Dec. 30, 1969 G. SCHLEMON 3,486,255

METHOD AND APPARATUS FOR GARMENT PRESSING

Filed Oct. 18, 1967 2 Sheets-Sheet 1

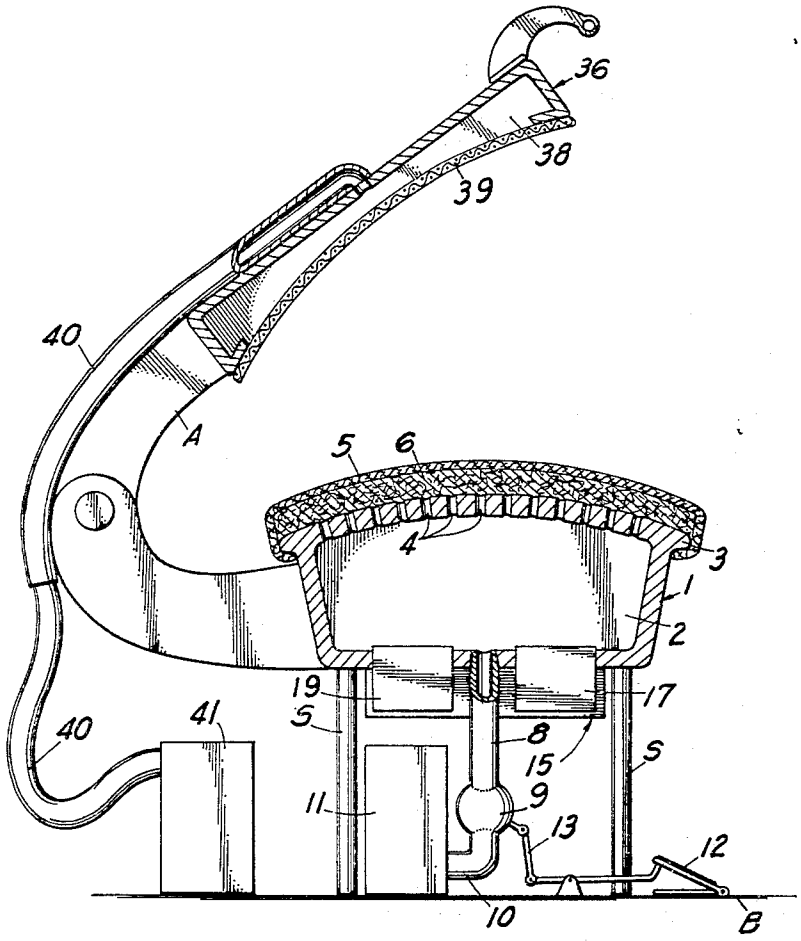



Fig. 1

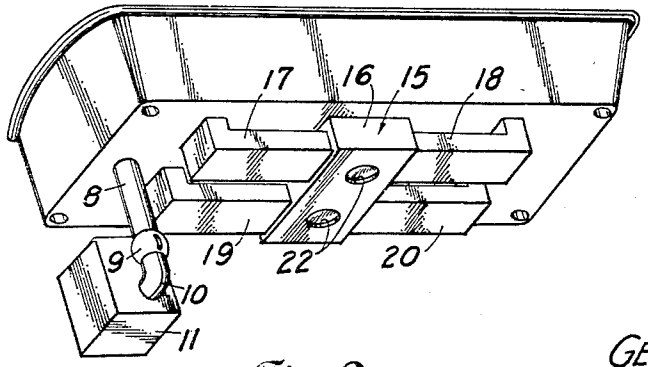



Fig. 2

INVENTOR.
GEORGE SCHLEMON
BY
Newton, Hopkins, Jones & Ormsby
ATTORNEYS

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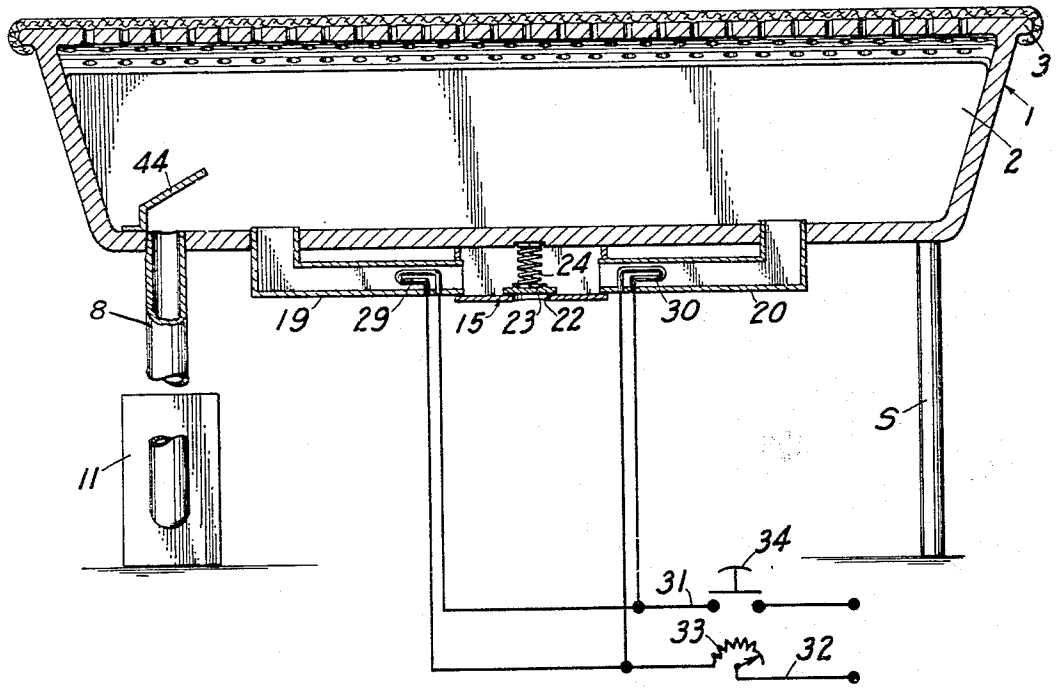



Fig. 3

INVENTOR.
GEORGE SCHLEMON
BY Newton, Hopkins, Jones & Ormsby
ATTORNEYS

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3,486,255

# METHOD AND APPARATUS FOR GARMENT PRESSING

George Schlemon, 3060 Pharr Court N., Atlanta, Ga.

Continuation-in-part of application Ser. No. 543,996, Apr. 20, 1966. This application Oct. 18, 1967, Ser. No. 676,098

Int. Cl. D06f 71/34

U.S. Cl. 38—16 10 Claims

## ABSTRACT OF THE DISCLOSURE

A method and apparatus for imparting a permanent press to garments comprising arranging the garments in their respective proper pressing positions, applying light pressure to the garments, passing substantially saturated steam through the garments to loosen the fabric, and passing air heated to a temperature at which the fabric is cured through the garment.

## CROSS REFERENCE TO RELATED APPLICATION

This application is a continuation in part of United States application S.N. 543,996, filed Apr. 20, 1966, now abandoned.

Permanently pressed garments have been gaining wide commercial success of late due to the fact that the shape of the garment, as initially sewn and pressed, is locked in whereby the seams lie flat and neat, puckering is virtually eliminated, and the smooth, unblemished surface of the fabric is substantially retained for the life of the garment.

At the present time there are generally four accepted procedures for obtaining permanently pressed garments, all of which are dependent upon the type of fabric used to form the garments. By type of fabric is meant the pretreatment or pre-conditioning given to the fabric, the type of weave, and the type of filaments used to make the fabric.

