March 21, 1950 A. H. CHARLAND 2,501,028

AUTOMATIC VALVE MECHANISM FOR STEAM IRONS

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FIG. 1.

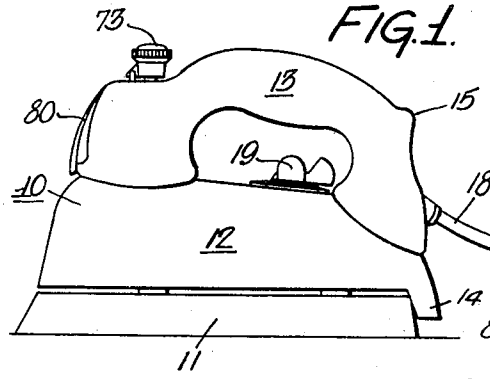

FIG. 3.

FIG. 5.

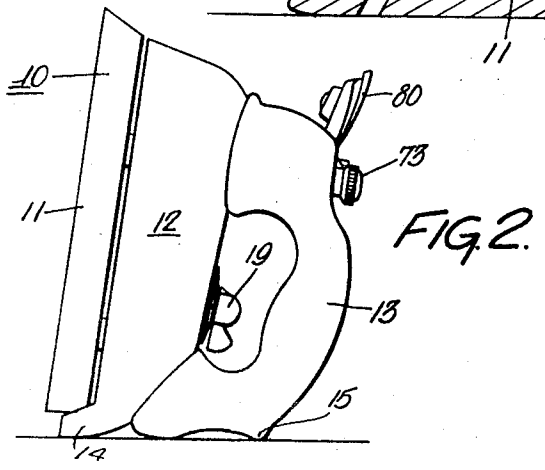

FIG. 2.

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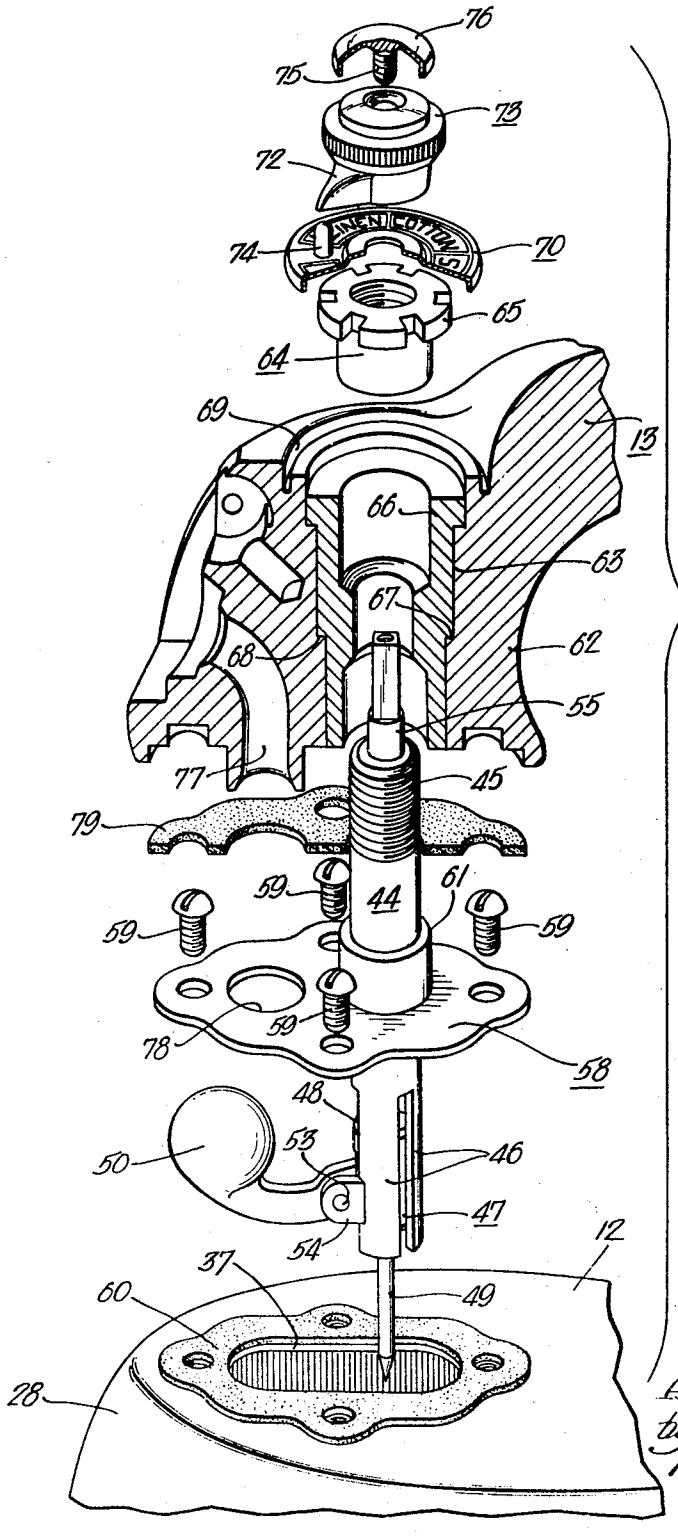

