **43** of the spreader extends outwardly on each end past the sides **38** and **39** of the spreader. As a result of this extension of the discharge edge past the sides of the chevron at least some of the condenser water is discharged onto the sides during the drying operation concurrently with the discharge of the small closely spaced streams onto the surface of the chevron. The spaces **45** between the teeth **44** are not large enough to pass all of the condenser water flow and thereby some of it is spread horizontally by the discharge edge until it reaches the opposite ends thereof and flows down the sides **38** and **39**. These streams discharged onto the sides **38** and **39** of the chevron themselves tend to spread as they move down the sides. In other words they overflow the sides onto the surface of the chevron. After coming on to the surface they then spread out and join the sheet formed by the streams leaving the spreader through the spaces between the teeth **44** and thus form a wide homogeneous sheet covering the entire chevron. As shown in Figs. 2, 3 and 4 the chevron near its lower end encompasses almost the entire width of the tub wall and thereby an extremely wide sheet of condensing water is formed flowing down the tub wall. The decreasing height of the sides **38** and **39** as they extend downwardly aid in causing the overflowing onto the surface of the chevron to be a continuous even action from the spreader edge **43** to almost the bottom of the chevron.

It will be noted that my new and improved water spreading arrangement is not particularly susceptible to clogging by any foreign matter which may be contained in the condenser water flow. The single inlet aperture **35** in the tub wall being very large will not clog. The spreader **37** itself will also normally not clog. Any foreign particles tend to flow to the edges of the spreader and be discharged down the sides whereby no clogging occurs. In other words the flow of water to the sides carries the foreign matter with it rather than allowing it to enter the holes **43** and thereby prevents any stoppage of the spreader action.

Adjacent the bottom of the condensing wall on which the chevron **36** is formed, there is mounted a longitudinally extending baffle or dam **46** (Figs. 1 and 4). This dam **46** is inclined downwardly toward the front of the machine and it catches the sheet of condenser water coming down the chevron **36**. It turns the water forwardly toward the front of the dryer and discharges it out its front end **47** in a relatively turbulent stream. The stream then flows backwardly toward the rear of the tub chamber through a recess **48** provided in the tub bottom and thereby an additional condensing action is provided within the chamber **4**. From the recess **48** the condenser water and the condensed moisture are then discharged out of the machine through the drain aperture **28** which leads into the sump **27**. From the sump **27** a motor driven drain pump **49** passes the flow outwardly to the household drain through the hoses **50** and **51** (Fig. 1). The drain pump **49** incidentally also serves as the drain means during the washing cycle of the machine as well as during the drying cycle.

Of course, it will be understood that the condensing sheet could be allowed to flow directly downwardly to the drain without departing from my invention. That is, it could be allowed to enter the drain directly from the tub wall without being passed forwardly to the front of the machine and then back across the tub bottom. However, it had been found that as a result of this latter action a better condensing effect is provided within the drying chamber **4** keeping the temperatures within the chamber lower during the drying operation. It is believed that the dam **46** by breaking up the laminar sheet coming down the tub wall and discharging the water with considerable turbulence across the tub bottom causes new portions or surfaces of the water to be presented to the moist air within the chamber. Thereby an additional condensing action is obtained out of the same water already used to wet and cool the tub wall. The dam **46** and its arrangement to produce this second condensing action are, however, not my invention but rather are fully described and claimed in the copending application of Aidan M. Stone, S. N. 610,022 filed concurrently herewith and assigned to the same assignee as the present invention.

In order to control the length of the drying operation the machine **1** is provided with a thermostat **52**. This thermostat includes a sensing bulb **53** disposed within the chamber **4**, which senses the temperature within the chamber and thus the condition of the clothes being dried. When the temperature within the chamber indicates that the clothes have substantially dried, the thermostat **52** triggers the sequence control **17** so as to terminate the operation of the machine. The clean dry clothes may then be removed from the machine.

