United States Patent [19]

Jeffress

[11] **3,896,572**

[45] **July 29, 1975**

[54] **FLASH/FLOODED BOILER STEAM IRON**

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[73] Assignee: **General Electric Company,** Bridgeport, Conn.

[22] Filed: **May 20, 1974**

[21] Appl. No.: **471,697**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 358,052, May 7, 1973, abandoned.

[52] **U.S. Cl.** **38/77.83**

[51] **Int. Cl.** **D06f 75/06**

[58] **Field of Search**..... 38/77.8, 77.82, 77.83

[56] **References Cited**

UNITED STATES PATENTS

2,837,847	6/1958	Franklin et al.	38/77.82
2,878,600	3/1959	Burmeister et al.	38/77.82
3,274,714	9/1966	Abraham	38/77.83

Primary Examiner—Patrick D. Lawson

Attorney, Agent, or Firm—John F. Cullen; George R. Powers; Leonard J. Platt

[57] **ABSTRACT**

A combination flash/flooded boiler steam iron with a water tank and steam generating soleplate with steam ports and water valve means to meter water to a soleplate boiler. The valve metering means is fixedly sized to permit the flow of water from the tank to the boiler at a first rate selected to maintain the boiler in a flooded condition at a first range of operating temperatures and a second rate selected to maintain the boiler in a flash steam condition at a second range of operating temperatures. A conduit connects the boiler and the upper portion of the tank to carry steam and water into the tank and balance pressure between the tank and boiler. Baffle means help to separate the water and steam and a second conduit carries the separated steam to a point of use such as the soleplate ports and the fabric being ironed.

17 Claims, 5 Drawing Figures

Fig. 1.

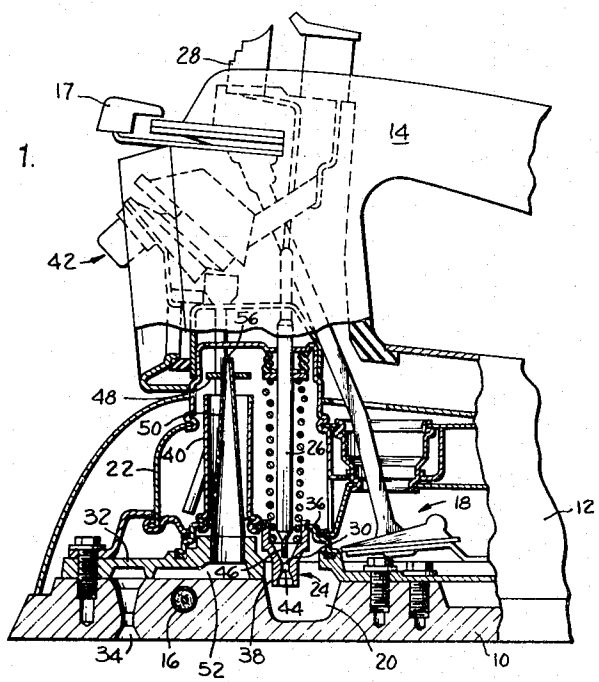


FIG. 1.

