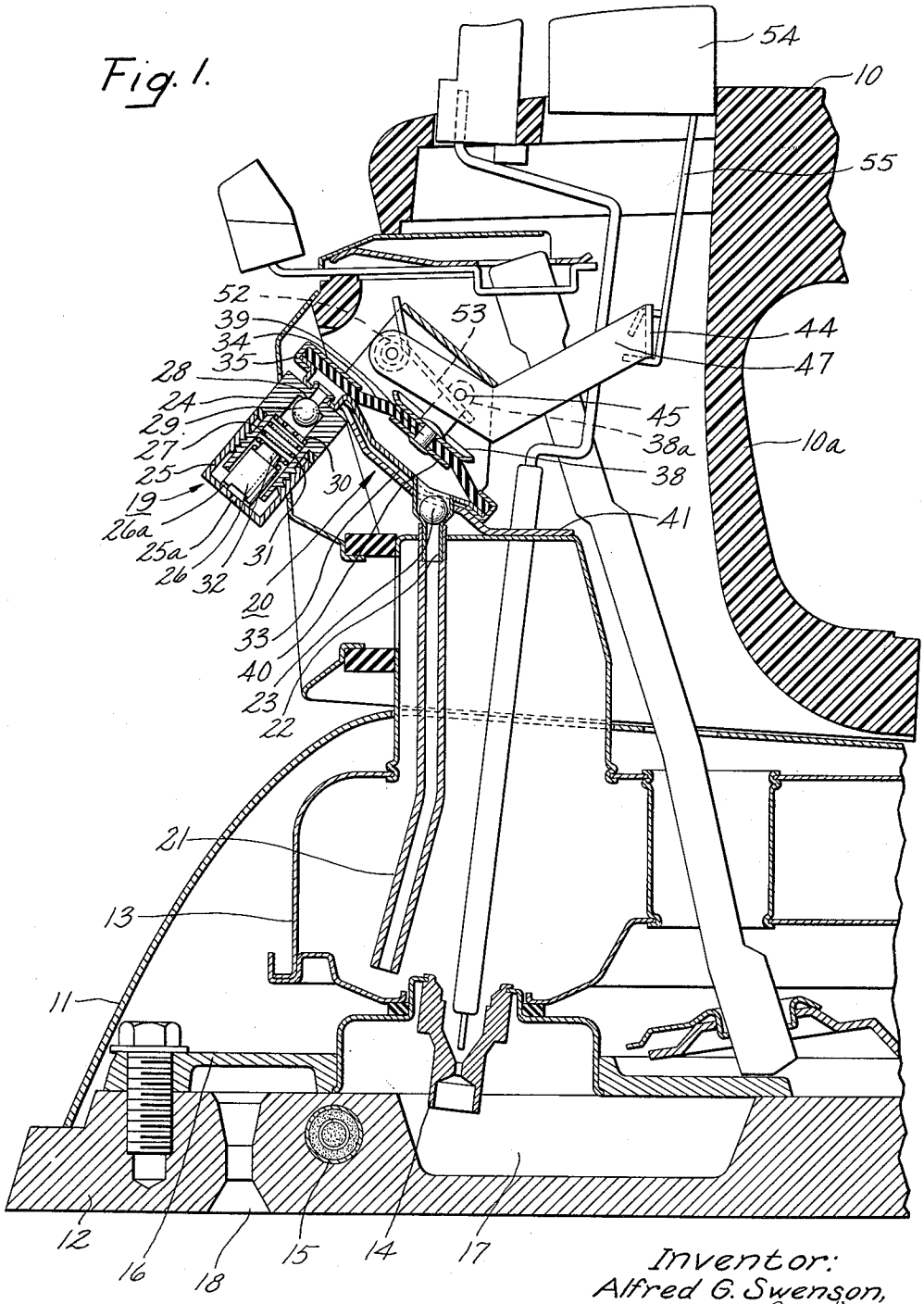
May 18, 1965 A. G. SWENSON 3,183,611

MANUAL SPRAY IRON

Filed March 22, 1963 2 Sheets-Sheet 1

Fig. 1.



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MANUAL SPRAY IRON

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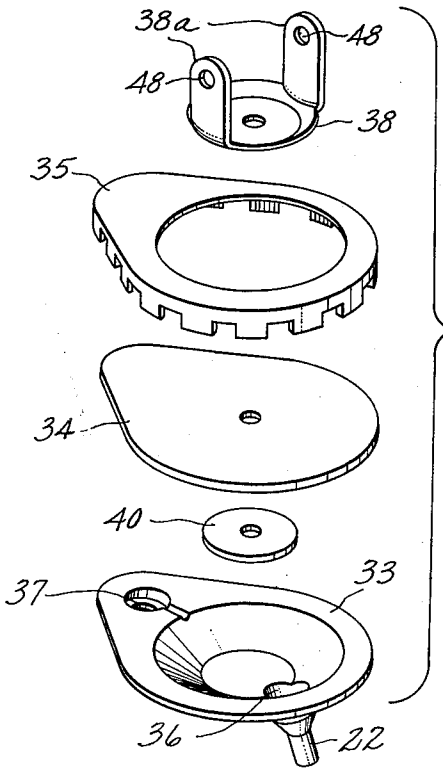
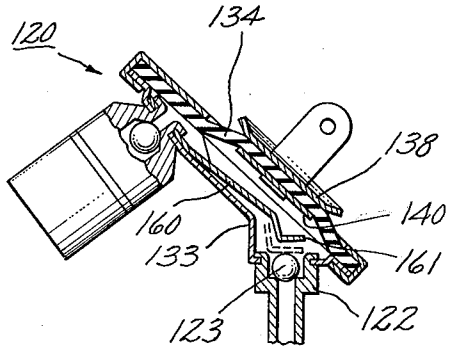
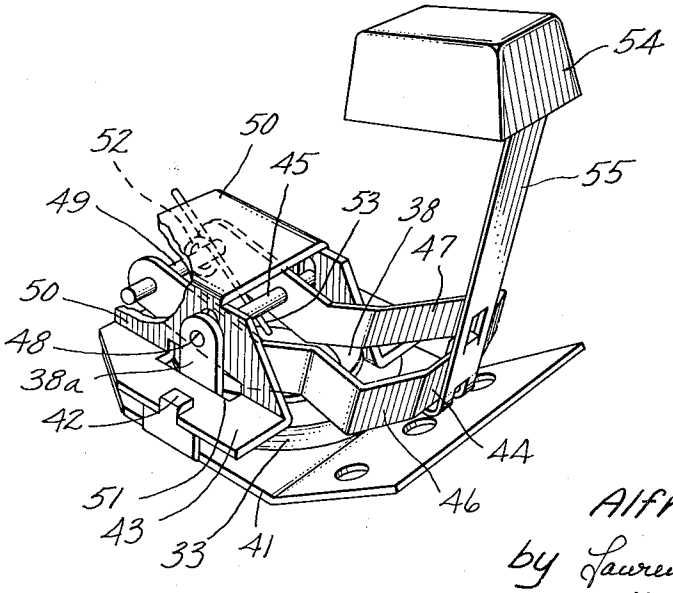


Fig. 2.

Fig. 3.

Fig. 4.





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United States Patent Office 3,183,611 Patented May 18, 1965

3,183,611

MANUAL SPRAY IRON

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Filed Mar. 22, 1963, Ser. No. 267,217
8 Claims. (Cl. 38—77)

This invention relates to steam irons, and more particularly to such irons having means to spray water onto the fabric being ironed.

It has been found that many fabrics cannot be satisfactorily ironed unless some moisture is present in the fabric during the application of heat from the iron. For this reason, steam irons have been developed which, in addition to dispensing moist steam onto the fabric during the ironing process, provide means to spray water onto the fabric. One of the commonly used systems designed to accomplish this result utilizes the steam pressure generated within the iron to provide the pressure necessary to force the water outwardly from the iron in spray fashion. Other systems use a piston-type or bellows-type pump in or associated with the water tank to provide liquid sprayer operation.

Piston-type and bellows-type pumps, being entirely manually operated, are readily adapted to permit spraying during dry ironing. However, the piston-type pumps present many disadvantages including the relatively high operating force required to overcome the friction between the piston seals and cylinder, and the short life of the moving piston seals. A disadvantage of the bellows-type pump is that the severe flexing of the small radius of the convolutions introduces friction that must be overcome by the manual operating force and also causes failure due to rupture. In addition to the aforementioned frictional forces of prior art pumps which increase the manual force necessary for operation, sprayers utilizing spring-biased valve members add to the required force as the force of the spring must be overcome to dispense water through the valve. Another problem present in available manually operated steam iron pumps results from the location of the pump in the water reservoir. The high temperatures in the water reservoir have been found to produce vaporization of the water in the pump chamber resulting in erratic water spraying or the discharge of steam only onto the fabric to be dampened.

It is one object of this invention to provide an improved manual spray iron of simple construction and low production and maintenance cost.

It is another object of this invention to provide a manual spray iron requiring a minimum of effort for its operation.

It is a further object of this invention to provide such an iron capable of liquid spraying during dry ironing.

It is another object of this invention to provide a liquid spray steam iron wherein an even spray of liquid is obtained.

It is yet another object of this invention to provide a liquid spray steam iron wherein the effect of the accumulation of foreign particles is minimized.

It is another object of this invention to provide a liquid spray steam iron wherein the elements of the spray system are conveniently located for maximum efficiency of operation.

In carrying out the objects of my invention, in one form thereof, I provide a steam iron having a diaphragm pump located in a handle support thereof. The inlet to the pump communicates by means of an inlet tube with a water reservoir which is disposed beneath the pump within the cover of the iron. A check valve is located in the inlet tube to permit the flow of water up into the pump but to prevent its flow back into the reservoir. The outlet of the pump communicates with a sprayer designed to diffuse any water expelled therethrough into a fine mist and particularly providing for easy maintenance and reduced pump operating force. Operating means connect the diaphragm with a push button which is manually operable at the top of the handle to compress the diaphragm, thus expelling water through the sprayer. Upon the return of the diaphragm to its normal position by the upward bias of the operating means, water is conveyed from the reservoir through the inlet tube into the pump chamber. To assure maximum and even expulsion of water from the pump, means are secured to both the outer and inner surfaces of the diaphragm.

In one modification of my invention, a leaf spring is secured within the pump chamber having its free and disposed adjacent a ball-type inlet check valve. Upon compression of the diaphragm, the free end of the leaf spring is pressed against the ball of the check valve. This presses the ball against its valve seat to seat the ball firmly and to crush any foreign particles lodged between the ball and the valve seat. Further objects and advantages of my invention may best be understood by reference to the following description taken in connection with the accompanying drawings in which:

FIG. 1 is a sectional elevation view of the forward section of a steam iron incorporating an embodiment of this invention;

FIG. 2 is an exploded perspective view of the diaphragm pump of this invention;

FIG. 3 is a perspective view of the operating means of the pump of this invention having portions thereof cut away for clarity, and

FIG. 4 is a sectional elevation view of a modified form of this invention.

Referring now to the drawings, FIG. 1 shows, in section, the forward portion of a steam iron having a handle **10**, a cover **11** and a soleplate **12**. Mounted within the cover **11** is a water reservoir **13** having a drip valve **14** in its bottom wall. Water within the reservoir may be dispensed through valve **14** onto the soleplate **12** to flash into steam when the soleplate is heated by heater **15**. A soleplate cover **16** is affixed to the top of the soleplate and provides paths for the passage of steam from a boiler **17** to a plurality of steam outlets, one of which is shown at **18**. Steam is ejected from the outlets onto the clothes being ironed.

In order to convey water to a sprayer **19** for dispensing onto the fabric being ironed, this invention incorporates a diaphragm pump **20** mounted in forward hollow handle support **10***a*. The diaphragm pump **20** communicates with reservoir **13** by means of a water or inlet tube **21** which extends vertically from a point adjacent the bottom of the reservoir through the top of the reservoir. Any suitable unidirectional valve, such as ball-check valve **22** having a ball **23**, may be used to connect the water tube **21** to diaphragm pump **20**.

Sprayer **19** is secured to pump **20** and comprises a sprayer body **24**, an apertured cap **25** threadedly engaged with body **24**, a spreader **26**, a spring **27** and a ball-check valve **28**. The spreader **26** insures an even flow of water

to aperture 25*a* of cap 25 and also aids in effecting the spraying by imparting a whirling action to the water through the provision of a plurality of grooves 26*a*. The upper end of spring 27 limits the downward movement of the ball 29 and abuts surface or shoulder 30 to bias spreader 26 against the inner surface of cap 25. Shoulder 30 is spaced from the seat of valve 28 so as to permit the free play of ball 29 between the valve seat and the upper end of spring 27. Thus no spring force need be overcome during operation of the pump. Furthermore spring 27 has a varying coil diameter to frictionally engage the inner surface of body 24 at 31 and to frictionally engage a reduced portion 32 of spreader 26, thereby holding the spreader and spring 27 within the sprayer body. This feature prevents the possible loss of sprayer elements resulting from their falling from the sprayer body when cap 25 is removed for cleaning.

Diaphragm pump 20 comprises a rigid brass shell 33, having a generally concave configuration, and a tough flexible diaphragm 34, preferably of silicone rubber, which are peripherally joined in a watertight relation by clamp ring 35. FIG. 2 reveals the configuration of the diaphragm pump elements. Shell 33 provides an inlet 36 to which check valve 22 may be joined by brazing or other suitable joining process. An outlet aperture 37 is provided at the other end of shell 33 for communicating with sprayer 19.

Diaphragm 34 is actuated by a deflector 38 having a pair of upstanding ears 38*a*. The deflector 38 is secured by rivet 39 to the outer surface of the diaphragm and is part of the pump operating mechanism. The periphery of deflector 38 is turned upwardly to conform with the configuration of shell 33 thereby being capable of closely compressing diaphragm 34 against the shell to maximize expulsion of water from the pump.

In order to obtain an even flow of water from the pump 20 the deflector 38 provides a relatively large flat center area and the diaphragm 34 is clamped between this flat area and a disk 40 by rivet 39. This insures positive movement of a relatively large center area of the diaphragm. It has been found that when a rubber diaphragm such as 34 is deflected at its center, in the conventional manner of deflecting metal diaphragms, the area between the center point and the periphery will bulge upwardly due to the fluid pressure.

A pump support 41, affixed to reservoir 13, secures pump shell 33 in position in the forward end of handle support 10*a*. A pair of tabs 42, one of which can be seen in FIG. 3, are provided on the side edges of pump support 41, for engagement with lever bracket 43. Bracket 43 is secured by turning these tabs inwardly. This produces a rigid assembly of pump support, pump and bracket, and provides support for the pump operating mechanism.

Deflector 38 is operated and supported by lever 44. A pin 45 passes through the arms 46 and 47 of lever 44 and through apertures 48 in the upstanding ears 38*a* of deflector 38. Lever 44 is pivotal about rod 49 which is secured to the vertical walls 50 of bracket 43. Walls 50 also provide openings 51 which accommodate deflector 38. To bias lever 44 upwardly a wire spring 52 is secured about rod 49 and includes an arm 53 which engages the lower surface of pin 45.

The pump is actuated through a push button 54 which extends upwardly above the top surface of handle 10 for operation by the user. Push button 54 is connected to lever 44 through any suitable means such as a rod 55.

As can be seen in FIG. 1, diaphragm 34 has a normal first position in which it is flexed concavely away from shell 33 to form a pump chamber. To expel water from the chamber, diaphragm 34 is moved to a second position into abutment with shell 33.

To illustrate the operation of this invention, it will be assumed that diaphragm 34 is in its normal position prepared to expel water present in the pump through sprayer 19 onto the material being ironed. As the push button 54 is depressed, lever 44 pivots about rod 49 against the bias of spring 52 to press deflector 38, and thus diaphragm 34, to which the deflector 38 is secured, against shell 33. As mentioned above, the large area of deflector 38 prevents any undue bulging of diaphragm 34 to maintain a steady flow of water from the pump during the compression stroke.

Also the upturned edge of deflector 38 assures conformity of diaphragm 34 to the concave configuration of shell 33 and prevents sharp deflection of the diaphragm. Water expelled from the pump 20 is directed through outlet 37, and past ball 29 so as to pass through sprayer 19, ball 23 meanwhile preventing the flow of water back into reservoir 18 through check valve 22.

Upon release of push button 54, spring 52 operates to return lever 44 and thus the entire operating mechanism as well as diaphragm 34 to the normal position shown in FIG. 1. During the return of diaphragm 34 to its normal position, the normal pressure in reservoir 13 forces water up inlet tube 21, through check valve 22 and into pump 20, the suction present in the pump chamber causing ball 29 to seat against the valve seat of valve 28 to prevent the entrance of air therethrough.

Thus it can be seen that this invention provides a simple, inexpensive mechanism of high dependability which assures even water spraying during either steam or dry ironing. Furthermore, the diaphragm pump is more efficient than other types due to its inherently low friction. The location of the pump in the handle support not only provides for more precise control of spraying being close to the handle-mounted push button, but also reduces the likelihood of vaporization and the consequent poor operation resulting from location in the reservoir. The sprayer mechanism insures retention of the elements thereof within the sprayer body upon removal of the cap for cleaning.

FIG. 4 reveals a modified embodiment of the diaphragm pump of my invention designed to minimize the dangers of accumulation of foreign particles in the pump inlet valve. The pump 120 includes a diaphragm 134, a rigid metal shell 133 having an inlet and an outlet, and a ball check valve 122, similar to that of the pump discussed above. Additionally, however, the modification of FIG. 4 embodies a leaf spring 160 which is secured to the inner surface of the shell 133 and provides a free end 161 which is normally disposed immediately above the ball 123 of ball check valve 122. Upon the compression of diaphragm 134 against shell 133 to expel water present in pump 120 through sprayer 119, the free end 161 of leaf spring 160 is pressed against ball 123 pressing the ball 123 against the valve seat of valve 122. The depression of ball 123 against the valve seat directly, by manual force, as exerted through the operating mechanism of the pump, effects a crushing of any foreign particles which may have accumulated on the valve seat. Thus, means are provided to assure maintenance of a clear fluid passage through inlet check valve 122 and an effective seal between ball 123 and valve seat of valve 122. Due to the fact that the free end 161 of leaf spring 160 is disposed immediately above the ball 123, it also limits the upward movement of the ball away from its valve seat.

While the preferred embodiment described herein discloses the positioning of a push button 54 at the top of the handle 10 which is particularly convenient to the user, any external operating means may be utilized to operate the pump of this invention. Furthermore my invention contemplates the use of any diaphragm operating mechanism.

While I have shown and described a specific embodiment of my invention, I do not desire my invention to be limited to the particular construction shown and described. Instead, I intend, by the appended claims, to cover all modifications within the spirit and scope of my invention.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. In a steam iron:
(a) an electrically heated soleplate;
(b) a water reservoir overlying said soleplate for supplying water thereto for generation of steam;
(c) a handle for gripping said iron including a hollow front handle support extending upwardly from said reservoir;
(d) a sprayer means mounted on said handle support;
(e) a diaphragm pump mounted within said handle support above said reservoir, said pump including an outlet connected to said sprayer means;
(f) an inlet tube for said pump extending from said pump into said reservoir;
(g) a check valve within said inlet tube adjacent said pump and above said reservoir; and
(h) manually operable means for actuating said pump to effect spraying of water from said sprayer means.

2. In a steam iron:
(a) an electrically heated soleplate;
(b) a water reservoir overlying said soleplate for supplying water thereto for generation of steam;
(c) a handle for gripping said iron including a hollow front handle support extending upwardly from said reservoir;
(d) sprayer means projecting from the upper portion of said handle support;
(e) a diaphragm pump mounted within said handle support above said reservoir, said pump including an outlet connected to said sprayer means;
(f) an inlet tube for said pump extending from said pump into said reservoir;
(g) a check valve within said inlet tube adjacent said pump and above said reservoir; and
(h) manually operable means, including a push button mounted in the top of said handle, for actuating said pump to effect spraying of water from said sprayer means.

3. In a steam iron:
(a) an electrically heated soleplate ;
(b) a water reservoir overlying said soleplate for supplying water thereto for generation of steam;
(c) a handle for gripping said iron including a hollow front handle support extending upwardly from said reservoir;
(d) sprayer means mounted on said handle support;
(e) a diaphragm pump mounted within said handle support above the reservoir liquid level including:
(aa) a rigid concave shell having an inlet and an outlet, said outlet being connected to said sprayer means, and
(bb) a flexible diaphragm peripherally secured to said shell to form a chamber therebetween;
(f) an inlet tube for said pump including a check valve therein, said tube extending from said inlet into said reservoir; and
(g) manually operable means for actuating said pump to effect spraying of water from said sprayer means.

4. The combination recited in claim 3 wherein said check valve is located adjacent said inlet, wherein means are mounted within said pump extending into the area adjacent said check valve and wherein movement of said diaphragm causes said last-named means to engage said check valve for crushing any foreign particles which may accumulate in said check valve.

5. In a steam iron:
(a) an electrically heated soleplate;
(b) a water reservoir overlying said soleplate for supplying water thereto for generation of steam;
(c) a handle for gripping said iron including a hollow front handle support extending upwardly from said reservoir;
(d) sprayer means mounted on said handle support;

(e) a diaphragm pump mounted within said handle support above the liquid level in said reservoir and including:
(aa) a rigid concave shell having an inlet and an outlet, said outlet being connected to said sprayer means, and
(bb) a flexible diaphragm peripherally secured to said shell and having a first position in which a chamber is formed between said diaphragm and said shell and a second position in which said diaphragm abuts said shell;
(f) an inlet tube for said pump including a check valve therein adjacent said pump shell, said inlet tube extending from said inlet into said reservoir;
(g) means engaging said diaphragm for effecting movement thereof between said first and second positions; and
(h) manually operable means connected to said last-named means and including a push button mounted in the top of said handle for effecting movement of said last-named means to spray water from said sprayer means.

6. The combination recited in claim 5 wherein said means engaging said diaphragm includes a concave deflector secured to said diaphragm assuring abutment of said diaphragm with said shell and for preventing sharp deflection of said diaphragm when said diaphragm is in said second position.

7. In a steam iron:
(a) an electrically heated soleplate;
(b) a water reservoir overlying said soleplate for supplying water thereto for generation of steam;
(c) a handle for gripping said iron including a hollow front handle support;
(d) sprayer means mounted on said handle support;
(e) a diaphragm pump mounted within said handle support including:
(aa) a rigid concave shell having an inlet and an outlet, said outlet being connected to said sprayer means, and
(bb) a flexible diaphragm peripherally secured to said shell to form a chamber therebetween;
(f) an inlet tube for said pump extending from said inlet into said reservoir;
(g) a valve seat in said tube adjacent said inlet and a ball engaging said valve seat for permitting the flow of water from said reservoir to said chamber and preventing the return of water to said reservoir from said chamber;
(h) manually operable means, including a push button mounted in the top of said handle, for compressing said diaphragm against said shell to effect pumping of water from said sprayer means; and
(i) a leaf spring secured to said shell within said chamber and having its free end extending into the area of said valve seat, compression of said diaphragm by said actuating means causing said free end of said leaf spring to engage said ball to crush any particles accumulated on said valve seat.

8. In a steam and spray iron:
(a) an electrically heated soleplate;
(b) a liquid reservoir having walls including a top wall and positioned over the upper surface of said soleplate and in a high temperature zone approximating the liquid boiling point during normal operation;
(c) valve means interconnecting said reservoir with said soleplate for supply of liquid thereto for generation of steam;
(d) a handle for the iron including a hollow upwardly extending handle support;
(e) a liquid sprayer mounted in said handle for spraying liquid onto the fabric being ironed;

(*f*) a liquid pump mounted on said handle above said reservoir top wall in a relatively cool temperature zone connected to said sprayer to supply liquid under pressure;

(*g*) an inlet tube for said pump extending downwardly through said hollow handle support and reservoir top wall into the liquid space in said reservoir;

(*h*) inlet check valve means adjacent said pump above said reservoir top wall in the flow path through said inlet tube; and

(*i*) manually operable means for actuating said pump to spray liquid.

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