FIG. 4.

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AUTOMATIC VALVE MECHANISM FOR STEAM IRONS

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4 Claims. (Cl. 38—77)

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The present invention relates to steam irons and particularly to that type of iron wherein water is fed from a reservoir to a heated zone in which the water is converted into steam to be discharged onto the fabric being ironed.

In irons of the class referred to, it has been proposed to provide a valve-controlled duct between the reservoir and the heated zone or steam generating chamber, said duct, when the iron is set for steaming operation, being normally open irrespective of whether the iron is in an operative ironing position or in an inoperative up-tilted position. The advantage of such an arrangement is that the iron starts steaming immediately when placed in the operative ironing position and stops steaming immediately when placed in the inoperative up-tilted position without necessity for manipulating some sort of valve actuating means. However, to be operative, such an arrangement requires that the duct be located at the nose portion of the iron and that some means be provided for positively limiting the water in the reservoir to a quantity less than the total capacity thereof. This is necessary to insure that the water level in said reservoir will always be below the outlet duct which opens into the steam generating chamber when the iron is in its inoperative up-tilted position.

Moreover, because the duct between the reservoir and the steam generating zone or chamber is normally open when the iron is set for steaming operation, the operator must manually close the duct control valve, and thus disturb the valve setting, every time water is introduced into the reservoir, especially if the iron is cold, for otherwise the water, running freely into the steam generating chamber, would flood the latter.

It is an object of this invention to provide an arrangement whereby immediate automatic cessation of the steaming operation takes place when the iron is placed in inoperative up-tilted position, and immediate automatic resumption of the steaming operation occurs when the iron is placed in operative ironing position, regardless of the location of the communicating duct between the water reservoir and the steam generating chamber and irrespective of the quantity of water within said reservoir.

Another object of the invention is the provision of an improved structural arrangement in an iron of the general type hereinbefore mentioned, which arrangement eliminates the necessity of manipulating and disturbing the setting of the duct controlling valve means included in such an iron, when water is introduced into the reservoir incorporated in the body of said iron.

Still another and more specific object of the invention resides in the provision of a valve assembly for steam irons of the kind specified, said valve assembly being adapted for adjustable

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control to regulate the flow of water through the duct leading from the reservoir to the steam generating chamber, and being capable of self-actuation to automatically open said duct to a preset degree upon placement of the iron in operative ironing position, and to automatically close said duct completely upon placement of the iron in inoperative up-tilted position.

It is also an important feature of the invention to provide a steam iron of the type to which this invention pertains, with a self-actuated valve assembly of the character above mentioned which may be readily associated with the iron without necessitating material change in the accepted construction thereof, and which may be readily removed as a unit from the iron for cleaning or repair purposes.

Other objects and advantages of the invention will appear from the following description based on the accompanying drawings, in which:

Fig. 1 is a side elevational view of an iron constructed in accordance with the present invention, said iron occupying a normal operative ironing position;

Fig. 2 is a side elevational view of the iron showing the iron in an up-tilted inoperative position;

Fig. 3 is an enlarged transverse cross-sectional view of the forward portion of the iron;

Fig. 4 is an exploded perspective view illustrating possible various sub-assembly units and the mode of assembling the same; and

Fig. 5 is a perspective view of the forward end of the handle of the iron.