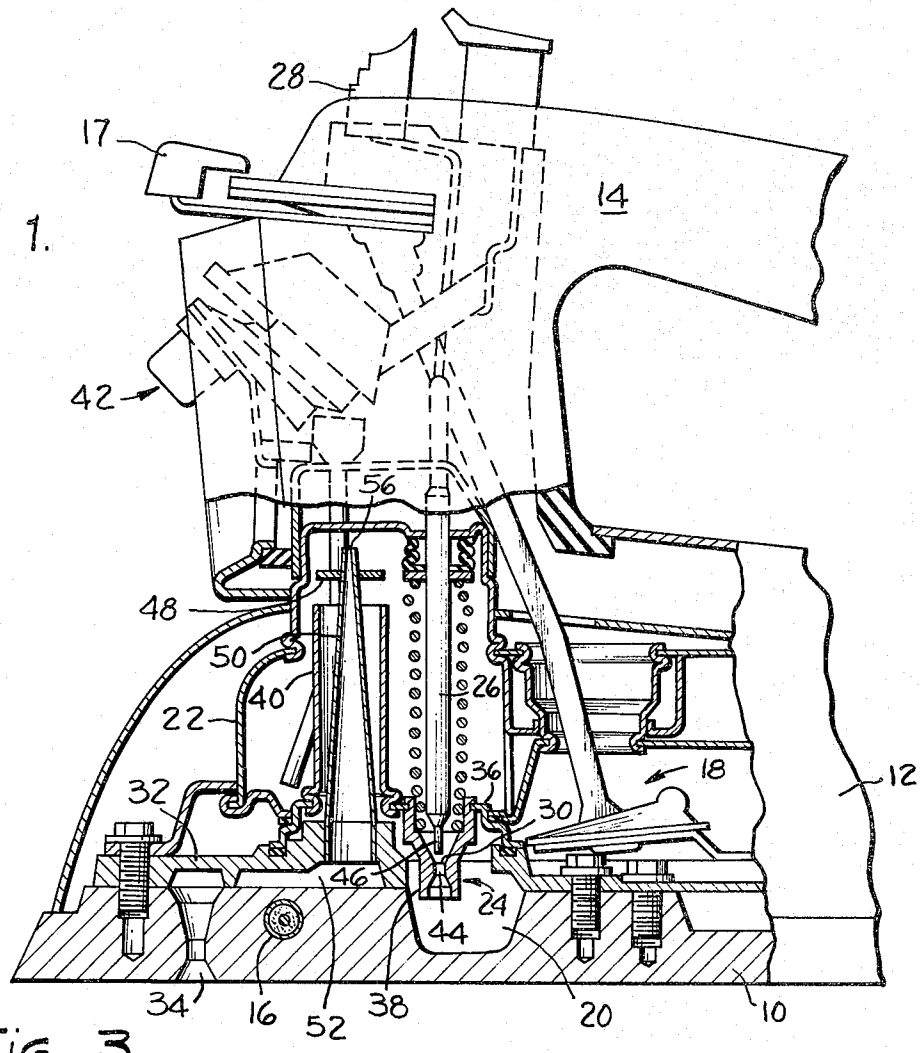


FIG. 3.

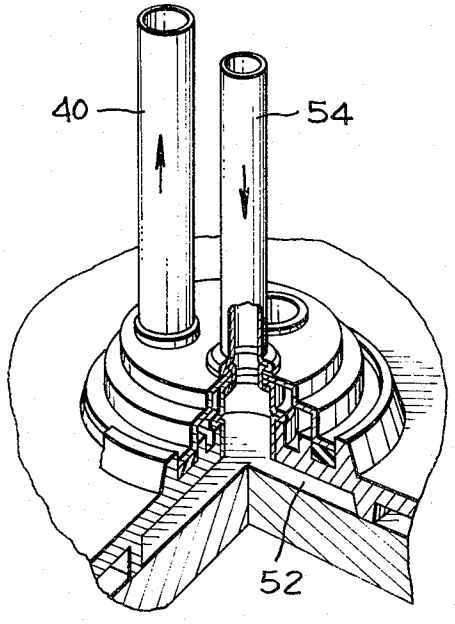


FIG. 2a.

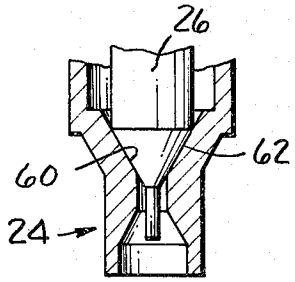


FIG. 2b.

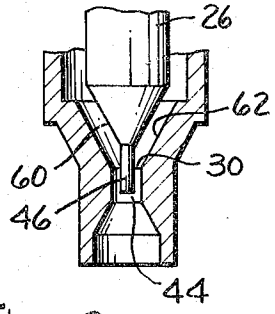
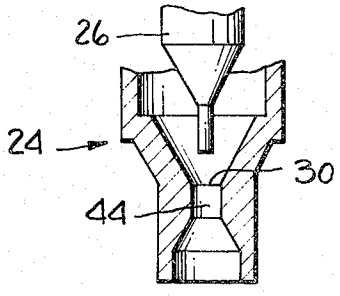


FIG. 2c.



