Dec. 21, 1943. E. O. MORTON 2,337,078

STEAM IRON

Filed April 11, 1942

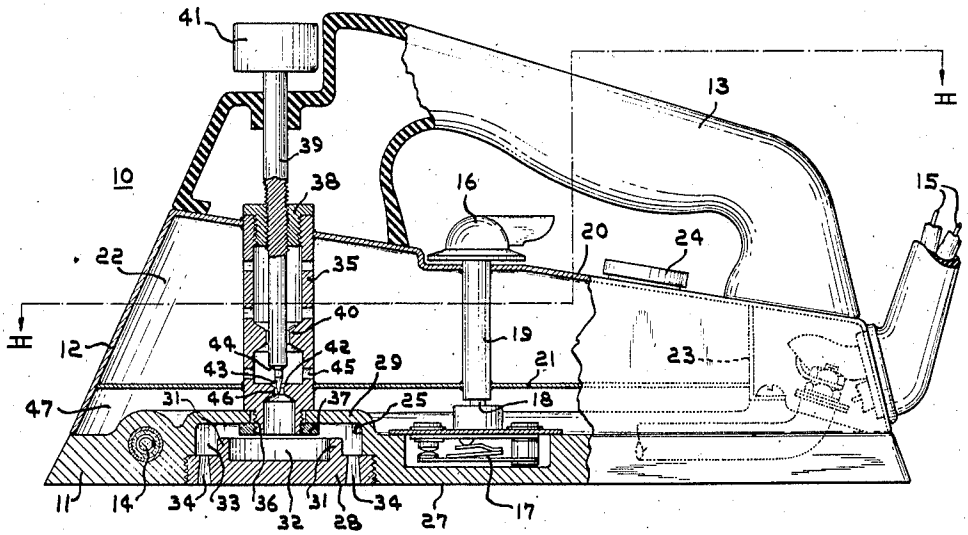


FIG. 1.

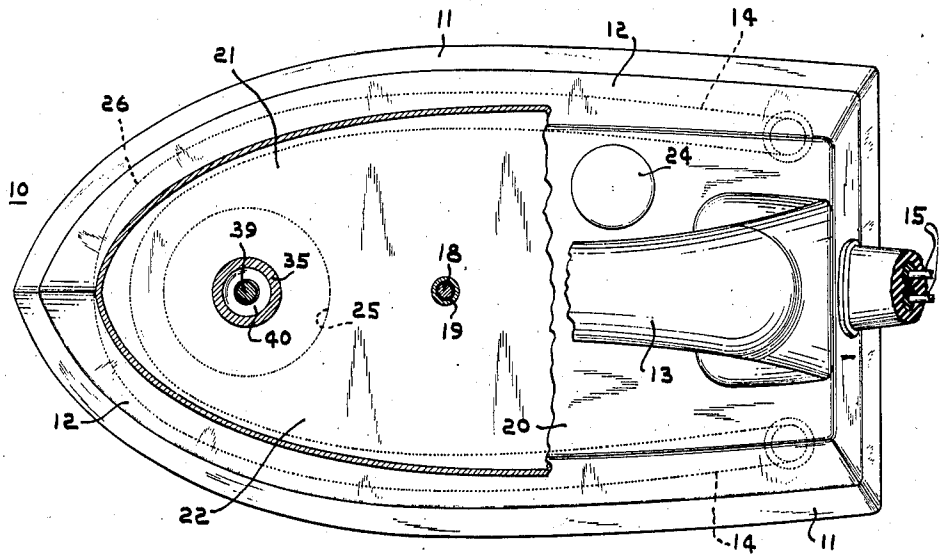


FIG. 2.

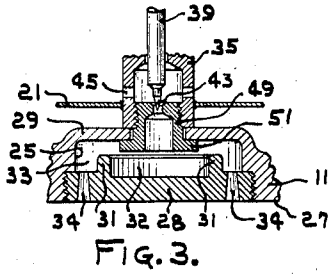


FIG. 3.

WITNESSES:

Roy N. Ewell

E. H. Lutz

INVENTOR
ELDRED O. MORTON

BY

ATTORNEY

Patented Dec. 21, 1943

2,337,078

UNITED STATES PATENT OFFICE

2,337,078

STEAM IRON

Eldred O. Morton, Mansfield, Ohio, assignor to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., a corporation of Pennsylvania

Application April 11, 1942, Serial No. 438,537

5 Claims. (Cl. 38—77)

This invention relates to steam pressing irons and particularly to that class of steam irons which include a valve-controlled water supply for feeding water at a selected rate to a steam generator provided in the iron, and it has for an object to provide an improved steam iron of the character set forth.