Referring more specifically to the drawings, the steam iron therein illustrated and designated generally by the reference character 10, includes a sole plate 11, a body portion 12, and a handle 13. Preferably the rear part 14 of the body portion 12 and the rear part 15 of the handle 13 are constructed and arranged to cooperate in providing means for supporting the iron in up-ended position (Fig. 2).

As more clearly shown in Fig. 2, the sole plate 11 comprises a body of suitable material, such as cast aluminum, having a conventional heating element 16, preferably embedded therein in the manner well known in the art. Also in accordance with the usual practice in the art, the heating element is adapted for electrical connection with a current supplying cord 18 (Fig. 1), the current flowing through said element being controllable by means of a thermostat (not shown) which may be selectively adjusted through manipulation of a knob 19.

As illustrated particularly in Fig. 3 the sole plate is provided with a recessed portion defining a steam generating chamber 20 which communicates, as at 21, with steam circulating channels, one of which is represented at 22. These channels in turn communicate with discharge ports

extending through the sole plate as shown, for instance, at 23.

The open sides of the steam generating chamber 20 and channels 22 are closed by means of a cover plate 24 suitably fixed to the sole plate by means, for example, of screws 25 or like fastening elements. This cover plate 24 is provided with an aperture 26 at the top of the steam generating chamber 20, said aperture preferably having an internally threaded nipple 27 secured therein, as by brazing.

The body portion 12 of the iron, as more clearly seen in Fig. 3, comprises a hollow shell 28 of suitable material, such as aluminum. A member 29 having its edge portion engaged within a recess 30 and rigidly connected to the side of the shell 28, as by brazing, constitutes a bottom for the body portion of the iron and cooperates with the walls of said shell to define a water reservoir 31. The member 29 is provided with an aperture 32 preferably having a nipple 33 rigidly fixed therein, as by brazing, and depending in axial alignment with and for abutting relation to the nipple 27 of the cover plate 24 of the sole plate 11 when the shell 28 is assembled with said sole plate.

In mounting the shell on the sole plate, the connection at the forward end thereof may conveniently be effected by means of a plug 34 having a screw threaded shank portion 35 and an enlarged head portion 36. The screw threaded shank of the plug 34 is adapted to be slipped into the nipple 33 for engagement with the internal screw thread of the nipple 27, and the enlarged head portion 36 of said plug is adapted for bearing engagement with the said nipple 33. Upon tightening the plug 34 by means of a suitable tool which may be inserted through an opening 37 in the top of the shell 28, the sole plate is drawn towards the shell until a snug and tight connection is obtained between the adjacent ends of the nipples 27 and 33. If desired, a spacer 38 of suitable insulating material may be interposed between said adjacent ends thereby providing a thermal break between said nipples.

Preferably, the interengageable surfaces of the nipple 33 and of the enlarged head portion 36 of the plug are beveled so as to provide a tight connection therebetween and to permit the exposed surface 40 of the plug to lie substantially flush with the inner surface 41 of the reservoir bottom member 29. The plug 34 is formed with a longitudinal central bore or duct 42 having a restricted valve seat 43 and through which communication is established between the water reservoir 31 and steam generating chamber 20.

The general construction and association of the sole plate 11 and body portion 12 of the iron as thus far described, are known, and form no part of the present invention, except in the combination hereinafter set forth.

In accordance with the present invention a valve unit indicated at 44 is adapted for manual setting to control the flow of water from the reservoir 31 to the steam generating chamber 20 through the communicating duct 42, said valve unit being capable of automatically opening said duct when the iron is moved into operative ironing position (Fig. 1), and of automatically closing said duct when the iron is moved into inoperative up-ended position (Fig. 2).