FLASH/FLOODED BOILER STEAM IRON

BACKGROUND OF THE INVENTION

This is a Continuation-In-Part application of copending application Ser. No. **358,052** filed May **7, 1973** now abandoned.

Field of Invention

The invention is a combination flash/flooded boiler system steam iron that provides ironing flexibility by taking advantage of two well-known and separate types of iron operating systems.

Description of the Prior Art

There are generally two well-known and separate systems of steam irons and these are the flooded boiler and the flash boiler iron and irons are usually one version or the other. The flooded boiler is not widely used in this country but is well-known and is used abroad. This allows water to drip into a soleplate steam boiler at a rate greater than the rate at which steam is formed in the boiler. Once the boiler is flooded, the steam rate varies with the temperature setting of the iron since more water can be boiled away as steam at high temperature settings than at low temperature settings. When operating flooded, the steam formed in the boiler is generated at the boiling temperature (**212**°F at sea level) and is separated from the boiler water and directed first into the tank and then ducted to the soleplate and fabric. A typical flooded boiler steam iron is shown in U.S. Pat. No. **3,156,054** of common assignment.

The system known as the flash boiler converts the water immediately into steam and has the advantage of providing very quick steam operation after starting with a cold iron. However, to accomplish rapid flash steaming it is necessary to have sufficient heat storage in the metallic components in which the steam is generated and delivered. Thus, the steam is typically relatively dry and substantially above the water boiling temperature. This steam may not be as satisfactory as a wetter lower temperature steam for moistening some fabrics since it does not condense as readily on the fabric to assist in ironing. Also, its steam rate does not vary with the temperature setting since it is a function of the sizing of the metering apparatus. This latter system has been particularly successful commercially in this country.

Thus, both flash boiler and flooded boiler irons are well known and irons usually are one version or the other with the flash boiler being more popular in this country. The prior art has not provided a simple and inexpensive iron using advantages of both the flooded boiler and the flash boiler to provide selectively both wet or saturated steam when operating in a flooded mode and dry superheated steam when operating in a flash mode.

SUMMARY OF THE INVENTION

Briefly described, the present invention is directed to a steam iron with a water tank and a steam generating soleplate having a boiler therein. Fixedly sized metering means is provided between the tank and the boiler for either preventing the flow of water to the boiler or for permitting water to flow to the boiler at a plurality of rates, including a first rate selected to maintain the boiler in a flooded condition during operation at a first range of ironing temperatures and a second rate selected to maintain the boiler in a flash steam condition during operation at a second range of temperatures. The lower limit of the first range of temperatures is substantially lower than the lower limit of the second range of temperatures. Suitable distribution means communicate with the boiler for supplying steam generated therein to a point of use such as soleplate ports.

In accordance with a further aspect of the invention, conduit means is disposed to connect the boiler and the water tank to carry boiler-formed steam and water carried in the steam to the tank upper portion and also to serve as a balanced pressure means between the boiler and tank to ensure flow. Suitable means for separating the steam from the water, such as a baffle, allows the steam to enter the tank whereas the water is returned to the free water surface in the tank. Additional conduit means are provided to carry the steam from the tank to a point of use such as the soleplate ports and thence the fabric being ironed. In accordance with still further aspects of the invention, the dual conduits may be remote or adjacent one another or may be concentric with one inside the other. In order to provide an audible or steam sound if desired, the conduit carrying the steam to the soleplate may be tapered to act as a megaphone.