The first such procedure may be referred to as a post-cure system. In this procedure the fabrics are impregnated with chemical cross-linking finish as they are produced at the fabric mills. These chemical finishers are well known in the art and new ones are continuously being developed. The impregnated fabrics are then dried at low temperatures so that only a minimum of cross-linking occurs thereby rendering the fabrics "sensitized" but not cured. The "sensitized" fabrics are shipped to the garment manufacturers to be cut and sewn into garments. The thus formed garments are thereafter pressed into the desired shape and fully cured at elevated temperatures to retain the pressed garment shape. The curing operations are generally carried out in a batch placed in a continuous oven but would also be possible as a simultaneous aspect of the pressing operation, provided proper temperature conditions can be achieved and maintained.

It is pointed out that chemical cross-linking finishes employed in the post-cured system react only with cellulosic fibers to produce the permanent press or set condition. Therefore, the fabrics employed therein must contain a sufficient cellulosic component, such as cotton or rayon for this procedure to be employed. Successful application of this procedure has been had with polyester/cotton fabric of the 65/35 and 50/50 blend levels. It has also been successively applied to stretch denims having stretch nylon warp and cotton filling, as well as to stretch blends of polyester/cotton/spandex.



A second procedure for obtaining permanently pressed garments is sometimes referred to as the pre-cure system. In this procedure the fabrics are impregnated with a chemical cross-linking finish which reacts only with the cellulosic component of the fabrics just as in the post-cure system and, therefore, the fabrics must have a cellulosic component. However, in this instance the fabrics must also contain a quantity of non-cellulosic thermoplastic fibers. The impregnated fabrics according to this procedure are fully cured in the flat state at the mills. After the fully cured fabrics have been received and formed into garments at the garment manufacturing facilities the resulting garments are pressed with sufficient heat and pressure to permanently reshape the fabric and set the non-cellulosic thermoplastic fiber component in the proper shape for the garment. Fabrics which may be employed according to this pre-cure system include polyester/cotton blends and stretch blends of 75/25 cotton/nylon.

A third procedure, herein referred to as the re-cure system, may also be used to obtain permanently pressed garments and involves the use of a special chemical cross-linking reactant and a special catalyst. Again, these special chemicals only react with the cellulosic component of the fabric, as in the post-cure and pre-cure systems, but the impregnated fabrics in this procedure are then substantially cured at the mills, i.e., up to 86% of the cross-linking reactions may have taken place. Upon being formed into garments, the fabrics are steam pressed whereby some of the previous cross-linking is broken or disrupted due to the presence of water. Subsequently, such cross-linking is reformed along with a complete cure by means of additional heat. Thus, in effect, the initial substantially cured fabric is temporarily uncured and then fully re-cured. The cellulosic component as well as the thermoplastic component, of the re-cured fabrics are both permanently shaped by the subsequent application of heat. The method and apparatus of the present invention is particularly suitable for this procedure in obtaining permanently pressed garments.

The last procedure for obtaining permanently pressed garments involves no chemical cross-linking reactant and, therefore, no curing, but rather depends entirely on the heat setting characteristics of thermoplastic fibers. Garments made from fabrics of this nature can be permanently pressed into shape according to this procedure at temperatures of about 300° F. to 400° F. depending on the particular thermoplastic used. These temperatures may also vary to below 300° F. and above 400° F. Examples of fabrics that may be used in this procedure include blends of polyester/acrylic and polyester/nylon, or it may comprise 100% polyester.

While the above discussion has been mainly concerned with cellulosic and non-cellulosic thermoplastic fibers which may be heat-set, it is further pointed out that wool may also be permanently pressed. Since wool is a keratin material and possesses a natural memory it is necessary to treat the wool with a chemical reducing agent, such as monoethanolamine sulfite, whereby the natural memory is lost. Upon repressing the treated wool fabric with heat, a new memory may be created and thus the fabric is permanently pressed.

The permanent pressing with which the present method and apparatus are concerned relates to the above described procedures. Therefore, wherever the term "permanent press" is used hereinafter, it is intended to generally relate to these pressing procedures, as opposed to conventional pressing which is of a non-permanent nature. This is not meant to imply that the present method and apparatus cannot be used with conventional pressing as it is generally applicable to all types of pressing.

