United States Patent

Ogata et al.

[15] **3,703,043**

[45] **Nov. 21, 1972**

[54] **STEAM IRON**

[72] Inventors: **Nobutaka Ogata,** Shijonawate; **Riyouzi Kumamoto,** Toyonaka; **Shuzi Asada,** Osaka, all of Japan

[73] Assignee: **Matsushita Electric Industrial Co., Ltd.,** Osaka, Japan

[22] Filed: **July 19, 1971**

[21] Appl. No.: **163,609**

[30] **Foreign Application Priority Data**

July 21, 1970 Japan 45/64213
Aug. 20, 1970 Japan 45/73610
April 5, 1971 Japan 46/21137

[52] **U.S. Cl.** **38/77.83**
[51] **Int. Cl.** **D06f 75/06**
[58] **Field of Search** 38/77.1, 77.5, 77.7, 77.8, 38/77.81, 77.83

[56] **References Cited**

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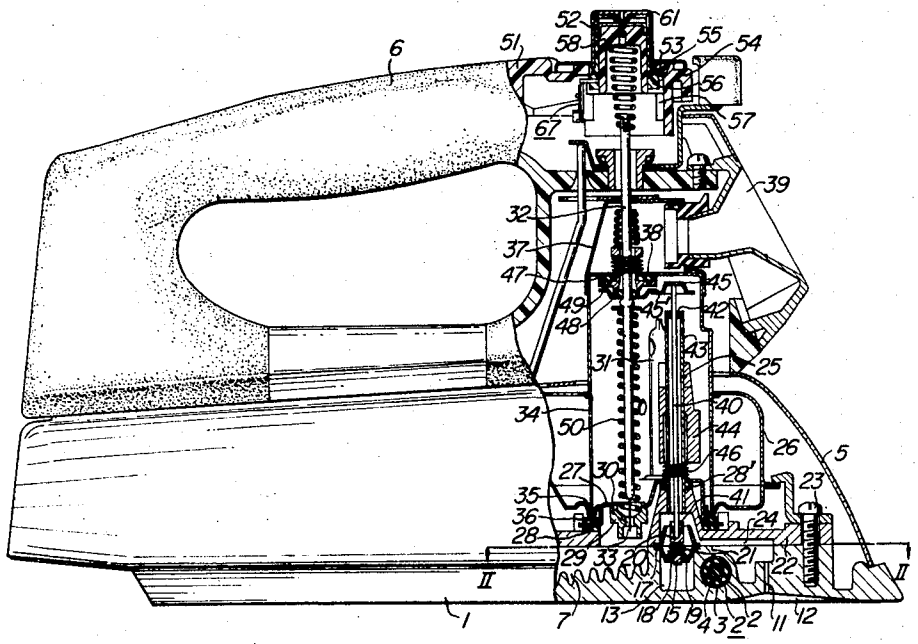
Primary Examiner—Patrick D. Lawson
Attorney—Stevens, Davis, Miller & Mosher

[57] **ABSTRACT**

A steam iron in which a large number of steam nozzles are grouped into a plurality of groups and means for delivering steam to said respective groups is shiftable, from a state of delivering steam to any one of said groups to a state of delivering steam to any other selected group, and further indicator means is provided to indicate which of said groups steam is being delivered to.

13 Claims, 48 Drawing Figures



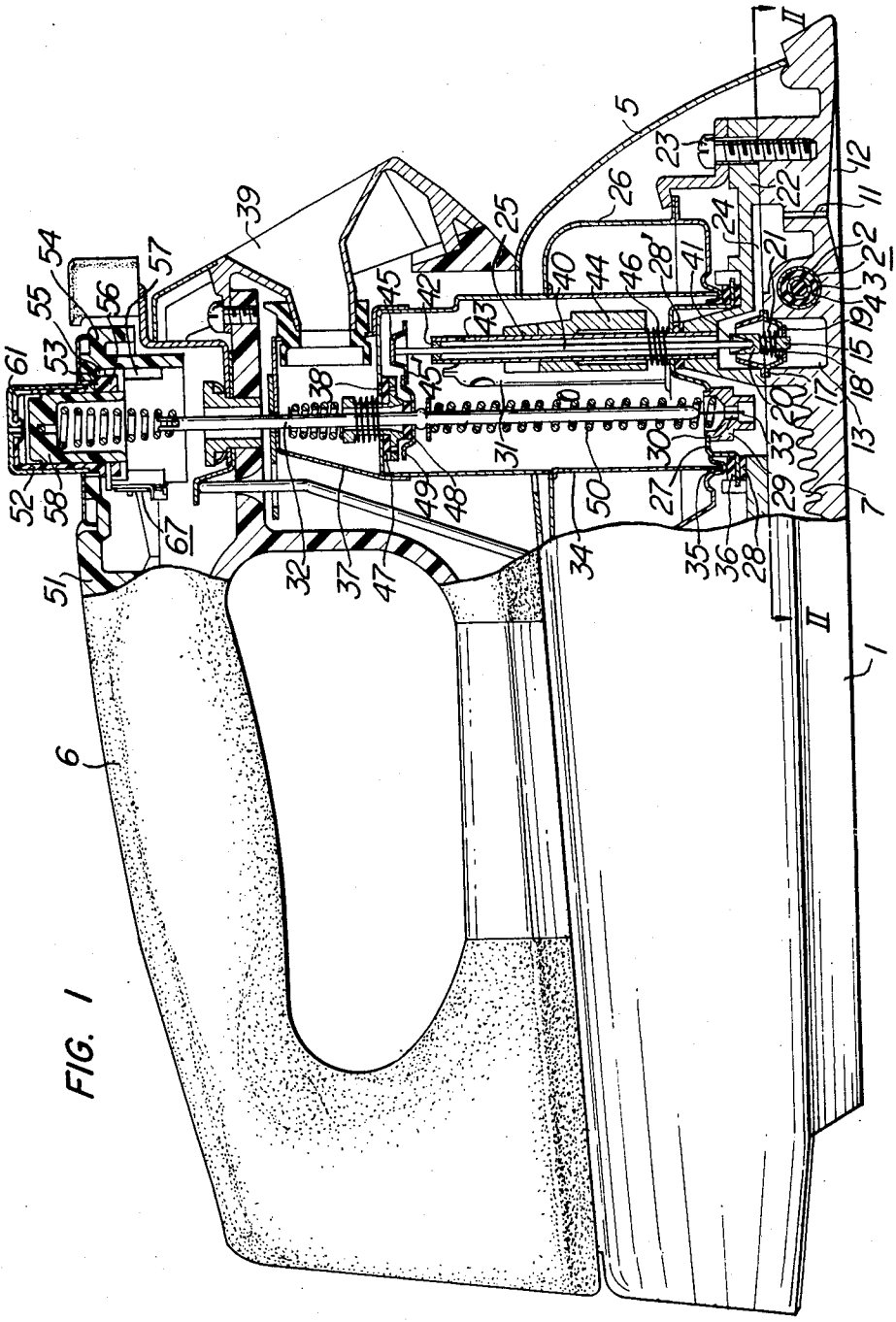


FIG. 1

FIG. 2

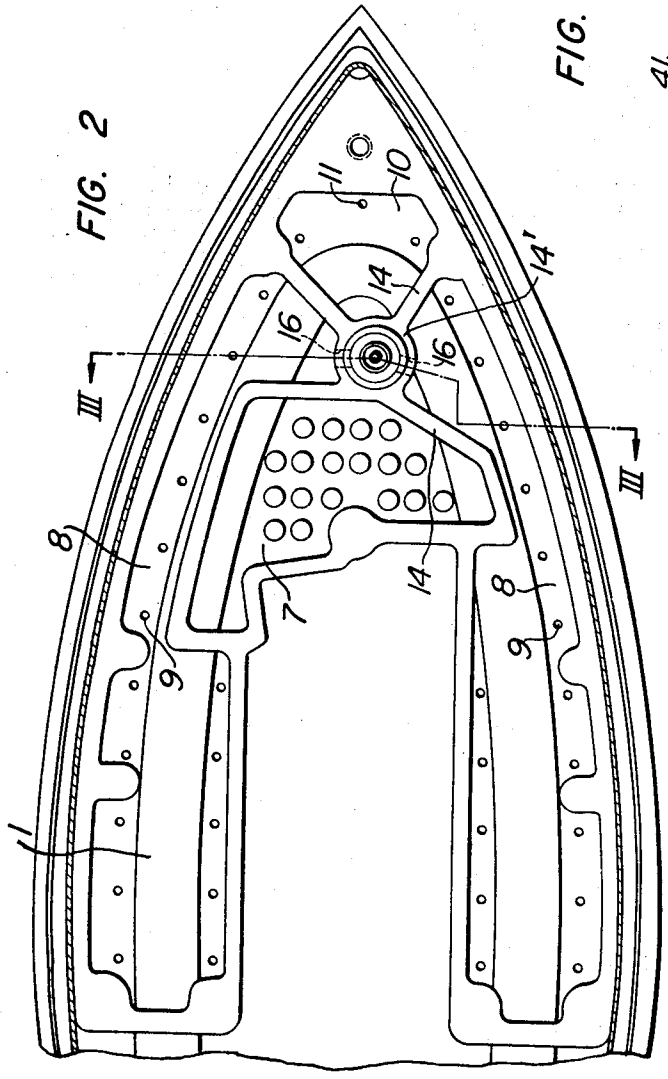

11
10
14
14'
16
16
III
III
8
9
7
14
8
9
1

FIG. 3

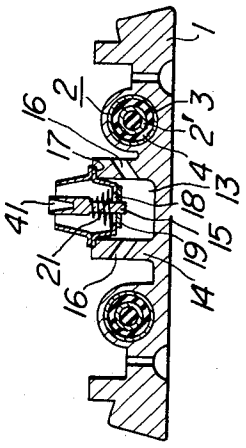

1
16
2
3
2'
17
4
13
18
41
15
19
21
16
14'

FIG. 4

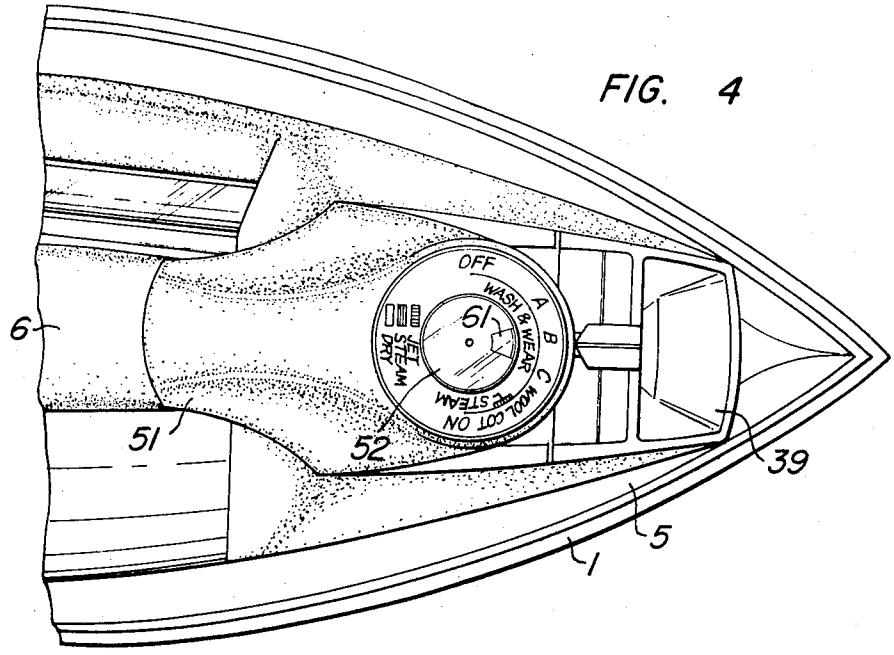

OFF
WASH & WEAR
A
B
C
WOOL
COTTON
STEAM
DRY
61
6
51
52
39
5
1

FIG. 5

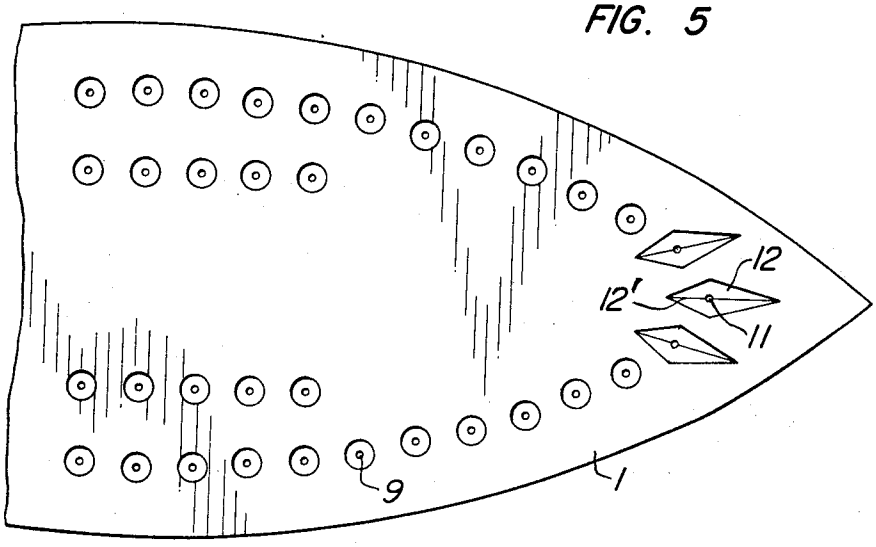
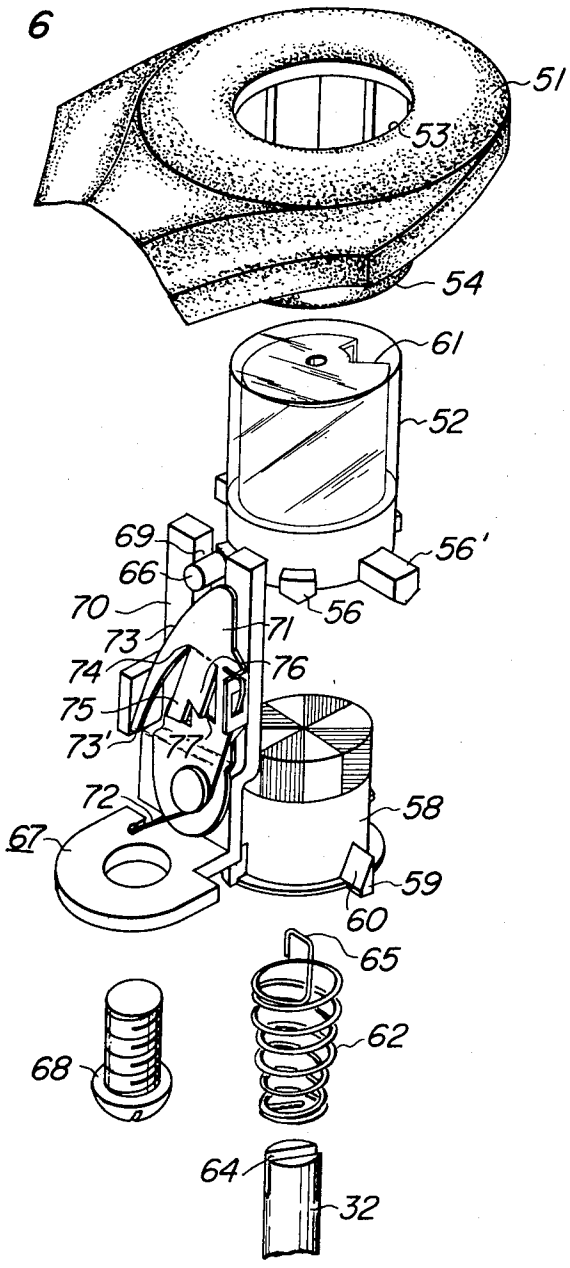

12
12'
11
9
1

FIG. 6


51
53
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61
52
69
66
56'
70
56
73
71
74
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77
72
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67
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68
64
32

FIG. 7

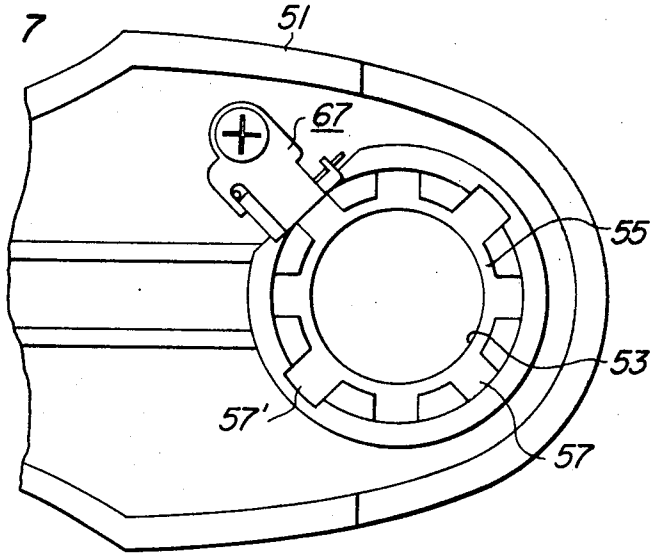


FIG. 8

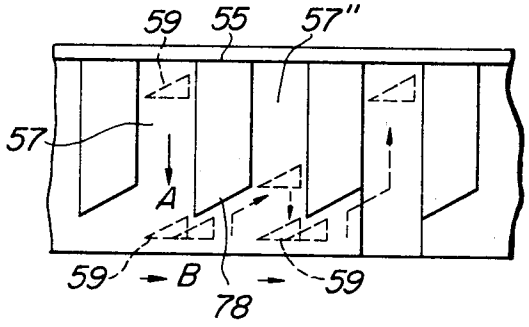


FIG. 9

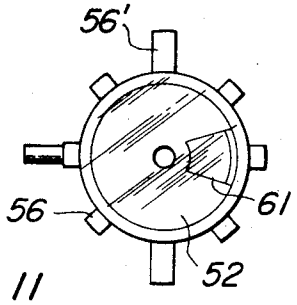


FIG. 10

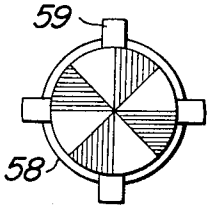


FIG. 11

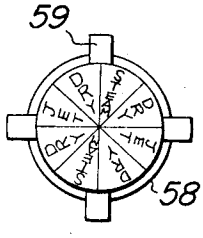


FIG. 12

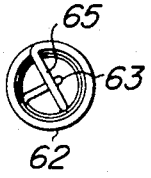
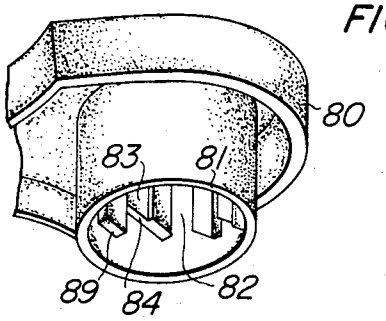


FIG. 13



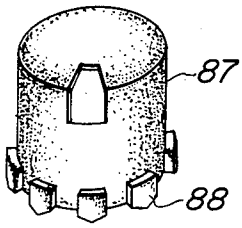


FIG. 14

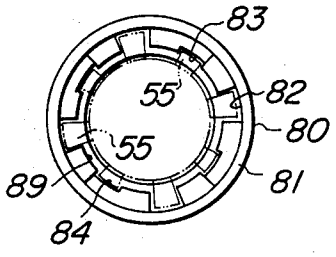


FIG. 15

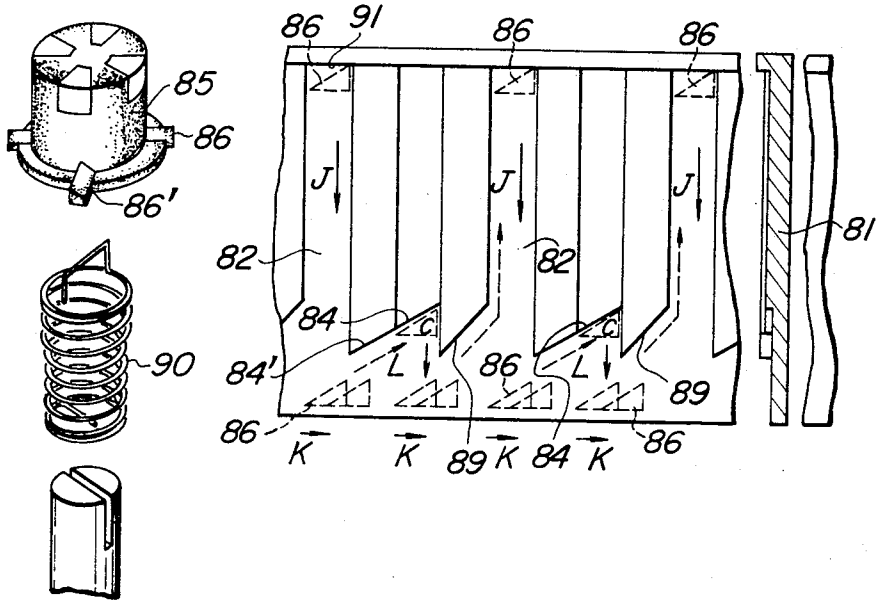


FIG. 16

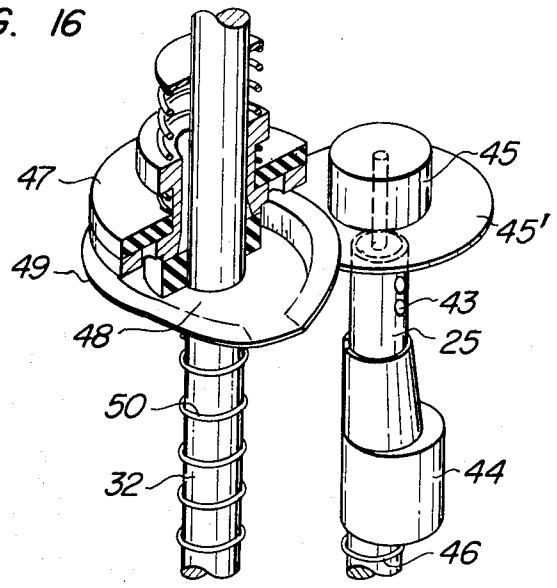


FIG. 17

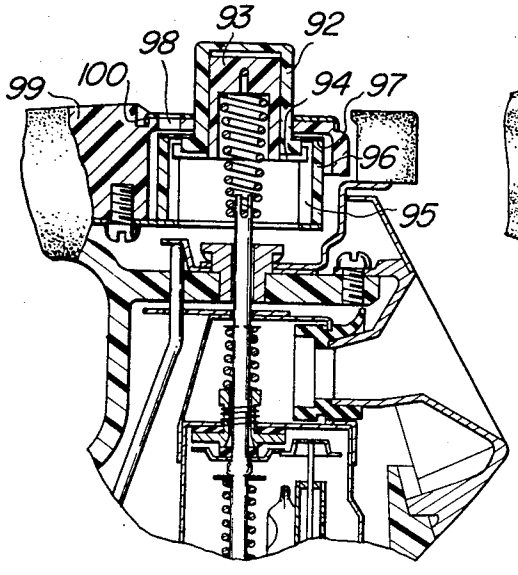


FIG. 18

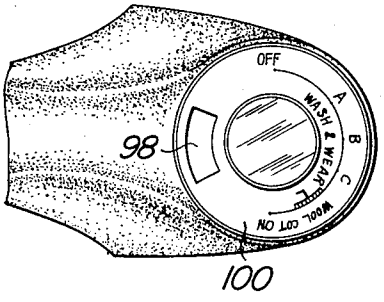


FIG. 19

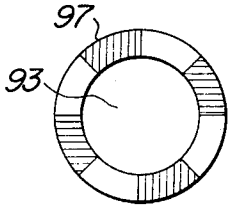


FIG. 20

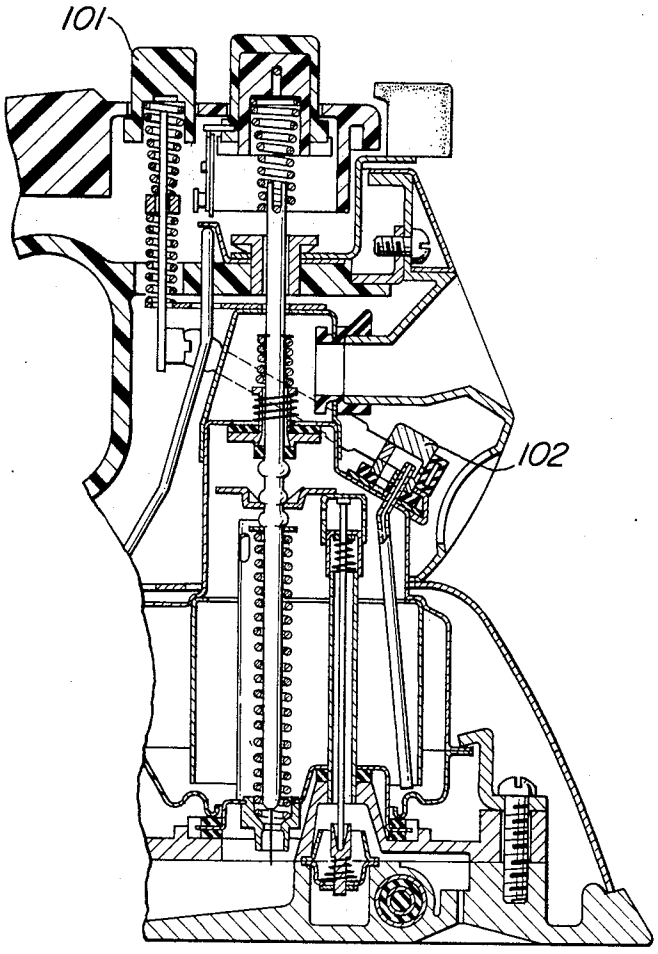


FIG. 21a

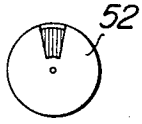


FIG. 22a

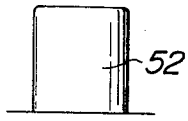


FIG. 23a

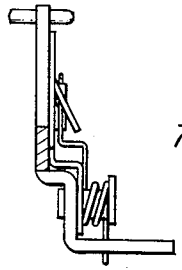


FIG. 24a

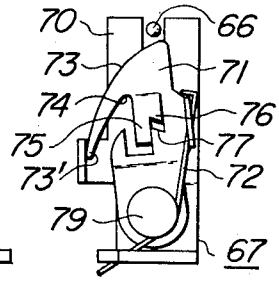


FIG. 21b

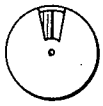


FIG. 22b

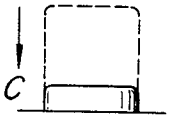


FIG. 23b

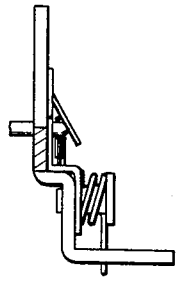


FIG. 24b

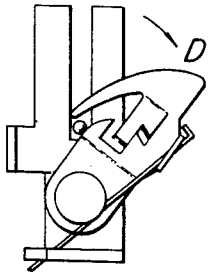


FIG. 21c

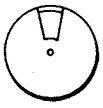


FIG. 22c

FIG. 23c

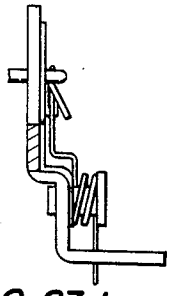


FIG. 24c

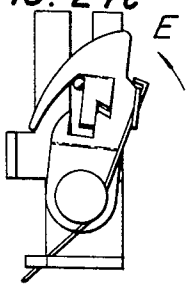


FIG. 21d

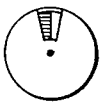


FIG. 22d

FIG. 23d

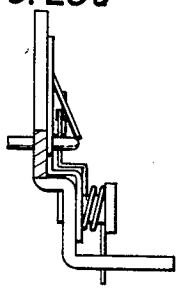


FIG. 24d

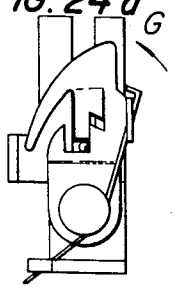


FIG. 21e FIG. 22e

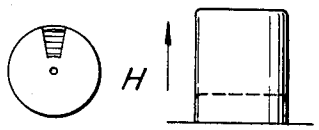


FIG. 23e

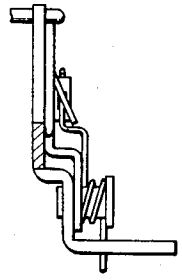


FIG. 24e

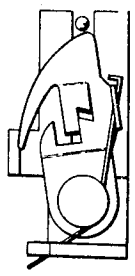


FIG. 21f FIG. 22f

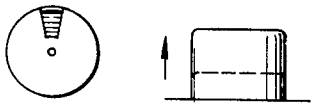


FIG. 23f

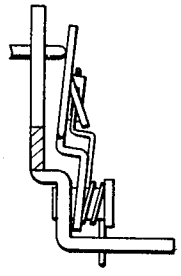


FIG. 24f

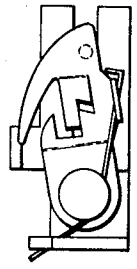


FIG. 21g FIG. 22g

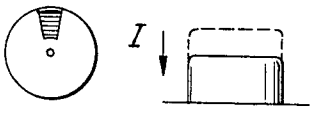


FIG. 23g

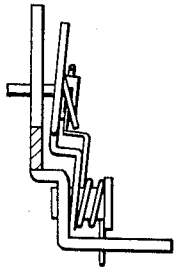
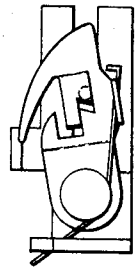


FIG. 24g



STEAM IRON

This invention relates to a steam iron having steam nozzles in a base thereof for ejecting steam therethrough.

Conventional irons of the type described have been designed such that steam is constantly ejected in the same state regardless of the kind of clothes to be pressed, i.e., the properties of the cloth or material, and accordingly the result of pressing has not always been the same depending upon the nature of the material fiber in the clothes.

In recent years, an increasing number of different kinds of fibers have been commercially used owing to the rapid progress of chemical fibers and it is presently impossible to obtain a good pressing result for any given fiber.

The present invention has been achieved with a view to solving such inconvenience, and the first object of the invention is to provide an improved steam iron which enables a better result of pressing to be obtained by varying the state of being ejected from the steam nozzles and thereby selectively supplying steam in the state most suitable for the cloth material to be pressed.

The second object of the invention is to provide an iron in which steam nozzles are grouped into a plurality of groups and an arrangement is made such that the ejection of steam is shifted from one of said groups to another of said groups by manually operating a button, whereby the operational procedure is rendered simple and the fatigue of the user can be minimized during use of the iron.

The third object of the invention is to provide an iron in which steam nozzles are grouped into a plurality of groups and means for shifting a flow of steam to the respective group is operatively associated with opening and closing means to concurrently operate the former, whereby a compact and effective steam direction shifting mechanism can be obtained.

The fourth object of the invention is to provide an iron in which a large number of steam nozzles are grouped into a group consisting of all of said steam nozzles and another group consisting of only a small number of the same, and steam is selectively delivered to said respective groups, whereby strong steam ejection and weak steam ejection can be, selectively easily obtained.

The fifth object of the invention is to provide an iron in which the ejection of steam from steam nozzles is varied to the state most suitable for the cloth material to be pressed and indicator means is provided to indicate the state of ejection of steam, whereby a casual mistake in a pressing operation can be precluded and the handling of the iron is rendered simple.

The sixth object of the invention is to provide an iron in which a switching device is employed for shifting the pressing operation from a "dry" to a "steam" operation, and vice versa, whereby the construction of the iron can be simplified and a reliable shifting operation can be obtained.

Other objects and features of the present invention will become apparent from the following description of an embodiment shown in the accompanying drawing:

FIG. 1 is a side elevational view, partially in section, of an embodiment of the stem iron according to the present invention;

FIG. 2 is a top plan view of the base looking in the direction of II–II' of FIG. 1;

FIG. 3 is a cross-sectional view taken on the line III–III' of FIG. 2;

FIG. 4 is a top plan view of the front portion of the iron of FIG. 1;

FIG. 5 is a bottom view of the base of the iron shown in FIG. 1;

FIG. 6 is an exploded perspective view of the manually operated button means of the iron shown in FIG. 1;

FIG. 7 is a bottom view of the handle cover shown in FIG. 6;

FIG. 8 is a diagram illustrating the operation of the manually operated button in the handle cover of FIG. 6;

FIG. 9 is a top plan view of the manually operated button of the iron shown in FIG. 1;

FIG. 10 is a top plan view of the rotary member of the iron shown in FIG. 1, which is provided with the indicator means;

FIG. 11 is a top plan view of the rotary member which is provided with another type of the indicator means;

FIG. 12 is a top plan view of a spring connecting the rotary member and the opening and closing rod, of the iron shown in FIG. 1;

FIG. 13 is an exploded perspective view of another type of the manually operated button means;

FIG. 14 is a bottom view of the handle cover shown in FIG. 13;

FIG. 15 is a diagram illustrating the operation of the manually operated button in the handle cover of FIG. 13;

FIG. 16 is an enlarged perspective view showing the relative position of a portion of the opening and closing rod and the steam pipe, of the iron shown in FIG. 1;

FIGS. 17, 18 and 19 are views showing another type of the indicator means respectively, of which FIG. 17 is a fragmentary cross-sectional view of an iron comprising the indicator means; FIG. 18 is a top plan view of the iron; and FIG. 19 is a top plan view of the indicator member;

FIG. 20 is a cross-sectional view of this type of iron comprising a spray means; and

FIGS. 21*a* to 24*a*, FIGS. 21*b* to 24*b*, FIGS. 21*c* to 24*c*, FIGS. 21*d*, to 24*d*, FIGS. 21*e* to 24*e*, FIGS. 21*f* to 24*f* and FIGS. 21*g* to 24*g* are a set of views illustrating the operation of the switching means cooperating with the manually operative button, in the iron of FIG. 1.

An embodiment of the present invention will be described with reference to the drawing. Referring to the drawing, an iron base 1 is a casting of aluminum alloy or the like and has a heater 2 mounted therein. The heater 2 is of an armored type and comprises a protecting sheath 3, and electric resistance wire 2' extending in said protecting sheath 3 and a heat-resistant electric insulating material 4, such as granular compressed magnesium oxide, interposed between said protecting sheath and said electric resistance wire to electrically insulate them from each other. Further, the heater 2 is extended in the usual manner from the rear portion to the front portion of the iron along one side of the base and from the front portion to the rear portion of the iron along the other side of the base. An iron

cover 5 is superposed on the base 1 and a handle 6 is secured to the upper face of said iron cover. A vaporizing chamber 7 is provided in the base 1 inside the area bounded by the heater 2. This vaporizing chamber 7 is formed by a recess formed in the base 1. A steam supply chamber 8 is formed exterior of the vaporizing chamber 7 extending around said vaporizing chamber and to the rear portion of the iron in such a manner as to stride over the heater 2 and has a number of steam nozzles 9. A steam chamber 10 of relatively narrow space is formed at the forward end portion of the base 1, which is formed by recessing the base 1 and has a small number of steam nozzles 11. The steam nozzles 11 are different in shape from the steam nozzles 9 and each of the steam nozzles 11 communicates with a non-circular recess 12 extending longitudinally of the iron, so that the steam may be expanded in said recess. A steam chamber 13 is surrounded by the vaporizing chamber 7, the steam supply chamber 8 and the steam chamber 10, and a change-over valve 15 is mounted therein. The steam chamber 13 and the steam supply chamber 8 are separated from each other by a wall 14' and through-holes 16 are formed in said wall 14' for introducing the steam delivered to said steam chamber 13 into the steam supply chamber 8. The change-over valve 15 is supported on a circular valve seat 17. The valve seat 17 has a depression and a valve port 18 for extending the change-over valve 15 therethrough. The change-over valve 15 has a valve plate 19 at the lower end thereof, which is in contact with the underside of the valve seat 17 to close the valve port 18. A spring 21 is disposed between the upper face of the valve seat 17 and a larger diameter portion 20 of the valve 15. Thus, the valve plate 19 is held in pressure contact with the underside of the valve seat 17, closing the valve port 18.

A base cover 22 is fixed to the upper face of the base 1 by means of fittings 23, such as screws, covering the major portion of the vaporizing chamber 7 and completely covering the steam supply chamber 8 and the steam chamber 10. The base cover 22 has a channel 24 formed therein to communicate the upper portion of the valve seat 17 with the steam chamber 10. The valve seat 17 is secured between the base cover 22 and the base 1. A steam pipe 25 extends substantially vertically upwards through the base cover 22, with its top end located within a tank 26 and its lower open end located opposite to the upper end of the change-over valve 15. The vaporizing chamber 7 is covered by a cover 27 which is fixed to the base cover 22 with packings 28, 28' interposed therebetween. The cover 27 is made of a material of relatively low heat conductivity, such as stainless steel, and has the steam pipe 25 penetrating therethrough. The cover 27 is fixed to the base cover 22, steamtight, by a suitable method. A nozzle body 29 is mounted in the cover 27, with its nozzle 30 being opposed by the vaporizing chamber 7. Water dropped from the nozzle 30 is vaporized into steam in the vaporizing chamber 7. A back pressure pipe 31 connected to the cover 27 has one end communicating with the vaporizing chamber 7 and the other end thereof open in the upper portion of the tank 26. This back pressure pipe 31 serves to return the steam generated in the vaporizing chamber 7 to the tank 26 to build up the steam pressure in said tank. An opening and closing rod 32 has its lower end located opposite to the nozzle body 29 and is provided at the lower end extremity with a needle valve 33. The nozzle 30 of the nozzle body 29 is opened or closed by this opening and closing rod 32, whereby the generation of steam is started or stopped. A cylinder 34 is disposed in thank 26 to encircle the the tank and closing rod, the back pressure pipe 31, the steam pipe 25 and other component parts, and communicates with said tank 26 by a channel 35. The cylinder 34 and the tank 26 are made of a material equivalent to that of the cover 27, and the tank 26 is hermetically fitted to the peripheral edge of the cover 27 through a packing 36. A water supply tube 37 is connected to the top end of the tank 26 and a water inlet opening 38 is formed in the upper face of the tank 26. The top end of the opening and closing rod 32 extends through the water inlet opening 38 and further through the water supply tube 37 to the upper portion of the cavity in the handle 6. Reference numeral 39 designates a water inlet port connected to the front side of the water supply tube 37 through a packing. Water is poured from the inlet port 39 into the tank 26 through the water supply tube 37 and the water inlet opening 38. Extending into the steam pipe 25 is a change-over rod 40 having the lower end fixed in a recess 41 formed in the enlarged diameter portion 20 of the change-over valve 15. The upper end of the change-over rod 40 is supported by a supporting member 42 pressure-fitted into the steam pipe 25. This change-over rod 40 is vertically slidable in the steam pipe 25. The supporting member 42 serves to hold the change-over rod 40 against lateral movement and also to prevent the steam from being admitted into the steam pipe 25 from the top opening thereof. Steam is admitted into the steam pipe 25 from steam inlet ports 43 formed in the wall of said steam pipe. A liquid spouting preventive valve 44 is provided around the steam pipe 25 in surrounding relation, which is heavier at the lower portion than at the upper portion and vertically movable by being guided by the outer peripheral surface of said pipe 25. An upward movement of the valve 44 is obstructed by a flange 45' of a cap 45 provided at the top end of the change-over rod 40, and its coming off the steam pipe 25 is prevented. A spring 46 is interposed between the valve 44 and the cover 27. In the normal state, this spring 46 is compressed under the weight of the valve 44 and the steam inlet ports 43 are in communication with the tank 26 as shown in FIG. 1. Therefore, the spring load is very small. However, when the iron happens to be brought down, the weight of the valve 44 exerted on the spring 46 progressively decreases as the steam pipe 25 is tilted to a horizontal state, so that the valve 44 is gradually moved toward the steam inlet ports 43 and finally closes said steam inlet holes. On the contrary, when the iron is returned to its normal position and the steam pipe 25 is brought to a vertical position from the horizontal state, the valve 44 moves down along the steam pipe 25 under gravity, whereby the steam inlet ports 43 are communicated with the tank 26. Reference numeral 47 designates an opening and closing valve located in the tank 26 adjacent the water inlet opening 38 and mounted on the opening and closing rod 32. This valve serves to open or close the water inlet opening 38 incident to vertical movement of the opening and closing

rod 32. Further, the valve 47 comprises a packing or the like to provide fluidtight sealing in cooperation with the wall of the tank 26. Below the opening and closing valve 47 is disposed a circular metallic member 48 which is also fixedly mounted on the rod 32 and has a cam surface 49 on the underside of the peripheral edge portion thereof. The flange 45' of the cap 45 connected to the change-over rod 40 is held in engagement with the cam surface 49 from the lower side thereof. The arrangement is such that when the metallic member 48 rotates, the flange 45' of the cap 45 in engagement with said cam surface 49 is moved down, whereby the change-over rod 40 moves down against the biasing force of the spring 21, opening the valve port 18. On the contrary, when the point of engagement between the cam surface 49 of the metallic member 48 and the flange 45' of the cap 45 is elevated, the change-over valve 15 and the change-over rod 40 are pushed up under the biasing force of the spring 21, so that the valve port 18 is closed. Thus, it will be understood that, by suitably selecting the configuration of the cam surface 49, the valve port 18 can be alternately opened and closed by rotating the metallic member 48. Reference numeral 50 designates a spring mounted around the opening and closing rod 32 between the metallic member 48 and the cover 27, by which said rod 32 is constantly urged upwards.

In using the steam iron of the construction described above, the opening and closing rod 32 is first of all moved down against the biasing force of the spring 50 by the manual operation to be described later, whereby the water inlet opening 38 is opened and the nozzle 30 of the nozzle body 29 is closed. Water is poured into the tank 26 from the water inlet port 39 in this state. Then, the iron base 1 is heated by the heater 2. When the wall 27 of the vaporizing chamber has reached a temperature at which the water dropped from the tank 26 is instantaneously vaporized into steam, the opening and closing rod 32 is moved upwards by manual operation, whereby the water inlet opening 38 is closed and the nozzle 30 is opened, allowing the water in the tank 26 to drop in the vaporizing chamber 7. The water thus dropped is continuously vaporized in the vaporizing chamber 7 to generate steam. The steam generated in the vaporizing chamber is returned into the tank 26 through the back pressure pipe 31. In the initial stage of operation, the steam is accumulated in the upper portion of the tank 26 because the pressure in said tank is low and substantially equal to the atmospheric pressure. However, the steam pressure in the tank soon becomes higher so that it flows from the steam inlet ports 43 through the steam pipe 25 into the recess 24 in the base cover 22 and thence into the steam chamber 10. In this case, since the change-over valve 15 is held in the position to close the valve port 18 by the manual operation as shown in FIG. 1, the steam passing in the steam pipe 25 is entirely delivered into the steam chamber 10 and ejected from a small number of the steam nozzles 11. Therefore, the amount of steam ejected from each nozzle is relatively large and the steam is ejected vigorously.

On the other hand, when the metallic member 48 is rotated by manually operating the opening and closing rod 32 to lower the point of engagement between the cam surface 49 and the flange 45' of the cap 45, the change-over valve 15 is moved down against the biasing force of the spring 21, whereby the valve pot 18 is opened. Therefore, the steam passing in the steam pipe 25 is admitted in the steam chamber 13 through said valve port 18 and also in the steam supply chamber 8 through the through-holes 16. At the same time, some of the steam is delivered to the steam chamber 10 through the recess 24 in the base cover 22. Namely, while the amount of steam delivered from the steam pipe 25 is constant, the steam is divided and delivered into the steam supply chamber 8 having a relatively large number of the steam nozzles 9 and the steam chamber 10 having a relatively small number of the steam nozzles 11, so that the amount of steam ejected from each nozzle is relatively small and the steam is applied to the cloth softly. It will be obvious that the iron can be used as an electric iron by shifting the operation to a "dry" operation during use of the iron as a steam iron. The shifting of the operation can be achieved by lowering the opening and closing rod 32 by the manual operation against the biasing force of the spring 50. Namely, by lowering the opening and closing rod 32, the nozzle 30 is closed so that the feed of water from the tank 26 is stopped and hence the generation of steam is stopped. Thus, the pressing is carried out only by the heat of the base 1.

Now, the manual operation mechanism in the subject steam iron will be described. A handle cover 51 provided above the cavity in the handle 4 is formed with a through-hole 53 for mounting a manually operative button 52 therein, in coaxial relation with the opening and closing rod 32. Further, a temperature scale plate is provided on the upper face of the handle cover. The manually operative button 52 is preferably made of a material, such as Duracon, which is highly resistive to wear. A cylindrical guide member 54 is formed on the underside of the handle cover 51 to surround the button-receiving through-hole 53 and further a wall 55 is formed along the peripheral edge of the through-hole 53 over the entire circumference of the inner surface of the guide member 54, by which an upward movement of the button 52 is limited. The button 52 has a plurality of regularly spaced claws 56 formed on the outer surface of the lower end portion thereof. These claws abut against the wall 55 of the guide member 54 when the button 52 moves upwardly. Some claws 56' of the claws 56 project outwardly further than the other ones. The underside of each claw is tapered downwardly at an acute angle smaller than 90°. These claws 56 are respectively received in grooves 57 formed in the inner surface of the guide member 54 in equally spaced relation, for vertical movement therein. Some grooves 57' of the grooves 57 are deeper than the other ones, in which the aforesaid longer claws 56' of the button 52 are received, whereby the button 52 is held against rotation. Reference numeral 58 designates a rotary member rotatable in one direction in engagement with the claws 56. The rotary member 58 has arms 59 for engagement with the claws 56 and each arm 59 has on its upper face a tapered surface 60 inclining in one direction. Namely, when the claws 56 are brought into engagement with the tapered surfaces 60 of the arms 59, either the claws 56 or arms 60 tend to rotate or both of them tend to rotate in opposite directions respectively. However, since the claws 56 are received

in the grooves 57 in the guide member 54, the tapered surfaces 60 of the arms 59 slide on the inclined surfaces of the claws 56 and thus the rotary member 58 only rotates in one direction. The rotary member 58 is to be received in the button 52 and is provided on the upper surface thereof indicator means, e.g., one comprising different colors as shown in FIG. 10, one comprising letters as shown in FIG. 11 or the most suitable one of any other conceivable indicator means, so that its angular position representative of the operational state of the iron may be readily confirmed from the outside. On the other hand, the button 52 is provided with a sight window 61 through which the indicator means is visible.

When the indicator means comprising different colors is employed in the embodiment described above, it is used in the following manner: Namely, for instance, a "white" color portion is used to represent the "dry" operation of the iron, a "light color" portion to represent the "steam" operation and further a "dark color" portion to represent the "jet steam" operation, and by manually locating the respective color portion in the sight window 61, a desired operating condition of the iron can be selectively obtained.

The rotary member 58 and the opening and closing rod 32 are operatively connected with each other by a spring 62 to positively transmit the rotation of the former to the latter. The lower end of the spring 62 is anchored to the rod 32 by fitting its end arm 63, extending diametrically across the coil, in a slit 64 formed in the top end of said rod 32, while the upper end thereof is connected to the rotary member 58 by inserting its curled end portion 65 into said rotary member.

Reference numeral 66 designates an operating pin projecting outwards from the lower portion of the manually operative button 52, and 67 designates a switching device fixed to the underside of the handle cover 51 by means of screws 68 or the like. The switching device 67 includes a guide surface 69 for receiving the operating pin 66 of the button 52 which surface opposes to a part of the grooves 57 in the guide member 54, a main body 70, a reversibly movable latching plate 71 and a spring 72. The reversibly movable latching plate 71 has a sloped portion 73 at the upper portion thereof on which the operating pin 66 will slide, a latching portion 74 successive to said sloped portion for latching said operating pin 66, a cut-bent lug 75 successive to said latching portion for releasing the engagement between the operating pin 66 and the latching portion 74 when the button 52 is depressed, and another cut-bent lug 76 successive to said first cut-bent lug 75 constituting a lowering preventing wall 77 on the side of the latching plate 71, said lowering preventing wall 77 being located upwards of the lower end 73' of the sloped portion 73.

Now, the relationship of the manually operative button 52, the rotary member 58 and the guide member 54, will be described. The button 52 is inserted into the through-hole 53 in the handle cover 51 from the lower side in such a manner that the claws 56 are received in the grooves 57 in said guide member 54 respectively.

Then, the rotary member 58 is inserted into the button 52 and connected with the opening and closing rod 32 by the spring 62. When the button 52 is pushed down in this state, the claws 56 of said button engage the tapered surfaces of the arms 59 of the rotary member 58 respectively and slide thereon. As a result, the rotary member 58 only is rotated in one direction since the button 52 is held against rotation by the grooves 57 in the guide member 54. Suppose that the arms 59 of the rotary member 58 are respectively located in the grooves 57 in the guide member 54 and the button 52 is in its highest position, namely the iron is in the state of "steam" operation. When it is desired to shift the operation from the "steam" to "dry," the button 52 is depressed manually in the direction of the arrow A in FIG. 8. The arms 59 move down in the respective grooves 57 together with the rotary member 58 and, when they have passed acute-angular guides 78 just slightly, the point of contact between each claw 56 and each tapered surface 60 is displaced and the rotary member 58 rotates in the direction of the arrow B and the arms 59 move into the grooves 57'' and tend to move upwards in said grooves together with the button 52. However, the upward movement of the button 52 must be prevented because otherwise the operational state of the iron is again returned to the "steam" operation. The switching device 67 is employed to prevent such upward movement. Now, the relation between the switching device 67 and the button 52 will be described with the reference to FIGS. 21*a* to 24*a*. These figures show a state in which the button 52 is in its highest position, i.e., the state of "steam," and the operating pin 66 on the button 52 is in contact with the upper portion of the latching plate 71 of the switching device 67. In this case, the opening and closing rod 32 is held in an elevated position under the biasing force of the spring 50 and therefore, the nozzle 30 is opened. For shifting the operation of the iron from "steam" to "dry," the button 52 is pushed down in the direction of the arrow C from the state shown in FIGS. 21*a* to 24*a* to the state shown in FIGS. 21*b* to 24*b*, whereupon the operating pin 66 of the button 52 moves down and pushes the sloped portion 73 of the latching plate 71. The latching plate 71 is caused to make a pivotal movement about a rivet 79 in the direction of the arrow D against the biasing force of the spring 72 and the downward movement of the operating pin 66 is stopped. When the pressure is removed from the button 52 at this point, the latching plate 71 makes a slight pivotal movement in the direction of the arrow E under the biasing force of the spring 72 and the operating pin 66 is latched by the latching portion 74. Therefore, the button 52 is held against upward movement while resisting to the force of the spring 50. The opening and closing rod 32, therefore, is held in its lowered position closing the nozzle 30. Thus, the switching means is placed in the state shown in FIGS. 21*c* to 24*c* and the operation of the iron is shifted to "dry."

When it is desired to shift the operation from "dry" to "steam," the button 52 is further depressed in the direction of the arrow F from the state shown in FIGS. 21*c* to 24*c* to the state shown in FIGS. 21*d* to 24*d* against the biasing force of the spring 50 and the biasing force of the spring 62 by which the opening and closing rod 32 is operatively connected with the rotary member 58. The operating pin 66 is moved down, disengaged from the latching portion 74 and brought into abutting engagement with the inner surface of the lug 75. In this case, the latching plate 71 rotates further in

the direction of the arrow G. When the pressure is removed from the button **52** in this state, the operating pin **66** moves upwards in the direction of the arrow H under the biasing forces of the springs **50, 62** while sliding on the inner surface (the back side) of the lug **75** and causing the latching plate **71** to move axially forwards of the operating pin **66**. Upon completion of the upward movement, the operating pin **66** abuts against the upper portion of the latching plate **71** and thereby the switching means is returned to the state shown in FIGS. **21***a* to **24***a*. By repeating the above-described operation, the operation of the iron is shifted alternately from "steam" to "dry" and "dry" to "steam."

The operation of the iron of the invention constructed as described above will be described hereinafter. In the state of FIG. **1**, the iron performs a "JET steam" pressing operation. Namely, as described previously, the steam generated in the vaporizing chamber **7** passes in the back pressure pipe **31** and gradually accumulates in the upper portion of the tank **26**. As the steam pressure gradually rises in the tank **26**, the steam moves from the steam inlet ports **43** through the steam pipe **25** into the recess **24** in the base cover **22** and thence into the steam chamber **10**, and is ejected vigorously from a small number of the steam nozzles **11**. In this state, "JET steam" is indicated in the window **61** of the button **52**.

When the operation is desired to be shifted from "JET steam" to "dry" in the process of ironing, the button **52** is depressed, whereupon the rotary member **58** pushes the opening and closing rod **32** downward through the spring **62**. The opening and closing rod **32** opens the water inlet opening **38** and concurrently closes the nozzle **30**. Therefore, the dropping of water into the vaporizing chamber **7** from the tank **26** is stopped and hence the generation of steam is stopped. In this case, the rotary member **58** rotates in one direction while being moved downwards by the button **52**, and the operating pin **66** of the button **52** is latched by the latching portion **74** of the latching plate **71** of the switching device **67**, so that the opening and closing rod **32** is held in the lowered position. The indication in the window **61** of the button **52** is also changed from "JET steam" to "dry" incident to rotation of the rotary member **58**. Furthermore, the rotation of the rotary member **58** causes the opening and closing rod **32** to rotate through the spring **62**. Therefore, the metallic member **48** mounted on the opening and closing rod **32** is also rotated. Incident to the rotation of this metallic member **48**, the point of engagement between the cam surface **49** of said metallic member and the flange **45'** of the cap **45** is gradually shifted downwards from its highest position, so that the change-over valve **15** is half opened by the change-over rod **40**. This enables the water filling or draining operation to be achieved quickly and efficiently which is performed in the state of "dry," because the flow rate of air into the atmosphere from the tank **26** or into the tank **26** from the atmosphere is high.

When the operation is desired to be further shifted from "dry" to "steam," the button **52** in the lowered position is further depressed. The tapered surfaces **60** of the rotary member **58** engage the acute-angular guides **78** and the rotary member **58** is received in the grooves **57** in the guide member **54** while rotating in the same direction and moved upwards under the biasing force of the spring **62**. The button **52** also moves upwards along the grooves **57**. The rotation of the rotary member **58** concurrently causes the opening and closing rod **32** and therefore the metallic member **48**, to rotate. As a result of rotation of the metallic member **48**, the point of engagement between the cam surface **49** of said metallic member and the flange **45'** of the cap **45** is shifted to the lowest position, so that the change-over valve **15** is completely opened by the change-over rod **40**. Therefore, the steam from the steam pipe **25** moves from the valve port **18** into the steam chamber **13** and thence into the steam supply chamber **8** through the through-holes **16**. At the same time, part of the steam is delivered to the steam chamber **10** through the recess **24** in the base cover **22**. The steam thus delivered is divided and ejected from a large number of the steam nozzles **9** and a small number of the steam nozzles **11**. Thus a relatively weak steam can be obtained over the entire surface of the base **1**. The indication in the window **61** of the button **52** is also changed from "dry" to "steam" incident to the rotation of said rotary member **58**.

When the button **52** is pushed down in the direction of the arrow I in the state shown in FIGS. **21***f* to **24***f*, i.e., in the process of upward movement of the button **52** to the position of "JET steam," the operating pin **66** moves down without being latched by the latching portion **74** but the downward movement of said pin is finally stopped by the downward movement preventing wall **77** as shown in FIGS. **21***g* to **24***g*. Namely, in this state the claws **56** of the button **52** are held out of contact with the arms **59** of the rotary member **58**. Therefore, even if the above-described operation is performed from a halfway position, the indication will not be changed to "steam" unless the switching means is in the state shown in FIGS. **21***e* to **24***e*, due to the presence of the downward movement preventing wall **77**.

FIGS. **13** and **14** shows another type of the switching means. In this type, the latching portion **74** of the latching plate **71** of the switching device **67** shown in FIG **6**, which engages the operating pin **66** when the button **52** is depressed, to maintain the "dry" position, is provided on the guide member **81** below the handle cover **80**. Namely, the guide member **81** is formed in the inner surface thereof with equally spaced relatively deep grooves **82**, relatively shallow grooves **83** between said relatively deep grooves **82** and acute-angular inclining surfaces **84** at the lower ends of said relatively shallow grooves **83**, each of which inclines from the relatively deep groove **82** toward the relatively shallow groove **83**. The operation of this type of switching means will be described with reference to FIG. **15**. Suppose that the arms **86** of the rotary member **85** are located in the upper portions of the relatively deep grooves **82** in the guide member **81** respectively, i.e., the switching means is in the state of "steam." When the button **87** is depressed in this state, the rotary member **85** is moved down along the relatively deep grooves **82** in the direction of the arrow J. The arms **86** of the rotary member **85** are caused to be displaced by the claws **88** of the button **87** in engagement with the tapered surfaces **86'** of said arms at the point when the rotary member **85** has just passed the ends **84'** of the

acute-angular inclining surfaces **84**, and said rotary member **85** is slightly rotated in the direction of the arrow K and latched on said inclining surfaces. Namely, the switching means is placed in a position shown in FIGS. **21***c* to **24***c*, that is the state of "dry." When the button **87** is depressed further in this state, the rotary member **85** is pushed down in the direction of the arrow L and the tapered surfaces **86'** of the arms **86** are brought into contact with acute-angular guides **89**, whereby the rotary member **85** is rotated in the same direction as before, i.e., in the direction of the arrow K, and its arms **86** are received in the next deep grooves **82**. The rotary member **85** is moved upwardly by the spring **90** and the button **87** is also moved upwardly along the deep grooves **82**. The upward movement of the button **87** is finally stopped by a wall **91** and the upward movement of the rotary member **85** is also stopped. Namely, the switching means is placed in a position shown in FIGS. **21***e* to **24** *e*, that is the state of "steam." As described, the rotary member **85** can be rotated and the operation of the iron can be shifted from "steam" to "dry" or vice versa, by only depressing the button **87**.

FIGS. **17**, **18** and **19** show another type of the indicator means. In this type, grooves **95** are provided for vertically slidably receiving the arms **94** of the rotary member **93** inserted into the button **92** and an indicator **97** is provided on the upper surface of an indicator member **96** which is rotatable in association with the rotation of said rotary member **93**. The indicator **97** has different colors respectively representing the different states of operation. Reference numeral **98** designates sight windows formed in the handle **99** and the temperature scale plate **100** in register with one of the colors of the indicator **97**, through which the state of "steam," "dry" or "JET steam" is indicated by the respective color.

FIG. **20** shows spray means incorporated in the steam iron of FIG. **1**, which comprises a spray button **101** and a spray nozzle **102** which is opened or closed upon depressing said spray button. By employing such spray means, steam adequate for a given fiber can be supplied and good ironing can be effectively achieved.

We claim:

1. A steam iron comprising a base having a heater, a vaporizing chamber and a number of steam nozzles grouped into a plurality of groups, a handle arranged above said base, a water storage tank, opening and closing means for opening or closing a water passage communicating said tank with said vaporizing chamber for controlling water dropping from said tank into said vaporizing chamber, manually operated button means for operating said opening and closing means, means for delivering steam generated in said vaporizing chamber to each of said plurality of groups of steam nozzles, switching means for shifting said steam delivering means from a state of delivering the steam to any one of a plurality of said groups to a state of delivering the steam to any other one of a plurality of said groups, and indicator means for indicating which of said groups of steam nozzles the steam is being delivered to.

2. A steam iron as defined in claim **1**, wherein said switching means is operated manually.

3. A steam iron as defined in claim **2**, wherein said switching means and said manually operated button means are operatively associated with each other.

4. A steam iron as defined in claim **2**, wherein said base has formed therein a steam supply chamber communicating with a large number of said steam nozzles and a steam chamber communicating with a small number of said steam nozzles, and said switching means includes a change-over valve which is disposed in either one of said steam supplying chamber and said steam chamber or in a passage communicating the former with the latter, and further means is provided to manually operate said change-over valve.

5. A steam iron as defined in claim **1**, wherein a number of said steam nozzles are grouped into a first group including all of said steam nozzles and a second group including a small number of said steam nozzles.

6. A steam iron as defined in claim **5**, wherein a noncircular recess having extensions extending longitudinally of the iron is formed around each of a small number of said steam nozzles in communication therewith.

7. A steam iron as defined in claim **1**, wherein said opening and closing means has an opening and closing rod for controlling water dropping from said tank into said vaporizing chamber, said manually operated button means has disposed therein a rotary member which rotates said opening and closing rod when said buttom means is moved vertically, and said opening and closing rod is provided with a metallic member and said switching means including a change-over valve which is operatively associated with said metallic member and opened or closed by said opening and closing rod incident to rotation thereof.

8. A steam iron as defined in claim **7**, wherein said opening and closing rod and said rotary member of said manually operated button means are operatively connected with each other by means of a spring, whereby a rotation of said rotary member is transmitted to said opening and closing rod.

9. A steam iron as defined in claim **1**, wherein said indicator means is located adjacent said manually operated button means.

10. A steam iron as defined in claim **9**, wherein a plurality of indication media are provided on the upper face of said rotary member of said manually operated button means, while a window is formed in said button means in register with one of said indication media, whereby the operational states of the iron are indicated one after another sequentially through said window incident to the rotation of said rotary member.

11. A steam iron as defined in claim **9**, wherein indication media are provided on indicator means operatively associated with said rotary member of the manually operated button means, while a sight window is formed at a portion of the handle in which said manually operated button means is provided, said sight window being in register with one of said indication media.

12. A steam iron as defined in claim **1**, wherein said manually operated button means comprises a guide member for vertically movably but unrotatably holding said means, a switching device disposed on one side of said guide member and having a reversibly movable latching plate, and an operating pin engageable with and disengageable from said reversibly movable latching plate and carried by said manually operated button means.

13. A steam iron as defined in claim 12, wherein said switching device comprises a main body, said reversibly movable latching plate, a latching portion formed on said latching plate and adapted to latch said operating pin, a cut-bent lug formed on said latching plate on a side opposite to said main body, and a downward movement preventing wall provided in side-by-side relation to said lug and adapted to stop a downward movement of said operating pin.

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