BRIEF DESCRIPTION OF THE DRAWING

FIG. **1** is a side elevation, partially in section, showing the invention in one modification in a steam iron;

FIGS. **2***a*, **2***b*, and **2***c* are detail views showing the valve structure of FIG. **1** in its three operative positions; and

FIG. **3** is a perspective, partially broken away, of a slightly different modification as it might be used in the iron of FIG. **1**.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. **1**, a steam iron embodying the invention typically includes a soleplate **10**, connected cover **12**, and operating handle **14**. In accordance with conventional practice, soleplate **10** may be cast from aluminum with an electrical heating element usually of the sheath type in which an electrical resistance **16** extends through a protective sheath with the heating element separated from the sheath by an insulating compound such as a mass of granulated and compressed magnesium oxide. The entire heating element **16** is cast into the soleplate. The temperature of the soleplate is set by temperature control knob **17** connected to operate a thermostat, generally indicated at **18**, all as well known in the art. Uniform heat distribution is provided by extending the heating element **16** in a loop from the rear along the iron side to the forward end and then rearwardly along the other side.

For steam generation, soleplate **10** has a steam boiler **20** and a suitable water tank **22** supplies water thereto under control of water valve structure, generally indicated at **24**, that includes a valve stem **26** suitably actuated by step button **28** through known linkage for metering water through orifice **30** into the hot boiler **20** for conversion into steam. As illustrated by FIG. **2***a*, valve stem **26** may be lowered until its conical portion **60** seats on mating surface **62** to close off orifice **30** and thereby stop steam generation for dry ironing.

The steam iron of FIG. 1 has steam distribution means including steam distributing passages under coverplate 32 and steam ports 34 in the soleplate 10. A steam collecting dome 36 is tightly sealed to coverplate 32 in any suitable fashion and also supports various components of the iron including the water valve body 38 and may carry pressure balancing tube 40 which transmits pressure from the boiler to the upper portion of the water tank 22. The balance tube extends above the water surface and this is intended as the upper portion of the tank. All connections to the steam dome are liquid tight, accomplished by brazing, metal spinning, or other well-known techniques. If the iron is operated under pressure, a uniform pressure may be maintained by a steam pressure regulator as fully described in U.S. Pat. No. 3,041,757, or a more recent arrangement as shown in U.S. Pat. No. 3,780,457, both of common assignment.

In order to equalize pressure throughout the defined system, balance tube 40 extends above the water line in water tank 22 to ensure the same steam pressure in the upper portion of the tank as in boiler 20 and, for greater flexibility, the iron may be operated as a spray iron also with either power or manual spray as shown generally at 42 and both systems are well known.

In accordance with the invention, an iron is disclosed that combines the two types of steam systems in a unique manner to provide many advantages, and especially the ability of the iron to provide steam at a high rate almost double the rate at which the normal flash boiler system produces. This is achieved by the combination of the two systems resulting in the ability of the systems to interact with one another. While a dual rate system will be described as a practical preferred form, it should be understood that, within the teaching herein, multiple rates of flow and various means of steam separation are possible and contemplated as obvious expedients in this flash/flooded invention. Thus, in accordance with the invention as illustrated by FIGS. 1 and 2*c*, the water from tank 22 is dripped through a metering means or valve 24 into boiler 20. The liquid passage 44 includes an orifice 30 sized (when unrestricted) to pass enough water so that it is supplied to the boiler at a first rate greater than the rate at which water may be flashed into steam in the boiler at a first range of ironing temperatures so the boiler operates flooded at these temperatures. Thus, the metering means is "fixedly sized" meaning a selected sized orifice 30 operates with the passage 44 and pin 46 (when "in") to provide a repeatable selected setting by button 28 as opposed to a random trial and error setting that would be useless in an iron. This repeatable selectivity of water flow through the sized parts by button 28 is what is meant by "fixedly sized". This first range of operating temperatures has a lower limit or lowest temperature at which the iron can generate steam from a flooded boiler. Although lower temperatures are theoretically possible, the lowest temperature at which continuous generation of saturated steam can be assured in a typical iron is around 230°F (becomes intermittent below 230°F). For this reason, an iron embodying the present invention would normally have the indicated lower level of the first range of operating temperatures at about 230°F, but it should be noted that the actual lower limit of this range is at the lowest temperature at which saturated steam can be generated.