As more clearly shown in Figs. 3 and 4, the valve unit includes a tubular member 45 preferably having one of its end portions slotted longitudinally to provide a plurality of spaced depending fingers 46, which serve as guides for a slidable needle valve 47, said needle valve comprising a head 48 and a stem 49. The valve head 48 is adapted to be loosely received within the slotted end portion of the tubular member 45 for free reciprocating movement therein, and the valve stem 49 is adapted to be loosely received within the bore or duct 42 for coaction with the valve seat 43. In this connection it is to be noted that the diameter of the valve stem is substantially less than the diameter of the duct 42 so that ample space is provided for the passage of water from the reservoir 31 to the steam generating chamber when the valve stem is removed from the valve seat 43.

Arranged for engagement with the head 48 of the valve means 47, is a gravity actuated element in the form in the present instance of a weighted lever 50 which operates to move and maintain said valve means in unseated position upon placement of the iron in operative position, and in seated position upon placement of the iron in inoperative up-ended position. This is accomplished by providing the weighted lever 50 with an extension 51 which is loosely engaged in a slot 52 in the valve head 48; and by pivoting said lever, as at 53, to a pair of ears 54 laterally projecting from two adjacent guide fingers 46. It will be apparent that, as long as the iron is in an operative ironing position as shown in Fig. 1, the weighted lever 50 will rest in a position, shown in full lines in Fig. 3, to maintain the valve means 47 in unseated position, whereby the duct 42 is opened for free flow of water from the reservoir 31 into the steam generating chamber 20; but that when the iron is moved to the inoperative up-ended position, shown in Fig. 2, the weighted lever will pivot to a position as shown in broken lines in Fig. 3, and will thereby move said valve means into seated position, closing said duct and accordingly positively preventing water from entering the steam generating chamber. It will also be apparent that, as the iron moves from its inoperative up-ended position to its operative ironing position, the weighted lever 50 drops, thereby moving the valve means out of seated position and reopening the duct 43, whereupon feeding of water from the reservoir to the steam generating chamber is resumed.

In steam irons of the type herein referred to, it is desirable that the amount of water fed into the steam generating chamber be controlled so that the proper quantity of steam may be generated for the satisfactory ironing of various types of fabrics such as rayon, silk, wool, cotton, and linen. This may be accomplished by adjusting the valve so that water from the reservoir will flow into the steam generating chamber at the required rate, said rate being variable from a few drops per minute to a steady fine stream. For that purpose, the valve unit 44 includes a spindle 55 adjustably mounted in the tubular member 45 and having an extension 56 disposed for contact with the valve head 48 so that the valve means 47 may be arrested and held at various levels when moving to unseated position, thereby regulating the position of the valve stem 49 with respect to the valve seat 43. In practice the spindle 55 may be made adjustable by providing cooperating screw-threaded portions on corresponding surfaces of the spindle and tubular member, as represented at 57. Rotation of the spindle in clockwise direction will cause the spindle and its extension 56 to progress inwardly in relation to the tubular member and

will establish the final unseated position of the valve means 46 at a level restricting the flow of water into the steam generating chamber and causing it to enter at a relatively slow rate. Rotation of the spindle in counterclockwise direction, causes the spindle and its extension to progress outwardly in relation to the tubular member and establishes the final unseated position of the valve means 47 at a higher level, with the result that the water is allowed to flow into the steam generating chamber at a faster rate.

It will be understood also that by turning the spindle in a clockwise direction to an extent bringing the valve means into snug engagement with the valve seat, water will be prevented from entering the steam generating chamber regardless of the position of the iron. With such an adjustment, the iron may be used as a dry iron.

The valve unit 44 is adapted to be assembled in the iron by introducing the valve-carrying end of the tubular member through the opening 37 in the top of the reservoir. For that purpose, the opening as best seen in Fig. 4 is elongated to allow the combined width of the tubular member and weighted lever carried thereby to clear the edges of the opening. It is to be noted from Fig. 4, that due to the pivotal connection between the tubular member and weighter lever, said lever may be brought close to the side of said member, which makes it possible to use an opening of relatively small size.