As is apparent from the above permanent press procedures the newly formed garments are in all cases subjected to pressing operations to provide the garment with its initial shape. In some instances the thus pressed garments are further subjected to a curing operation to obtain permanence of shape while in others the garments are permanently pressed as a result of the pressing operations alone. The pressing operations in all cases, however, must be controlled with respect to the temperature conditions so as to effect the desired cross-linking or curing when chemical finishes are employed or the desired heat-setting when non-cellulosic thermoplastic fabrics are employed.

The heretofore conventional pressing procedures and apparatus are not adequate to performing permanent press operations since the conventional apparatus does not control the temperatures and pressures necessary to obtain permanent pressing. By way of example, these presses have generally comprised a pad covered buck and an uncovered head which is adapted to be raised and lowered into engagement with a garment placed on the buck. The head is usually provided with an upper chamber in which steam under pressure is stored and a lower chamber into which the steam from this upper chamber is released for dispersion through a plurality of holes or apertures in the lower pressing surface of the head. Often times, steam is additionally supplied to the buck which is then dispersed through the pad covering.

The storing of steam in the head and the repeated release of steam out of the head cause the pressing surface of the head and buck to become extremely hot and difficult to control. Moreover, because of the storing of high pressure steam, the heads have been massive and have required large and expensive structures to support, raise and lower them. As a result, garments being pressed according to permanent pressing procedures may very likely be exposed to uncontrolled excessive heat and pressure which may not only interfere with the permanent press of the garment but also may result in a "shine" on the garments. Not only do the conventional presses have disadvantages with respect to garments being permanently pressed but they also create hazardous conditions to the operator of the press. Since steam is applied from the head to the garment backed by the pad on the buck and before a drying vacuum is applied, these conventional pressing operations result in excess steam being freely spread about the region of the press. This is due to the fact that the steam supplied to the pressing surfaces has nowhere to escape except to the surrounding region of the press, particularly when steam is also supplied from the buck.

The present invention substantially eliminates these difficulties and limitations encountered with the previously existing methods and apparatus for permanently pressing garments. In accordance with the present invention, the massive steam containing head with its hazards to the operator and its excessive heat and pressure which tends to damage synthetic fabrics and blends and to "shine" the fabrics is eliminated. Moreover, the present invention provides for positive control over temperature conditions necessary to permanent pressing while maintaining low pressures on the garments and preventing "shine," by utilizing a steam cycle and a heated air cycle; that is, steam at a controlled temperature is passed through the garment, and air heated to a prescribed temperature is passed through the garment.

The improvements of the present invention are achieved through the use of an improved head of light and inexpensive construction, and an improved buck which includes a chamber communicating with its pad, a steam regulator, and an air heater. The head contains no stored steam nor does it supply any steam to the pressing surfaces of the press. Steam is supplied to the press solely through the buck whereupon it diffuses through the pad on the buck and into the garment spread thereover. The head only provides a vacuum which withdraws the steam and heated air from the pressing surfaces as they pass through the garment and thereafter exhausts it from the press or recirculates it to the steam source for the buck. During normal operation of the apparatus, steam is passed through the garment as the garment is pressed between the head and buck, the steam cycle is terminated, and air heated to the temperature range proper for curing the garment is passed through the garment. The heated air cycle is employed after the garment has been initially steam pressed to produce the necessary curing or heat-setting in the garment for properly permanently pressing the material.



Temperature control for permanent pressing according to the present invention is achieved by regulating the temperature of the heated air through heating means as are well known in the art, e.g., electrical, gas-fired, etc. The pressing surfaces are provided with proper temperature conditions by passage of the heated air through the steam pressed garment and withdrawal of the heated air through the vacuum system of the head. The vacuum system operates continuously so that the pressing surfaces and the head are prevented from over-heating and the various temperature ranges necessary to obtain a permanent press of the garments may be controllably obtained. Also, the continuous vacuum functions to exhaust any excess steam or heated air from the vicinity of the apparatus when the head has been disengaged from the buck, thereby providing the advantage of no excess steam or hot air being free to spread about the region of the press which would cause uncomfortable conditions and possible hazard to the operator. Moreover, since the head does not overheat and is of light weight construction substantially no damage or "shine" will be produced on the fabric of the garment being permanently pressed.

These and other features and advantages of the invention will be more clearly understood from the following detailed description and the accompanying drawing.

FIGURE 1 is a schematic view of a press according to the present invention and shows the improved head and buck in section.

FIGURE 2 is a bottom perspective view of the buck.

FIGURE 3 is a cross-sectional view of the buck and related components.

It should be understood that the following detailed description and the accompanying drawing disclose a preferred embodiment of the present invention but neither the method nor the apparatus of the present invention are limited to the details disclosed since they may be embodied in equivalent forms.

Referring now more particularly to the drawing, in which like numerals represent like parts through the views, FIGURE 1 shows a press provided with a buck **1** having a chamber **2** and an upper plate **3**. The upper plate **3** of the buck is provided with a plurality of openings or apertures **4** which allow air and steam to escape from the chamber **2** and pass upward into the garment being permanently pressed. A conventional pad comprising a cover cloth **5** and a porous resilient layer **6** coextensively cover the upper surface of the upper plate **3**. These are both well known in the art. The pad is held in place by the edges of the cover cloth **5** which encompass the peripheral edges of the upper plate **3**. The buck **1** is mounted in an elevated position on supports S which are in turn mounted on base B, or the floor surface.

Communicating with chamber **2** through the bottom of the buck **1** is a steam inlet conduit **8**. The lower end of conduit **8** is connected to a control valve **9** and control valve **9** is connected to steam supply conduit **10** which leads from steam source **11**. Valve **9** may be selectively operated to supply steam to chamber **2** of the buck **1**. Such valves are believed to be of common construction well known in the art.

Steam source **11** supplies steam under pressure to cham-

ber 2, and valve 9 is controlled by foot pedal 12 at the front of buck 1 and linkage 13, to open and close communication between buck 1 and steam source 11. The steam supplied from steam source 11 is controlled in pressure and temperature, and can be regulated as necessary.

Heating unit 15 is connected to the underside of buck 1 and includes valve housing 16 and heating ducts 17, 18, 19 and 20. Each duct 17–20 communicates at one of its ends through housing ports with housing 16 and at the other of its ends with chamber 2 of buck 1. Ducts 17–20 are arranged so that their points of communication with chamber 2 are spaced from one another.

Valve housing 16 defines entrance ports 22 in its lower wall, and valve elements 23 are urged over ports 22 by springs 24, to close the ports. Springs 24 are weak and function primarily to guide valve elements 23 to their closed position.

Heating elements such as elements 29 and 30, are positioned in each heating duct 17–20, respectively. Each heating element is electrically connected in parallel to bus lines 31 and 32, line 32 having adjustable control rheostat 33 to control the heat output of the heaters. On-off switch 34 in line 31 controls energization of the heaters. Air heated by the heating elements is raised to a temperature so that after it passes into chamber 2 and through pad 6 and cover 5 it retains the temperature as required by the particular garment fabric for permanent pressing. The heating elements may include electrical resistance type heaters, gas-fired heaters, steam heat exchanges, and the like; however, electrical resistance heaters have been discovered as the least expensive, safe to control, and space saving.

Head 36 is movably supported above the buck 1 by means of arm A which is pivotally connected to buck 1. Head 36 includes a vacuum chamber 38 and a pressing surface 39. The pressing surface 39 is fabricated of a highly porous semi-rigid material such as wire mesh. The wire mesh is preferably of the type having very small openings and an unevenly textured surface. The pressing surface 39 may comprise one or more layers of wire mesh. Specifically, it has been found that three layers of fine wire mesh provide a pressing surface having sufficient strength to hold a garment and prevent creeping as well as being able to exert adequate pressure on the fabric of the garment as may be required for imparting a permanent press.

Use of wire mesh having an uneven surface texture is preferred for the reason that the wire mesh does not readily retain heat nor does it crush or flatten the fabric during application of reasonable pressure so as to produce a "shine" on the garments. Moreover, since each strand of the wire mesh is of small diameter the pressing surface 39 does not tend to collect moisture or mark the garment when the pressing surface is in contact therewith. This is an advantageous feature since it is desired to maintain the original texture of the fabric of the garment during the permanent pressing procedure.

Vacuum is drawn in head 36 by means of conduit 40 being connected between head 36 and a vacuum source 41. The vacuum may be controlled in any one of several ways, for example, it may be continuously applied to the head 36 at all times, or it may be applied to the head only when the head is in pressing relationship with buck 1. The latter application of vacuum to the upper buck may include a control switch which is activated by the arm A or it may be connected to foot pedal 12 controlled by the press operator. All of these arrangements are believed well known in the art and therefore need no further explanation; however, in practical use of the invention, the continuous application of a vacuum to head 36 functions to evacuate the hot air surrounding the buck from the vicinity of the press, which makes the pressing operation more comfortable to the operator. Also, the wire mesh is cooled between pressing operations, thereby further reducing the tendency of the press from imparting a shine to the garments.

In order to permanently press garments according to the present invention, it is essential that the necessary curing or heat-setting conditions to affect a permanent press be ascertained. As previously pointed out, these conditions will vary according to the particular fabric being pressed. These conditions are usually available from the mill which has produced the fabric from which the garment is made. As a general observation, it is usually required that the garment be held in its desired shape and subjected to a particular temperature range for a specific period of time. Once these conditions have been ascertained the press operator initially adjusts rheostat 33 so as to provide the buck 1 with appropriate temperature conditions for the permanent pressing operation. When the press is operated, the vacuum drawn in head 36 functions to induce the steam or heated air supplied to chamber 2 of buck 1 to be drawn through the padding of the buck and the garment placed thereon. The heating elements are controlled so that they heat the air drawn through heating ducts 17–20 by the vacuum to a temperature suitable for the fabric. The garment to be permanently pressed is positioned on the upper surface of the pad covering the buck 1 and head 36 is pivoted down into contact with the garment which places the garment under sufficient pressure between the head 36 and the buck 1 to prevent creeping of the garment on the pad. This pressure is, of course, insufficient to cause "shine" on the garment. Steam is introduced to the chamber 2 of the buck 1 through the conduit 10 by manipulation of pedal 12. When the steam enters chamber 2 it engages baffle plate 44 (FIGURE 3) and quickly diffuses throughout the chamber 2 and passes upward through the plurality of openings 4 in the upper plate 3 of the buck, through the pad and into the garment which is to be permanently pressed. A vacuum is immediately applied to chamber 2 of buck 1 as head 36 engages the buck. As a result, the steam supplied to chamber 2 is continuously drawn through the garment and into the chamber 38 of the head and exhausted by way of conduit 40.

Steam pressing of the garment in this manner dampens and loosens the threads of the fabric and thus aids in forming the garment into its desired shape for permanent pressing.

The application of vacuum to the chamber 38 of head 36 while steam is being applied to the garment from the chamber 2 of the buck 1 not only functions to draw the steam through the garment but insures that the work area of the press operator will not become uncomfortable or hazardous because of the presence of excess free steam. The steam is contained by the pad and the garment until it passes through the garment whereafter it is immediately drawn into the head 36 and therefore cannot escape to the surrounding region. Moreover, the application of the vacuum while steam is being applied to the garment also prevents excess moisture from collecting in the fabric of the garment. This improves the quality of the pressing and makes later drying of the garment less difficult.

After the garment has been steam pressed and while the press is still closed the heated air is directed to the pressing surfaces. Pedal 12 is released by the operator, which closes valve 9 and terminates the flow of steam into chamber 2. Since a vacuum is still being drawn by head 36, valves 23 in valve housing 15 open to admit air to chamber 2. As the air passes through heating ducts 17–20 and over the heating elements, it is heated to a temperature slightly above that necessary to cure or permanently press the fabric being treated. As the heated air enters chamber 2 it displaces the steam previously admitted to chamber 2 and passes through the garment. Of course, there is a slight heat loss as the heated air approaches the garment, so that the air is at the proper temperature to permanently press the garment as it passes through the garment. The garment may be subjected to the heated air

for any necessary period of time to produce curing of the finish or heat-setting of the synthetic fibers. As is apparent, the heated air will pick up a certain amount of moisture in the garment remaining from the steam pressing operation and exhaust it through the vacuum system of the head.

If desired, cooling air may thereafter be supplied to the pressing surfaces for cooling the permanently pressed garment to complete the curing of the fabric. This may be done by providing a separate entry conduit to chamber **2**, and closing valves **23** so that atmospheric air passes into chamber **2**; however, in practical use of the invention, it has been found that the garments are substantially cured or permanently pressed at the end of the heating cycle and a cooling cycle is not necessary and merely functions to prolong the operation.

Generally, permanent pressing operations may be carried out in connection with the method and apparatus of the present invention by employing a specified pressing temperature range within the range of 250° F. to 450° F. for specified period of time which may vary from a few seconds up to about 20 minutes.

By way of specific example, the present invention may be used to permanently press a polyester/cotton garment by post-curing procedures employing the following general heated air temperature conditions and pressing times:

| | Minutes |
|---|---|
| 370° F. | 2 |
| 340° F. | 4 |
| 320° F. | 8 |
| 300° F. | 15 |

Another example of permanent pressing according to the present invention, but using the re-cure procedure, involves pressing at approximately 325° F. for a period of time in the range of about 25 seconds to 3 minutes.

A further example of permanent pressing according to the present invention and using heat-setting procedures on a polyester/acrylic garment involve pressing at approximately 250° F. for about 15 seconds.

Thus, it may be seen that the apparatus of the present invention is capable of providing a variety of temperature and time conditions as are necessary to perform any particular type of permanent pressing operation. Moreover, these temperature conditions are able to be controlled in such a manner as to prevent overheating of the pressing surfaces thereby preventing possible interference with the permanent pressing operation and damage to the garment. As previously pointed out, this feature is provided by controlled heated air input to the pressing surfaces through only the buck in combination with vacuum applied by the head to continuously provide circulation through the garment while it is being permanently pressed. In this manner heat does not tend to build up on the pressing surfaces of the garment. The overall result produced by the method and apparatus of the present invention is a uniformly permanently pressed garment.

It is also pointed out that convenient permanent pressing operations may be carried out in accordance with the present invention employing low pressure even in the event that the curing of the garment finish occurs at ambient temperatures, it being merely necessary to adjust the temperature of the heated air.

It should be understood that the present invention is particularly suited to automatic sequencing and timing operations since all pressing operations occur when the head is in pressing engagement with a garment overlying the buck. The sequencing of the operations and the operations themselves may be accomplished by well known apparatus. The present invention may also be adapted to presently existing presses with appropriate changes in the manner in which steam, heated air and vacuum are applied. While a foot pedal and rheostat have been illustrated as controlling the steam flow and air temperature, it should be obvious that various other devices can be utilized as well. For instance, a time controlled steam valve and thermostat can be substituted for these elements.

While the disclosed apparatus has been set forth as performing the steaming and heating steps for permanently pressing garments, it should be understood that the apparatus can be utilized to perform the "ironing" function without the "steaming" step. The air can be heated at a temperature high enough to cure a heat setting garment or to a lower temperature when the apparatus is utilized to merely iron or press a garment, whether the garment is a permanent press garment or non-permanent press garment.

Thus, having described the present invention, it will be obvious to those skilled in the art that certain variations and modifications may be made without departing from the spirit and scope thereof, and therefore, it is intended that the present invention be limited only as defined by the appended claims.

I claim:

**1.** Apparatus for pressing garments of heat settable fabrics comprising:

(a) a buck including an upper wall having an upper surface, a lower wall and side walls defining a chamber, a pressing pad extending over the upper surface of the buck, and means for communication between the chamber and a major area of the pressing pad;

(b) a source of steam connected by a conduit to the chamber and a control means within the conduit for regulating the flow of steam to the chamber;

(c) a heating unit defining at least one entrance port through which the interior of the unit communicates with the atmosphere and at least one chamber port through which the interior of the unit communicates with the chamber, and including a valve which is urged into a closed relationship with the entrance port to prohibit egress of air through the entrance port into the atmosphere when the pressure within the heating unit exceeds atmospheric pressure and permits ingress of air through the entrance port into the heating unit when the pressure within the unit is below atmospheric pressure, and heating means constructed and arranged to heat the air prior to its entry into the chamber;

(d) a head pivotable into engagement with the buck and a porous material extending across the head to form a pressing surface and to define a vacuum chamber within the head; and

(e) a source of vacuum connected by a conduit to the vacuum chamber.

**2.** Apparatus of claim **1** including means for regulating the heating means.

**3.** Apparatus of claim **1** wherein said heating unit comprises a valve housing and a plurality of ducts each communicating at one of its ends with the housing and at the other of its ends with the chamber of the buck, and the heating means is positioned in each of the ducts to heat air as it passes through the ducts to the chamber.

**4.** Apparatus of claim **1** including a baffle within the chamber of the buck to disperse steam as it enters the chamber.

**5.** Apparatus of claim **1** wherein the control means within the conduit is constructed and arranged to be foot operated.

**6.** Method of pressing a garment manufactured from a fabric including heat settable synthetic fibers comprising:

(a) flowing steam through a buck surface to a garment positioned thereon;

(b) withdrawing the steam from the garment by drawing a partial vacuum through a head surface;

(c) terminating the flow of steam while continuing to draw a partial vacuum through the head surface;

(d) heating air to a temperature of about 250° F. to about 450° F. and passing the heated air through the buck surface to the garment; and

(e) withdrawing the heated air from the garment by drawing a partial vacuum through the head surface.

**7.** Method of claim **6** wherein a partial vacuum is drawn continuously through the head surface during the pressing operation.

**8.** Method of imparting permanent press to a garment comprising the steps of:

(a) compressing a garment between a pair of pressing surfaces;

(b) then applying a partial vacuum to a first side of the garment;

(c) then passing steam under pressure through the garment from a second side of the garment opposite from the first side;

(d) then terminating the passage of steam through the garment; and

(e) then drawing air through the garment from the second side of the garment at a pressure below atmospheric pressure and at a temperature of about 250° F. to about 450° F.

**9.** Method of claim **8** wherein the step of applying a partial vacuum to the garment is performed continuously throughout the pressing operation.

**10.** Apparatus of claim **1** wherein element (c) comprises a heating unit defining at least one entrance port through which the interior of the unit communicates with the atmosphere and at least one chamber port through which the interior of the unit communicates with the chamber, and including a valve which is urged into a closed relationship with the entrance port to prohibit egress of air through the entrance port into the atmosphere when the pressure within the heating unit exceeds atmospheric pressure and is urged into an open relationship with the entrance port to permit ingress of air through the entrance port into the heating unit when the pressure within the unit is below atmospheric pressure, and heating means constructed and arranged to heat the air prior to its entry into the chamber.

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MERVIN STEIN, Primary Examiner

G. V. LARKIN, Assistant Examiner

U.S. Cl. X.R.

38—144