As indicated above, the orifice 30 is sized (when unrestricted) to permit the flow of water at a first rate greater than the rate at which the water can be flashed into stream at the first range of temperatures. At the lower limit of this range, the water can flood not only the boiler 20, but also the entire region under the steam dome 36 and the balance tube 40 up to the level of the water in the water tank 22. When this occurs, the actual rate at which water flows through the water valve assembly 24 is reduced to the rate at which water is actually converted to saturated steam. Since under these conditions steam is generated as a function of available heat, the rate at which steam is generated will gradually increase as the operating temperature of the iron is increased within the first range of temperatures. Normally, the orifice 30 will be sized such that the first rate at which it permits water to flow into the boiler 20 will be insufficient to maintain flooded operation at the very highest operating temperatures, say 400°F or more, of the iron. At these temperatures, the boiler 20 will boil dry and the iron will operate in a flash mode at the first metering rate. There is, however, no reason why the orifice 30 could not be sized so as to maintain flooded operation at the very highest operating temperatures of the iron.

As illustrated by FIG. 2*b*, means are provided to selectively operate in conjunction with the fixedly sized orifice 30 to restrict water flow to a selected amount through the passage 44 to convert the boiler to flash steam operation at a second range of operating temperatures. It should be noted that this temperature range is at a restricted second flow rate as opposed to the unrestricted first flow rate noted above for flooded operation at lower temperatures. This restrictive means may be any suitable structure to lower the flow rate and conveniently takes the form of a reduced pin portion 46 formed on the end of valve stem 26 to be disposed through the orifice 30 into passage 44 and restrict the water flow. Mechanical steam rate variation is controlled by reduced pin portion 46 with high steam rate operation with the pin portion 46 out of the valve body 38 as illustrated by FIG. 2*c* for flooded operation and low steam rate operation with the pin 46 in passage 44 as illustrated by FIG. 2*b* so that the water flow is cut down through a reduced annular passage around pin 46. Thus, there are at least two selective rates of water flow and steam by sizing orifice 30 and liquid passage 44 for operation of boiler 20 in either flooded or flash condition in conjunction with the position of pin 46 out or in the passage respectively. Any desirable number of different water flow rates may be obtained by a reduction such as by the stepped pin 46 or tapered pin or any equivalent construction to provide the selected fixedly sized metering. If the second or restricted flow rate permitted by the valve 24 is sufficiently great for effective ironing with flashed steam, the second range of operating temperatures will have a lower limit substantially greater than the lower limit of the first range of operating temperatures. The reason for this is that if the iron is operated at temperatures below that of the lower limit of the second temperature range and above that of the lower limit of the first temperature range, the restricted flow rate will be too great for flash operation. and the iron will operate flooded. To assure flash operation when desired, an iron embodying the present invention would normally have the indicated lower level of the second range of operating temperatures at about

255°F to 280°F. The upper limit of the second temperature range is established by the maximum operating temperature of the iron. By selectively preventing flow or shutting off the water as illustrated by FIG. 2*a*, of course, the iron operates dry in the conventional manner.

Since the production of steam in the flooded operation results in steam boiling through the water in boiler **20**, it is typical flooded boiler steam or wet steam and it is extremely desirable to separate the steam and water so that only steam can exit steam ports **34**. To this end, in the gravity system shown, there is supplied a conduit means connecting the boiler **20** and the upper portion of water tank **22** and this may conveniently be the balance tube **40**. Thus, all steam or steam and water generated must pass up the conduit or balance tube and into the space in the upper portion of the water tank. Since steam in flooded operation has water with it a suitable separator such as the horizontal baffle plate **48** extends over and is spaced from the end of the conduit in the upper portion of the tank to impede flow into the tank so that fluid striking the baffle allows the steam to pass around and into the tank whereas the water strikes the baffle and is deflected thereby and carried into the tank by its velocity where it then falls back by gravity to the free water surface of the tank. Thus, all generated steam is conducted to the upper portion of the tank **22**. For the steam to exit the iron, there is provided a suitable conduit steam carrying means **50** that, as shown in FIG. **1**, extends above the balance tube **40** and above the baffle **48** where it can pick off only steam and direct it down into distribution passages **52** under coverplate **32** to be distributed out ports **34** in the conventional manner. It will be understood that this is the only means by which the steam may reach the exit ports **34** - by the high separate conduit takeoff well in the upper or steam portion of water tank **22**. By extending the baffle **48** over the balance pressure means only, the steam exiting from the water tank does not carry any water droplets with it. This is a usual arrangement in a flooded boiler iron. As shown in FIG. **1**, it may be convenient to place the carrying tubular conduit **50** inside the balance tube **40** or the two conduits are concentric for ease of construction. As will be explained, the steam carrying tubular conduit **50** may be tapered along its length as shown in order to provide an audible steam sound.