As illustrated more particularly in Figs. 3 and 4, the opening 37 is closed by means of a cover plate 58, which is adapted to be securely fastened to the body of the iron by means, for example, of screw-threaded elements 59. A suitable gasket 60 may be used to effect a water-tight seal at said opening. Preferably, the cover plate is provided with a collar 61 snugly fitting about an intermediate portion of the tubular member 45 and fixed thereto, as by brazing, so that said plate then becomes a part of the valve unit which facilitates assembly of the iron.

The handle 13 which, in accordance with the usual practice, is preferably made of hard plastic material, includes a front leg portion 62 having a bore 63 through which the tubular member 45 of the valve unit extends. The front leg portion of the handle may conveniently be held in position on the body of the iron by means of a bushing 64 having screw-threaded engagement with the said tubular member and provided with a flange 65 arranged to urge and lock said front leg portion of the handle onto the body of the iron. This is possible because the tubular member 45 is fixedly connected with the cover plate 58, which in turn is securely fastened to the body of the iron.

In order to reinforce that portion of the handle in which the bore 63 is located and also to afford a strong rigid surface against which the bushing 64 may act for securing the handle in position, there is preferably provided a ferrule 66 adapted to line said bore and having stepped shoulder portions 67 engageable with like portions 68 on the circumferential surface of the bore. The upper portion of the handle surrounding the bore 63 is preferably recessed as shown at 69 to accommodate a removable disc 70 which covers the bushing 64 and prevents tampering therewith.

The disc 70 is provided with a central aperture 71 through which projects the free end of the valve setting spindle 55. Moreover, the disc 70, as more clearly shown in Fig. 5, may be provided with suitable indicia arranged to cooperate with a pointer 72 associated with a manipulating knob 73 on the projecting end of the spindle 55 through which knob the valve may be set in accordance with the requirements of the particular type of fabric being ironed. A stop means 74 is preferably located on the disc 70 in the path of movement of the pointer 72 to limit the rotation of the knob and spindle. Adequate connection between the knob 73 and the end of the spindle 55 may be obtained by squaring the interengageable portions of said knob and spindle end. Retention of the knob on the spindle end may be effected by means of a screw threaded fastening element 75 which preferably has an enlarged head 76 which not only imparts a finished appearance to the exposed top of the knob but which also may advantageously serve as a name plate.

In accordance with the invention, the water reservoir is filled through a funnel-like opening 77 communicating with the interior of the reservoir through an aperture 78 in the cover plate 58. This funnel-like opening is formed in the forward portion of the front leg 62 of the handle so that water may be introduced into the reservoir while the iron is tilted or supported in inoperative up-ended position. In this manner, the danger of flooding the steam generating chamber and steam circulating channels is obviated since the duct leading from the reservoir to said chamber is positively closed when the iron is in such position. Furthermore, because the positive closing of the duct is effected automatically through operation of the self-actuated valve means when the iron is moved to that position, it becomes unnecessary to disturb the operative setting of the valve preparatory to filling the reservoir. A gasket 79 may be interposed between the adjacent surfaces of the cover plate 58 and the handle to provide a cushion therebetween and also to effect a tight seal about the aperture 78 in the said plate.

The filling opening 77 may be conveniently closed by means of a cover plug 80 which is preferably pivoted, as shown at 81, to an adjoining portion of the handle. Suitable detent means 82 may be provided to releasably lock the cover plug 80 in either closed or open position. The detent means also permits easy opening or closing of said cover plug by the mere flipping thereof downwardly or upwardly. A vent 83 may be formed through the cover plug 80 to prevent the reservoir from becoming air-bound when the iron is in use.

From the foregoing description it will be understood that when the iron is set for steaming operation, water will enter the steam generating chamber 20 at the rate determined by the setting of the valve, which setting, in practice, is calibrated to correspond to that setting of the thermostat which will permit sufficient current to flow through the heating element for heating the surface of the steam generating chamber to the required degree for causing the water to "flash" immediately into steam upon coming in contact with said surface. The steam thus generated in the chamber 20 passes into the steam circulating channels 21 and out the ports 23 for discharge onto the fabric being ironed. The steam operation continues as long as there is water in the reservoir and as long as the iron is in operative ironing position. However, because of the self-actuated valve means, the steam oper-

ation instantly ceases when the iron is placed in inoperative up-ended position.

It will be appreciated also that with the hereindescribed arrangement, the filling of the reservoir may be accomplished without necessity of disturbing the valve setting and that the reservoir may be completely filled without any danger of water entering the steam generating chamber when the iron is in inoperative up-ended position. Moreover, as will be seen in Fig. 4, the arrangement is such that the various elements and parts are particularly adapted to form convenient sub-assembly units which may be readily assembled into the finished product.

Whereas the description and drawings set forth a preferred embodiment of the device, it is to be understood that the specific structural features thereof may be changed within the scope of the appended claims.

I claim:

1. In an iron including a sole plate having a steam generating chamber therein, a body mounted on said sole plate and defining a water reservoir, and a handle mounted on said body, said plate, body and handle being movable together between a substantially horizontal ironing position and a substantially vertical non-ironing position, a valve assembly comprising means defining a duct establishing communication between the water reservoir and the steam generating chamber, a tubular member extending through said handle and into said reservoir and terminating at a point above said duct, a valve element slidably received in said member and movable into and out of seating engagement with said duct to control communication between the water reservoir and the steam generating chamber, a weighted lever pivotally supported on said member and engaging the valve element, said lever being adapted to cause the element to open communication between said reservoir and chamber when the plate, body and handle are moved to said horizontal ironing position and to cause said element to close said communication when the plate, body and handle are moved to said vertical non-ironing position, and a spindle adjustably mounted in said member and having stop means engageable with said element to regulate the extent to which said element is moved in opening said communication.

2. In an iron, a structure providing a water reservoir, a steam generating chamber and a sole plate constructed to discharge steam generated in said chamber, said structure being movable to place the sole plate in a substantially horizontal ironing position and, alternatively, in a substantially vertical non-ironing position, means defining a duct for discharging water from said reservoir to said chamber, said duct having a portion providing a valve seat, a valve element movable into and out of engagement with said seat to open and close said duct, and a lever pivotally supported on the iron and connected at one end with the valve element and weighted at its other end to cause said element to move into engagement with said seat to close said duct in response to movement of said structure in shifting the sole plate from the said horizontal ironing position to the vertical non-ironing position, and to cause said element to move out of engagement with said seat to open said duct in response to movement of said structure in shifting the sole plate from the said vertical non-ironing position to the horizontal ironing position.

3. In an iron, a structure providing a water reservoir, a steam generating chamber and a sole plate constructed to discharge steam generated in said chamber, said structure being movable to place the sole plate in a substantially horizontal ironing position and, alternatively, in a substantially vertical non-ironing position, means defining a duct for discharging water from said reservoir to said chamber, said duct having a portion providing a valve seat, a valve element mounted in said reservoir and movable into and out of engagement with said seat to open and to close said duct, and a lever pivotally supported within the reservoir, one end portion of said lever being connected with the valve element, the other end portion of the lever being weighted to cause said element to move into engagement with said seat in response to movement of said structure in shifting the sole plate from the said horizontal ironing position to the vertical non-ironing position, and to cause said element to move out of engagement with said seat in response to movement of said structure in shifting the sole plate from the said vertical non-ironing position to the horizontal ironing position.

4. In an iron, a structure providing a water reservoir, a steam generating chamber and a sole plate constructed to discharge steam generated in said chamber, said structure being movable to place the sole plate in a substantially horizontal ironing position and, alternatively, in a substantially vertical non-ironing position, means defining a duct for discharging water from said reservoir to said chamber, said duct having a portion providing a valve seat, a valve element mounted in said reservoir for movement into and out of engagement with said seat to open and to close said duct, a lever pivotally supported in said reservoir and connected at one end to the valve element and weighted at its other end to cause said element to move into engagement with said seat in response to movement of said structure in shifting the sole plate from the said horizontal ironing position to the vertical non-ironing position, and to cause said element to move out of engagement with said seat in response to movement of said structure in shifting the sole plate from the said vertical non-ironing position to the horizontal ironing position, adjustable means extending within the reservoir for engagement with said element to regulate the extent of movement of said element out of engagement with said seat, and means outside of said reservoir and connected with said adjustable means for adjusting the same.

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