In testing steam pressing irons of the flash-boiler type, wherein water is supplied from a storage chamber carried by the iron to a steam generator which instantaneously flashes the water into steam, I have found that there is a tendency for the flow of steam from the steam generator to decrease as the temperature of the water within the storage chamber rises, indicating that the flow of water to the steam generator decreases, during a prolonged period of use of the iron. This result may be partially due to the decrease in head of the water in the chamber as the supply is depleted and it may also be due to some vaporization of the water in the passage between the chamber and the steam generator which tends to restrict the flow of water through the passage. I have also found that this condition can be corrected by increasing the valve opening as the temperature of the water in the storage chamber rises, without materially increasing the rate of steam flow from the generator to the material being ironed. While in making this correction, it is possible that the valve opening may be increased to a point where it admits more water to the steam generator, a slight increase in water flow is not objectionable when the water is hot because the evaporating capacity of the steam generator is increased by the amount of heat absorbed by the water in the storage chamber.

In accordance with my invention, I provide a self-compensating valve which automatically increases the valve opening as the temperature of the water within the storage chamber rises to insure that sufficient water enters the steam generator regardless of conditions which tend to reduce the rate of flow of water to the steam generator. It is to be understood that if it be found that the valve opening should be reduced in size as the temperature of the water in the storage chamber increases, the automatic compensation obtained with my invention may be such as to decrease the size of the valve opening with a rise in the temperature of the water in the storage chamber. A reduction in the size of the valve opening with an increase in water temperature may be required if the decrease in viscosity in the water tends to increase the rate of flow through the valve.

It is an object of my invention to provide a construction of steam iron in which the valve which controls the rate of water flow to the steam generator is automatically adjusted in accordance with temperature conditions in the iron.

It is another object of my invention to provide a steam iron construction in which the assembly of the iron and alignment of the water flow regulating means are facilitated.

These and other objects are effected by my invention as will be apparent from the following description and claims taken in accordance with the accompanying drawing, forming a part of this application, in which:

Fig. 1 is a side elevational view, partially in longitudinal section, of an electrically-heated steam iron in which the present invention has been incorporated;

Fig. 2 is a horizontal sectional view of the steam iron shown in Fig. 1 and taken substantially on the line II—II of that figure; and,

Fig. 3 is a fragmentary sectional view corresponding to a portion of Fig. 1 illustrating a slightly modified form of the invention.

Referring to the drawing, there has been shown an electrically-heated steam iron, generally indicated 10, which comprises a soleplate 11, a cover member 12, and a handle 13 secured together in any suitable manner.

The soleplate may be heated in any desired manner and is here shown as having a U-shaped, armored electric heating element 14 embedded therein, which is adapted to be connected to a source of electrical energy by means of supply conductors 15. The temperature at which the soleplate is to be maintained is selected by means of a knob 16 which adjusts a thermostat 17 mounted within a recess in the soleplate and connected in series with the heating element 14. The knob 16 is provided with the usual index or scale, and is operatively connected to the thermostat by means of a rod 18. This rod extends through a sleeve 19 brazed or otherwise secured in fluid-tight relation to the top wall 20 of the cover member 12 and a lower horizontal partition 21.

As shown particularly in Fig. 1, a liquid-storage chamber 22 is formed within the cover 12 by means of the horizontal partition 21 and a vertical partition 23 which, together with the side and top walls of the cover, define an enclosed space. The storage chamber 22 is filled with water or other vaporizable liquid suitable for dampening clothes through an opening provided

in the top wall 20 of the cover, which opening is normally closed by means of a removable cap or plug 24. If desired, a vent (not shown) may be provided for the storage chamber 22.

The water within the storage chamber is fed, in a manner to be hereinafter described, to a steam generator provided in the soleplate. The steam generator comprises a steam-generating space formed by a recess or hole 25 in the soleplate located within the loop or bight 26 of the heating element 14. This recess opens on the ironing surface 27 of the soleplate and is closed at its lower end by means of a removable metallic member or plug 28 which is threaded or otherwise removably secured to the soleplate in spaced relation to the upper wall 29 of the soleplate overlying the recess 25.

The upper surface of this plug is provided with an annular rib or baffle 31 which divides the space between the plug 28 and wall 29 into two communicating compartments 32 and 33. The rib 31 provides a pocket in which the water from the storage chamber 22 is received and instantly flashed into steam, the steam thus formed passing over the rib into the annular compartment 33. The steam is then discharged from ports 34, preferably formed in the plug, to the material to be pressed.

A tubular strut 35 is fixed in fluidtight relation to the upper and lower walls 20 and 21 of the storage chamber above the steam generator, as by brazing or the like. This strut, as shown in Fig. 1, extends below the lower wall 21 of the storage chamber and is provided with a reduced externally-threaded lower end 36 which is received in an aperture in the upper wall 29 of the soleplate. A nut 37 threaded on this reduced end serves to clamp the strut to the soleplate in fluidtight relation, as will be apparent from Fig. 1. The upper end of the strut is internally threaded and receives a threaded bushing 38. This bushing adjustably receives a threaded portion of a valve stem 39. The strut is also provided with a valve stem guide 40 which aids in maintaining the valve stem in alignment in the strut.

The upper end of this valve stem is provided with a knob 41 which is rotated to raise or lower the valve stem in the bushing 38 and adjust the valve stem with respect to a valve seat 42 which is formed in or fixed relative to the lower end of the strut 35. The lower end of this valve stem is provided with a tapered point 43 which cooperates with the valve seat 42 for regulating or throttling the flow of water through the valve into the steam generator. The lower end of the valve stem is provided with a second tapered portion 44 spaced above the tapered point which is adapted to engage the valve seat 42 to close the valve when it is desired to shut off the supply of water to the steam generator. The particular valve stem and valve seat disclosed is like that described and claimed in my copending application Serial No. 405,463, filed August 5, 1941, and assigned to the assignee of the present application.

The strut 35 and valve stem 39 are made of materials having substantially different coefficients of expansion so that as the temperature of these parts rises, due to an increase in temperature of the water within the storage chamber and from the heat conducted from the soleplate directly through the metal, the lower end of the valve stem and the valve seat will have relative movement with respect to each other. By making the strut of a material having a high coefficient of expansion, such as aluminum, and the valve stem of a material having a low coefficient of expansion, such as invar, the tapered end 43 of the valve stem is raised relative to the valve seat as the temperature of the stem and strut increases. This relative movement of the valve stem and valve seat increases the valve opening.

It is to be understood that if it be found necessary to have the valve opening decrease in size as the temperature of the water in the storage chamber increases, the valve stem may be made of a material having a high coefficient of expansion and the strut made of a material having a low coefficient of expansion to automatically reduce the size of the valve opening with an increase of temperature of the strut and valve stem.

The strut, in addition to the function of cooperating with the valve stem to obtain automatic valve opening adjustment, also serves to rigidly tie the upper and lower walls of the reservoir together and thereby minimize the tendency of these parts to buckle when heated. The structure described has a further advantage in that alignment of the valve stem and its tapered lower end with respect to the valve seat is simplified in that the valve seat and the valve stem are carried by the strut which may be of substantial weight as compared to the relatively light construction of the cover structure.

Operation

To use the present iron, the operator connects the conductors 15 to a suitable source of electricity and adjusts the thermostat 17, by means of the knob 16, to maintain the soleplate at any desired temperature. It is assumed that the storage chamber 22 has been filled with water or other vaporizable liquid suitable for dampening the material to be pressed. When the soleplate has reached ironing temperature, the iron may be used as a "dry" iron or if it is desired to steam the material while pressing, the operator turns the knob 41 to open the water valve and permit water to flow into the steam generator at a predetermined rate. The knob 41 may be provided with a suitable scale to indicate the rate of water flow to the steam generator for the particular setting thereof. It will be understood that the valve stem may be actuated as a sliding plunger rather than as a rotatable shaft having threaded engagement with the upper end of the strut, as shown for example in my copending application, Serial No. 394,258, filed May 20, 1941, and assigned to the assignee of the present invention. If the valve stem is adjusted by sliding the same up or down relative to the valve seat it may be held in fixed relation to the upper end of the strut during normal use of the iron in any suitable manner as by having a friction fit in the bushing member 38.

The water in the storage chamber passes through openings 45 provided in the strut 35, through the open valve into a passage 46 provided through the lower reduced end of the strut from which it falls into the steam-generating chamber 32 where it is instantaneously flashed into steam. The steam thus formed is carried over the rib 31 to the steam outlet ports 34 from which it is discharged to the material being pressed.

While the storage chamber is preferably thermally insulated from the heated soleplate, as by an air space 47, it will be appreciated that the temperature of the water stored in the storage

chamber will rise during prolonged use of the iron and may even reach the boiling point. The valve stem and the strut are in intimate contact with the water in the storage chamber and the temperature thereof also rises. Since the valve stem and strut are made of materials having substantially different coefficients of expansion, the lower free end of the valve stem and the valve seat carried by the lower end of the strut will move relative to each other as the temperature of the strut and valve stem rise since the stem and strut are interconnected at the upper end of the strut. Thus, in the particular iron illustrated, an increase in the temperature of the strut and the valve stem will cause the lower tapered end of the valve stem to be raised relative to the valve seat to increase the valve opening. By reversing the materials of these parts, that is, making the valve stem of material having a high coefficient of expansion and the strut of low coefficient of expansion material, an increase in temperature of these parts would result in a reduction of the size of the valve opening.

If desired, the valve seat **42** may be formed in a member **49** separate from the strut **35** as shown in Fig. 3. Further, this member may be made of harder and more durable material than the strut proper to reduce wear of the valve seat. The member **49** is provided with a flange or head portion **51** which engages the undersurface of the wall **29** of the soleplate and is screw-threaded into the lower end of the strut **35** which engages the top surface of the wall **29** to clamp the strut in fluid-tight relation to the soleplate.

While I have shown my invention in several forms, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other changes and modifications without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are specifically set forth in the appended claims.

What I claim is:

1. A steam iron comprising a body portion having a steam generator, means for heating said steam generator, means including a conduit opening into said steam generator for supplying water to said steam generator, said means also including a valve seat and a valve member cooperating with said valve seat to regulate the flow of water through said conduit to said steam generator to provide a predetermined rate of flow of water, means fixed relative to said valve seat and connected to said valve member a substantial distance from said valve seat, said last-mentioned means and said valve member being made of materials having substantially different coefficients of expansion and so arranged in said iron as to be affected by the temperature of the water supplied to said steam generator and adapted upon a change in temperature of said valve member and said last-mentioned means to cause relative movement between said valve member and valve seat in the direction and in such amount as to substantially reduce deviation from said predetermined rate of flow.

2. A steam iron comprising a soleplate, means for heating said soleplate, a steam generator carried by said soleplate, means including a conduit opening into said steam generator for supplying water to said steam generator, an adjustable valve for regulating the flow of water through said conduit, said valve including a valve seat and a valve member adjustable relative to said seat to provide a selected rate of flow of water therethrough, means for supporting said valve seat, said supporting means being adjustably connected to said valve member at a point spaced a substantial distance from said valve seat, said supporting means and said valve member being made of materials having substantially different coefficients of expansion and so arranged in said iron as to be affected by the temperature of the water supplied to said steam generator and adapted upon a change in temperature of said supporting means and said valve member to provide relative movement between said valve seat and said valve member to change the size of the opening through said valve in the direction and in such amount as to substantially reduce deviation from said selected rate of flow.

3. A steam iron comprising a soleplate, means for heating said soleplate, a steam generator carried by said soleplate, a liquid-storage chamber carried by said soleplate, a passage for conveying liquid from said chamber to said steam generator, a valve seat formed in said passage, a valve stem extending through said storage chamber and cooperating with said valve seat to control the flow of liquid from said chamber to said steam generator, a strut extending through said chamber and engaging said valve stem at one end thereof, said valve seat being fixed relative to the other end of said strut, means for adjusting said valve stem relative to said strut and valve seat to provide a predetermined rate of flow to the steam generator, said strut and said valve stem being made of materials having substantially different coefficients of expansion and adapted upon a rise in temperature of said strut and said valve stem to cause relative movement between said valve stem and said valve seat in the direction to increase the opening between said valve seat and stem in such amount as to substantially reduce deviation from said predetermined rate of flow.

4. A steam iron comprising a body having a liquid-storage chamber, a steam generator carried by said body, said storage chamber comprising spaced upper and lower walls of light-weight sheet material, a rigid strut extending between and connected to said walls, said lower wall having a passage therethrough communicating with said steam generator and located adjacent the lower end of said strut, a valve seat provided in said passage and fixed relative to said strut, a valve stem adapted to cooperate with said valve seat for regulating the flow of liquid through said passage from said chamber to said generator, said valve stem extending substantially parallel to said strut, and means adjustably connecting said valve stem to said strut adjacent said upper wall, whereby said stem is adjustable relative to said seat to provide a selected rate of flow to said steam generator, said strut and valve stem being made of materials having substantially different coefficients of expansion and adapted upon a change in temperature of said stem and strut to cause said valve stem and valve seat to be moved relative to each other to vary the size of the opening between said stem and valve seat in the direction and in such amount as to substantially reduce deviation from said selected rate of flow.

5. A steam iron comprising a body having a liquid-storage chamber, a steam generator carried by said body, a passage for conveying liquid from said chamber to said steam generator, said storage chamber having upper and lower walls formed of light-weight sheet material, a vertical, perforate tubular strut extending between and

connected to said upper and lower walls, said passage having a valve seat therein fixed relative to the lower end of said strut, a valve stem disposed within said strut, the lower end of said valve stem being adapted to cooperate with said valve seat for regulating the flow of liquid from said storage chamber to provide a selected rate of flow to said steam generator, and means adjustably connecting said valve stem to the upper end of said strut, said valve stem and strut being in contact with the liquid stored in said chamber and being made of materials having substantially different coefficients of expansion and adapted upon a change in temperature of said strut and said valve stem to cause relative movement between said valve stem and said valve seat in the direction and in such amount as to substantially reduce deviation from said selected rate of flow.

ELDRED O. MORTON.