An alternate arrangement is shown in FIG. **3** where balance pressure means **40** serves as the conduit from boiler **20** and adjacent and separate steam carrying means **54** returns the steam to passages **52** and thence to the fabric being ironed out the ports **34**. The separate and adjacent tubular conduits utilize present iron construction and minimize structural changes. Either way, the operation is identical and these are merely two slightly different delineations.

While the steam normally will be conducted to soleplate steam ports, it can be directed to any suitable point of use such as through a nozzle as in U.S. Pat. No. **3,722,117** of common assignment.

From the description of the combination flood/flash boiler iron noted above, there are numerous advantages and modes of operation as will now be explained. In this combination iron there are three prior use systems all incorporated into one unique system where rate flows are selected to achieve these advantages. First, with pin **46** in orifice **30** and liquid passage **44** as illustrated by FIG. 2b water flow into the boiler through the fixedly sized metering means is such that the system functions as a standard flash boiler at a given range of iron operating temperatures - usually those above 255°F to 280°F. This is essentially the same operation as used on all flash steam irons for a similar steam rate. Thus, the pin "in" permits a flow rate for flash steam operation over the second temperature range at the lower steam rate, preferably in a typical range of **0.017** to **0.024** pounds of water per minute. Second, when the pin is out of the orifice, as illustrated by FIG. 2*c*, water flow is at a higher rate through liquid passage **44** and the iron operates as a flooded boiler at the first range of iron temperatures where the water flows and is metered through a fixedly sized opening faster than it can be flashed off as steam. Preferably, the higher rate of water flow is selected such that the iron operates as a flash boiler at the higher iron operating temperatures, typically above **400°F**, where the water is converted to steam as fast as it flows in. Both of these latter modes are high steam rate systems and the iron is able to provide steam at a maximum rate of **0.035** to **0.040** pounds of water per minute at high temperature flooded steam operation or under flash steam operation whereas, with the metering means adjusted as shown by FIG. 2*b* to provide standard flash boiler operation only, as noted above, the rate is typically in the range of **0.017–0.024** pounds of water per minute. Therefore, the maximum steam rate for flooded boiler operation and flash operation at the very highest iron operating temperatures is almost a **100** percent increase over the normal rate for flash steam operation. The iron is self-regulating at the higher rate setting, automatically providing flooded operation throughout the first range of operating temperatures and flash operation at a still higher range of operating temperatures. Throughout the first range of temperatures, the rate at which steam is actually produced is a function of the iron operating temperature. The unrestricted orifice **30** is sized to permit water flow to the boiler at a rate sufficient to maintain flooded operation throughout the first range of operating temperatures. Third, the steam separator system works as a separator during flooded operation and as a steam delivery system during flash operation, i.e., any baffling assists separating the steam from the water by impingement during flooded boiler operation and operates as a conduit only or delivery system during flash operation when the fluid is all steam and no water is mixed in.