Summing up briefly the operation of the machine **1**, it will be understood that the clothes are first tumbled in soapy water to wash them free of soil particles and stain. The wash water is of course introduced into the machine through the inlet valves controlled by the solenoids **22** and **23** and the soap is placed into the machine through

the door 8. After the clothes have been washed for a suitable length of time the wash water is then drained from the machine by the pump 49 and the clothes basket is driven at high speed to extract the wash water from the clothes. Following the extraction of the wash water, clean rinse water is introduced into the machine by means of the water inlet valves and the clothes are tumbled in the rinse water so as to rinse them of suds. Then the rinse water is drained from the machine and the clothes are again spun at high speed. Following the extraction of the rinse water from the clothes, which leaves them in a damp dry condition, the heaters 18 and 19 are then turned on and the basket is driven at tumble speed so as to heat or fluff dry the clothes.

As the machine passes into the drying operation with the heaters 18 and 19 energized, the solenoid 30 of the condenser water valve is energized so that condenser water is passed into the machine through the condenser water inlet 35. This condenser water is spread by means of the spreader 37 and its cooperation with the chevron 36 so that the condenser water flows down the wall of the tub in a wide evenly distributed sheet or film. This sheet or film condenses the moisture extracted from the clothes by the action of the heaters 18 and 19 and carries it down to the drain 23. The small closely spaced streams discharged from the spaces 45 between the teeth of the spreader edge 43 and the streams discharged along the sides 38 and 39 spread out and unite as explained above, to form a particularly effective and even condensing film. When the clothes have been substantially dried by the action of the heaters and the condensing film, the drying cycle is then terminated automatically by the action of the thermostat 52.

While in accordance with the patent statutes I have described what at present is considered to be the preferred embodiment of my invention it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention, and it is, therefore, aimed in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a machine for drying clothes, an imperforate tub defining a drying chamber, clothes tumbling means disposed within said chamber, a heater for heating the clothes being tumbled to extract moisture therefrom, and means for flowing cold condenser water down a wall of said tub on the inner surface thereof to condense said moisture, said wall including an inverted V-shaped raised portion thereon to aid in the distribution of said water across said wall, and said condenser means including a condenser water inlet aperture through said wall of said tub, a cold water inlet line connected to said inlet aperture for introducing condenser water into said tub therethrough, and a spreader element connected to said tub wall for distributing said water across said wall to form a wide condensing sheet thereon, said spreader element including an upper portion covering said aperture for deflecting said condenser water downwardly and a lower portion acting as a barrier across the downward flow for spreading said water in a horizontal direction, said speader extending below and covering the upper end of said raised portion of said tub wall, and said lower portion including a horizontally extending serrated discharge edge touching said raised portion below the top thereof to form said barrier and extending outwardly past the sides of said raised portion, with the spaces between the teeth of said discharge edge providing for the discharge of condenser water onto said raised portion in a plurality of closely spaced streams, and with the extensions of said discharge edge past the sides of the raised portion providing for the discharge of a stream of water down each side of said raised portion, whereby the spreading out of said streams a wide sheet of water is formed flowing said raised portion.

2. In a machine for drying clothes, an imperforate tub defining a drying chamber, clothes tumbling means disposed within said chamber, a heater for heating the clothes being tumbled to extract moisture therefrom, and condenser means for flowing cold condenser water down a wall of said tub on the inner surface thereof to condense said moisture, said wall including an inverted V-shaped raised portion thereon to aid in the distribution of said water across said wall, and said condenser means including a condenser water inlet aperture through said wall of said tub, a cold water inlet line connected to said aperture for introducing condenser water into said tub therethrough, and a spreader element connected to said tub wall and covering said aperture for distributing said water over said raised portion of said wall to form a wide condensing film, said spreader element extending below and covering the upper end of said raised portion of said tub wall and having a bottom flange inclined toward said tub wall to form a barrier for spreading said water horizontally, said bottom flange having a horizontally extending serrated discharge edge touching said raised portion below the top thereof and extending outwardly past the sides of said raised portion, with the spaces between the teeth of said discharge edge providing for the discharge of said condenser water onto said raised portion in a plurality of closely spaced streams and with the extensions of the discharge edge past the sides of said raised portion providing for the discharge of a stream of water down each side of said raised portion, whereby upon the spreading out of said streams a wide sheet of water is formed flowing down said raised portion.

References Cited in the file of this patent

UNITED STATES PATENTS

554,271	Hoag	Feb. 11, 1896
1,803,393	Jones	May 5, 1931
2,680,916	Smith	June 15, 1954