There are numerous advantages to this unique combination of systems. A, the iron will not drip or spit water from the soleplate at any normal ironing temperature - steam rate combination. This is true of flooded boiler irons in general and is true of this combination because of the inability of any water to enter the steam carrying means **54** in any normal mode of operation - no water can reach the soleplate - only steam. B, during high steam rate operation, when the pin is out of the orifice and the iron is at high temperature and water is being flashed as fast as it enters the boiler, the iron has an automatic steam rate adjustment that starts when the boiler starts to flood. While flashing, the water valve dictates the steam rate. As the temperature of the iron is lowered there is not enough heat to flash all the water to steam and flooding starts. Now the steam rate becomes a function of the available heat instead of the available water. Thus, as the iron temperature is lowered there is less heat available and hence a lower

steam rate and it automatically becomes a flooded boiler operation again since the metering means is fixedly sized to provide this. C, a third advantage of this iron is its ability of provide saturated steam at iron temperatures above 212°F. During flooded operation, the steam is generated under water much as it is generated in a teakettle. Because of this excess water, all the heat that would normally superheat the steam is consumed as heat of vaporization by the excess water, i.e., the heat goes into heating the water rather than superheating the steam. The steam thus generated leaves the boiler at 212°F - again like a teakettle - and this operation continues as long as there is excess water in the boiler. Therefore, when the water valve 24 provides excess water to the boiler, which boiler may be above 212°F, the steam will be produced at 212°F at standard atmospheric conditions because it is just boiled off. This "cool" or "wet" steam is more useable since, as saturated steam, it only has to lose its heat of vaporization to condense on the ironed goods. Superheated steam, on the other hand, must lose not only its heat of vaporization but additionally that sensible heat which brought the steam to the superheated condition. D, another advantage of this iron is the simple mechanical adjustment of the steam rate by meter the water through the fixedly sized orifice 30/passage 44 with or without pin 46 - that is the pin in or out of the orifice. When set as illustrated by FIG. 2*b*, the metering means or valve 24 provides continuous flash boiler operation for longer steaming. This can provide a substantially uniform steam rate throughout the steam band of temperatures and is intended to provide a steam rate for permanent press or very light-weight ironing jobs. When set as illustrated by FIG. 2*c*, the iron can be operated flooded over a shorter period of time with a maximum very high steam rate throughout the temperature range or, if less steam is desired, it can be operated as a flash boiler with the pin in the orifice and a lower steam rate over a longer period of time. In either case, in the low temperature range and, regardless of whether the iron is set for either high or low steam rates, the system automatically adjusts itself to limit the steam flow to the heat available by the proper sizing of the parts so that the fabric can always be dried while ironing. In other words, the system is self-regulating so that, for example, it cannot provide a high steam rate at a low temperature where it would not then be possible for the iron to dry the fabric. A standard flooded boiler only iron will operate with a maximum of steam over a short range of time and require constant fillings and no other mode is available. Also, a flash boiler iron will operate over a long period of time with fewer fillings but at a lower steam rate and no other mode is available. The present iron gives the user a choice in a single iron that she did not have before - the choice of constant filling for a high steam rate operating flooded or a lower steam rate and fewer fillings when operating as a flash boiler. Thus, the user sets the operation of the iron rather than the iron setting the mode of operation for the user. E, another feature is the elimination of soleplate dripping which occurs when water runs out of the soleplate ports. The separation baffle system returns all steam or steam and water mixture to the water tank with the steam remaining in the free air space to be picked up and exhausted through the steam carrying means. Because the opening of the steam carrying means or conduit is generally above the free water surface during normal ironing or when the iron is on the heel rest water cannot get into the passages 52 to cause soleplate flooding. If the iron is inadvertently stored on the soleplate with the water valve open, no water will be able to reach the soleplate area.

Since this iron will produce different rates of steam, is is possible, if desired, to audibly indicate the rates. Consequently, a noise may be produced in the steam carrying means 50 as shown in FIG. 1, by shaping it in a tapered form to act as a megaphone with orifice-like opening 56 at the entrance. By tapering outwardly from the orifice 56, the shape amplifies the noise made by the steam passing through the orifice 50 at a high velocity. The velocity is varied, and hence the noise, by the amount of water converted to steam. Therefore, at the high steam rate there is a higher level of noise than at the low steam rate.

It will be seen that the combination flooded/flash boiler arrangement obtained by fixedly sizing the liquid orifice 30 and passage 44 and modifying the valve stem 26 so that water may flow through the valve at different rates as repeatedly selected by the pin structure 46, advantages are obtained that are unavailable in previous irons and because of the interaction between the systems, these advantages are greater than the individual advantages of either the flooded boiler or the flash boiler irons singly. The unique combination has produced a highly flexible iron with the attendant advantages as explained.

While I have shown preferred forms of the invention, obvious equivalent variations such as multiple flow rates, different means to separate the steam and water or different metering means are possible in light of the above teachings. It is therefore to be understood that, within the scope of the appended claims, the invention may be practised otherwise than as specifically described, and the claims are intended to cover such equivalent variations.

I claim:

1. In a steam iron having a water tank and a steam generating soleplate having a boiler therein, the improvement comprising;

metering means intermediate the water tank and the boiler fixedly sized for selectively preventing flow of water therebetween and for selectively permitting flow of water at a plurality of flow rates, said plurality of flow rates including a first rate selected to maintain the boiler in a flooded condition at least during iron operation at a first range of ironing temperatures and a second rate selected to maintain the boiler in a flash steam condition at least during iron operation at a second range of operating temperatures and distribution means communicating with the boiler for supplying steam generated therein to a point of use.

2. Apparatus as defined by claim 1 in which said distribution means further comprises steam separation means for removing water entrained in steam generated in the boiler prior to delivery of the steam to a point of use.

3. Apparatus as defined by claim 1 wherein the first rate established by said metering means is selected to maintain the boiler in a flash steam condition during iron operation at temperatures exceeding the upper limit of said first range.

4. Apparatus as defined by claim 1 wherein the lower limit of said first range is substantially lower than the lower limit of said second range.

5. Apparatus as defined by claim 4 wherein said metering means comprises passage means communicating with the water tank and the boiler and movable valve structure cooperating with said passage means to control the flow area of said passage means.

6. Apparatus as defined by claim 5 in which said distribution means comprises:

conduit means connecting the boiler and the upper portion of the tank to carry steam and water carried thereby to the tank and balance pressure therebetween, and

means carrying steam from the tank to a point of use.

7. Apparatus as defined by claim 6 in which said distribution means further comprises steam separation means for removing water entrained in steam generated in the boiler prior to delivery of the steam to a point of use.

8. Apparatus as described in claim 7 wherein the soleplate is provided with steam ports and said distribution means carries the steam to said soleplate ports and fabric being ironed.

9. Apparatus as described in claim 5 wherein said movable valve structure includes a conventional stem and orifice,

said stem having a reduced portion for disposal in said orifice to restrict the water flow for said flash steam operation.

10. Apparatus as described in claim 9 having means to separate water from steam generated in said boiler comprising means impeding conduit flow into said tank.

11. Apparatus as described in claim 10 where said means is a baffle plate extending over and spaced from the end of said conduit in the upper portion of said tank whereby steam escapes into the tank and water striking the means falls onto the free water surface in said tank.

12. Apparatus as described in claim 11 wherein said balance pressure means and said carrying means are separate and adjacent tubular conduits.

13. Apparatus as described in claim 1 wherein said balance pressure means and said carrying means are concentric tubular conduits.

14. Apparatus as described in claim 13 wherein the baffle plate extends over and is spaced from the balanced pressure means only.

15. Apparatus as described in claim 13 wherein the baffle plate means extends over and is spaced from the balanced pressure means, and

said carrying means extends above the baffle plate means to receive steam only.

16. Apparatus as described in claim 15 wherein the steam carrying tubular conduit is tapered along its length.

17. Apparatus as described in claim 16 wherein the tubular conduit is tapered outwardly from an orifice entrance disposed above said baffle plate means.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 3,896,572

DATED : July 29, 1975

INVENTOR(S) : Ronald E. Jeffress

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

IN THE CLAIMS:

Claim 13, Column 10, Line 13 - delete "1" and insert -- 12 --.

Claim 15, Column 10, Line 19 - delete "13" and insert -- 14 --.

Signed and Sealed this

twenty-seventh Day of *January 1976*

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks