United States Patent

[11] 3,556,361

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[54] **GARMENT TREATING APPARATUS**
15 Claims, 10 Drawing Figs.

[52] **U.S. Cl.** **223/73**
[51] **Int. Cl.** **D06c 5/00**
[50] **Field of Search** 223/57, 70, 67, 72, 73

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ABSTRACT: A garment treating apparatus has a support structure having a tubular upright support portion and a tubular upper support portion with an expansible treating form depending from the upper support portion. The expansible form has a plurality of contoured padded sections enclosed within an inflatable permeable air bag with the form sections being movable by adjustment means within the air bag for expanding and contracting the form to conform to a garment to be treated. An air blower directs air into the tubular upright portion and into contact with a radiator for heating same and then upwardly through the tubular upright portion and into an air flow duct within the upper support portion. The air flow duct has a compartment above the expansible form formed by a damper for selectively opening and closing the compartment to introduce heated air and a vacuum thereinto respectively. Steam is introduced into the expansible form through a manifold having a portion of the adjustment means reciprocable therethrough.

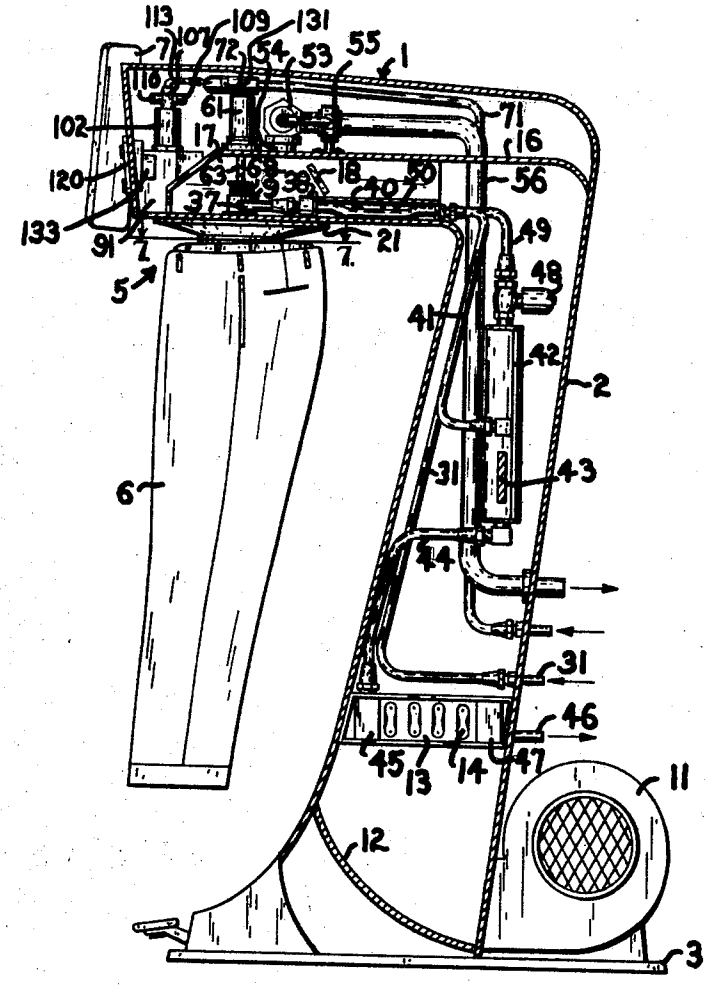

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Fig. 2.

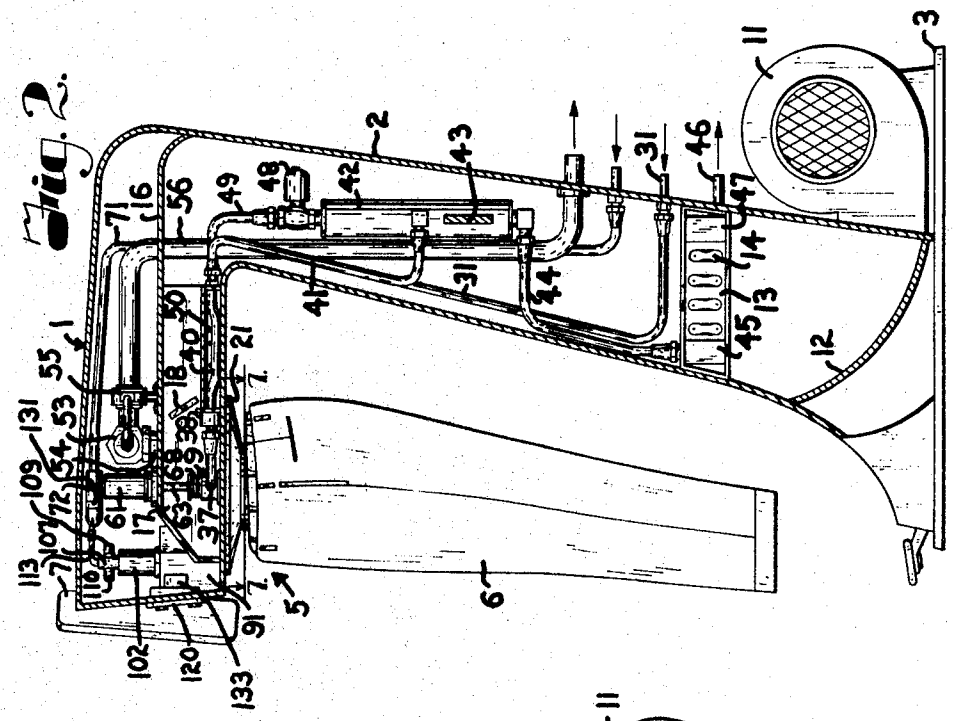
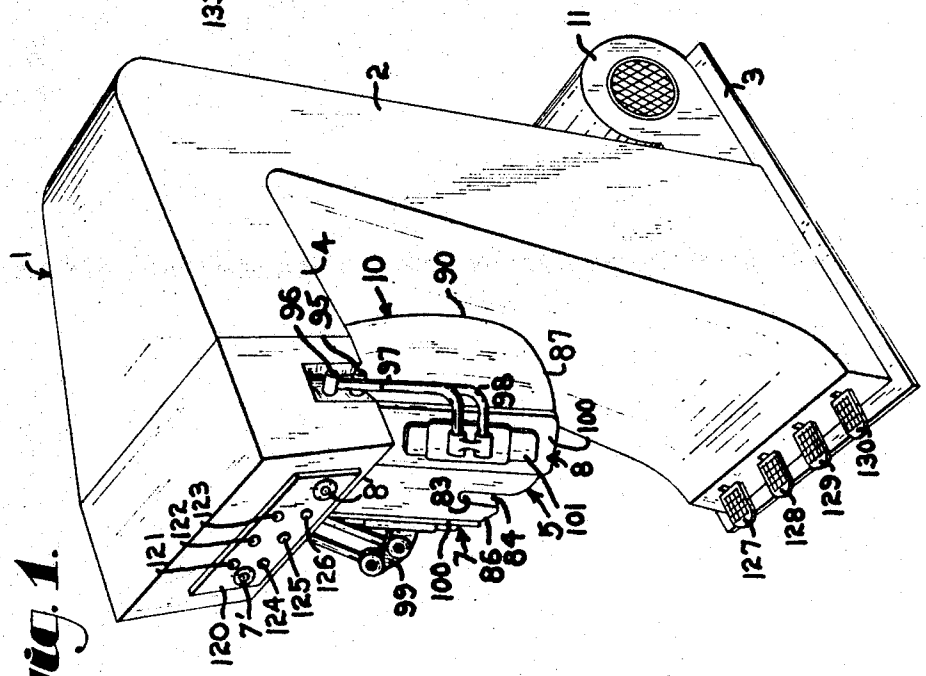


Fig. 1.



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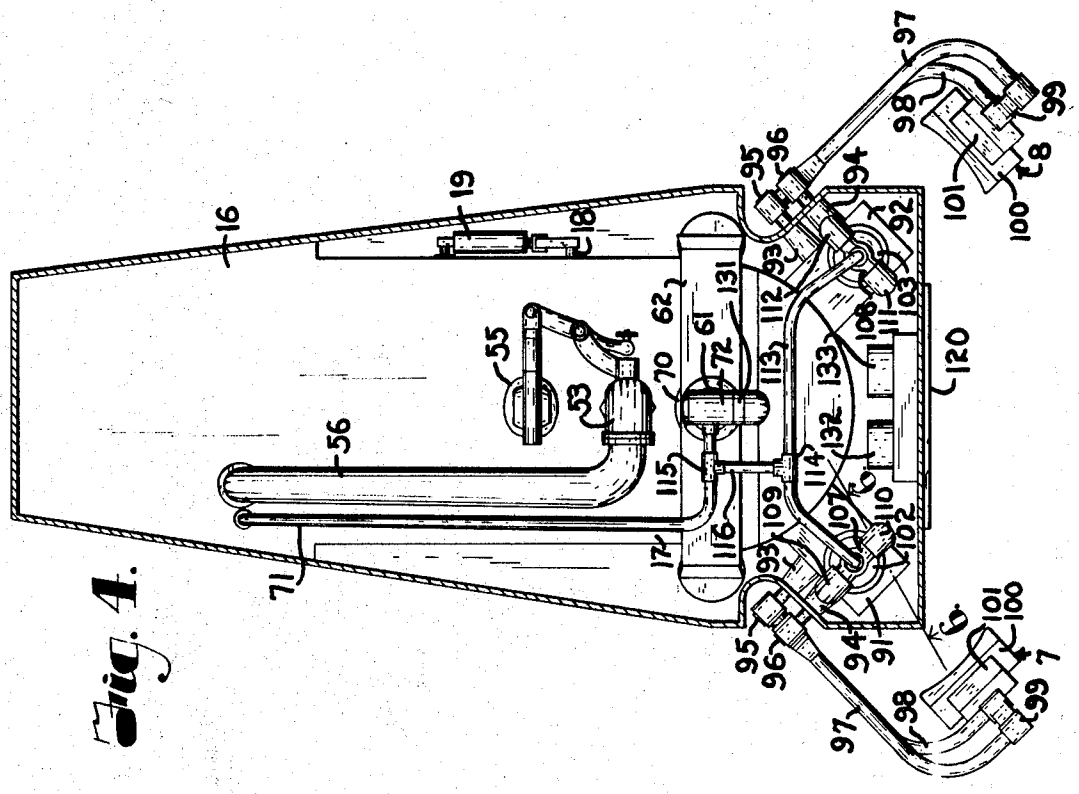

Fig. 4.

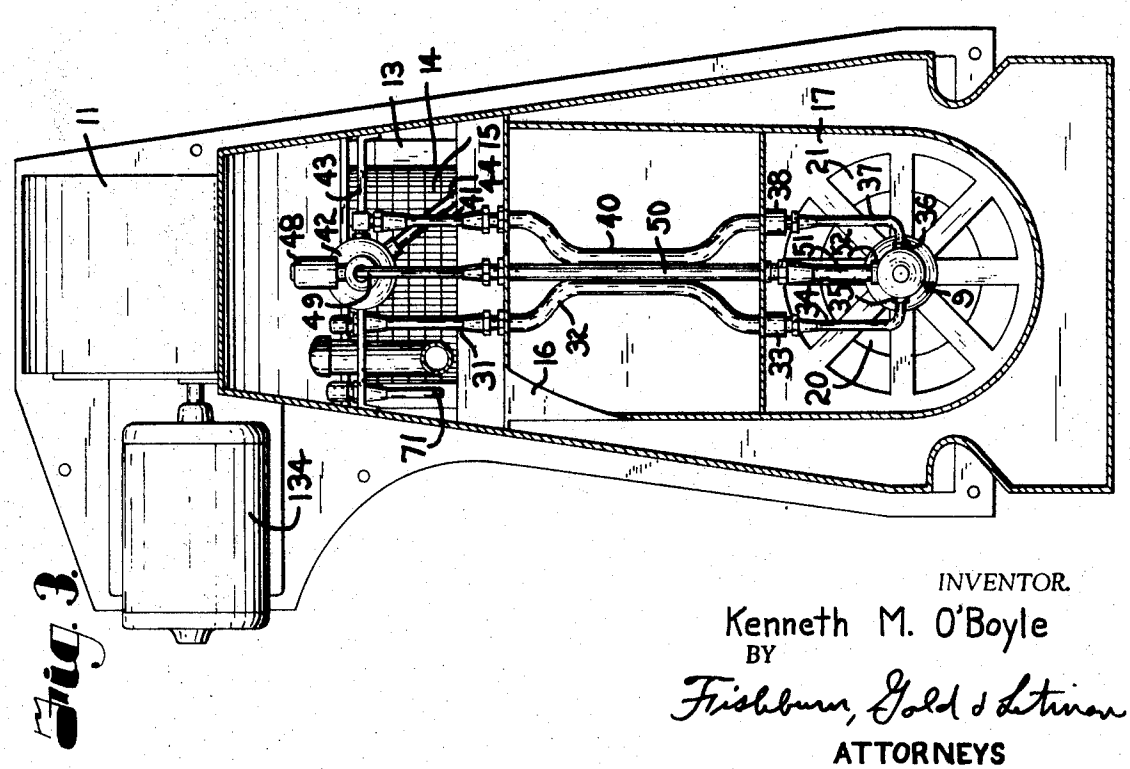

Fig. 3.

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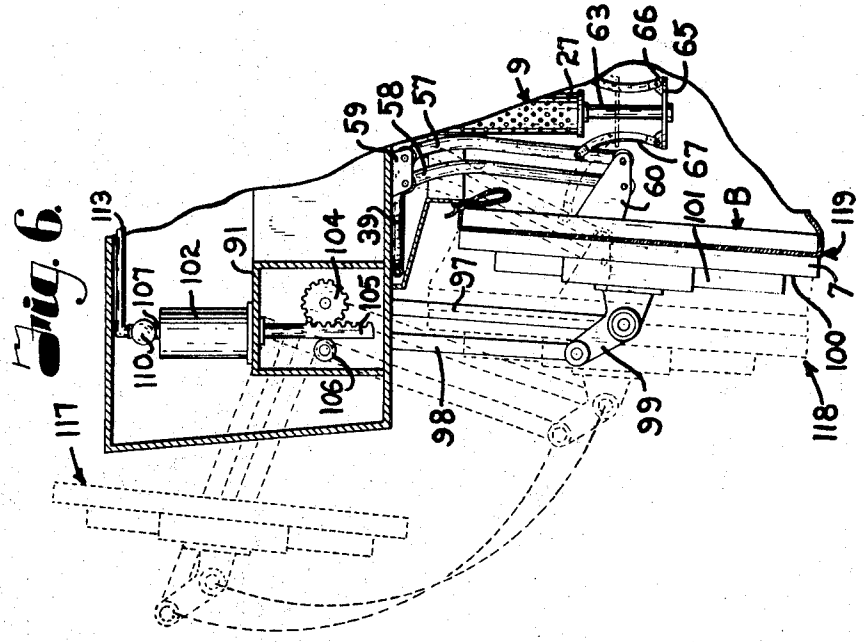

Fig. 6.

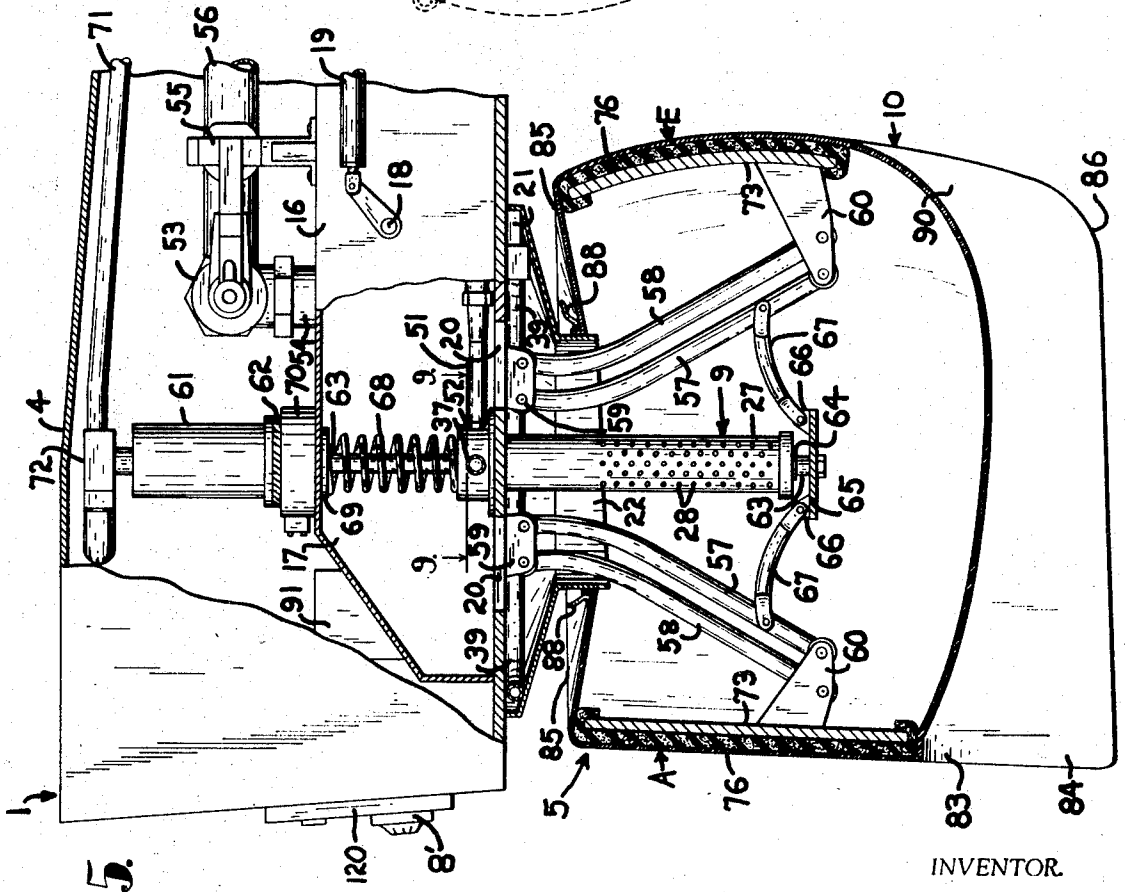

Fig. 5.

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Fig. 7.

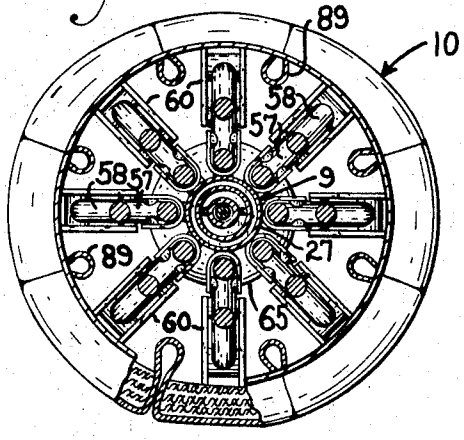


Fig. 8.

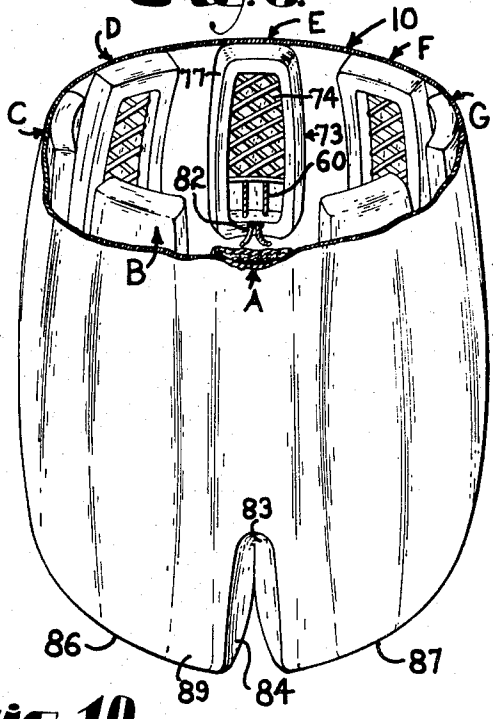


Fig. 9.

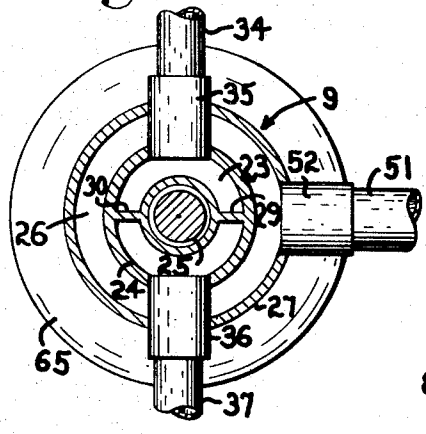
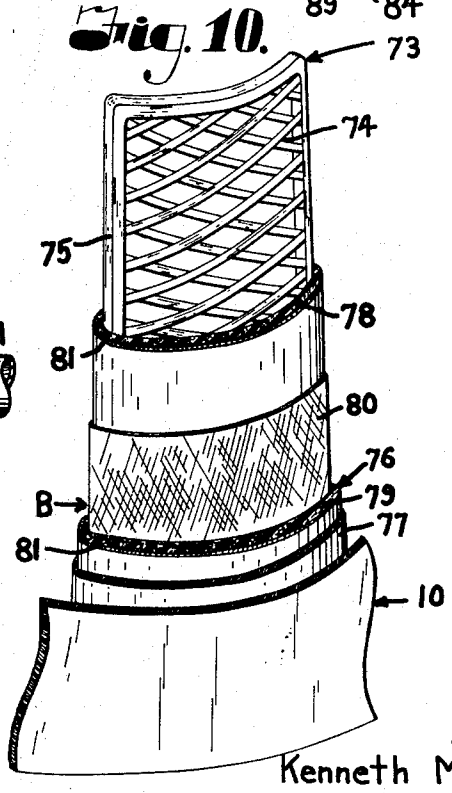


Fig. 10.



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GARMENT TREATING APPARATUS

This application is a continuation-in-part of copending patent application, Ser. No. 832,205, filed Jun. 11, 1969.

The invention relates to garment treating apparatus, and more particularly to apparatus for steam treating, pressing, forming, finishing and drying upper portions of trousers and the like, of variable sizes.

Improvements disclosed herein relate to air flow duct, form adjustment structure, steam discharge structure, and expansible form components.

The principal objects of the present invention are: to provide a garment treating apparatus having an improved, compact, power driven mechanism for expanding and contracting an expansible pressing form, thereby minimizing the space requirements for the expansion mechanism and simultaneously reducing the cost of manufacture by the simplicity of the design and the minimization of parts comprising the form expansion mechanism; to provide such a garment treating apparatus having an air duct structure enclosing an upper portion of the form expansion mechanism and having an air discharge opening of the air duct structure in pneumatic communication with an upper portion of an inflatable air bag assembly and having the air discharge opening sufficiently large for supplying a volume of heated air into the air bag assembly which will be commensurate with the air requirements of the largest sized trousers to be treated on the apparatus, yet having the air discharge opening confined within the limits of the allowable access at the top of the smallest sized trousers to be treated on the apparatus; to provide such a garment treating apparatus having an air duct structure, having a forward compartment therein which communicates with the top of the expansible form and air bag assembly, and which compartment is provided with vacuum valve means and air damper means for alternately and/or selectively introducing a vacuum within, or heated air into, the compartment and the associated expansible form and air bag assembly; to provide such a garment treating apparatus having an automatic time delay segment associated with the expansible form contraction means and the vacuum means for providing a slight delay in the contraction of the expansible form thereby allowing the vacuum means to first create sufficient vacuum within the air bag assembly (before the contraction of the form starts) to insure that the excess of the air bag assembly is drawn into neat folds within the expansible form as the form is brought into a retracted state for loading a garment thereon.

Further objects of the invention are to provide a garment treating apparatus having a heated steam discharge manifold which is centrally located within the expansible pressing form, and through the center of which manifold passes a segment of the form expansion mechanism, thus the steam discharge manifold and a portion of the form expansion mechanism may both occupy the desired central position within the expansible form; to provide such a garment treating apparatus having pleat pressing sections of the expansible form and their respective pleat pressing clamps each provided with self adjusting linkage means for automatically keeping the pleat pressing sections and the pleat pressing clamps coordinated and in exact alignment in all respects, one with the other, in all of the pressing positions of their movements; to provide such a garment treating apparatus having a pair of self adjusting pleat pressing clamps each of which is provided with suitable self regulating heating means for automatically maintaining the pressing surfaces of the clamps in heated condition to avoid the formation of condensate thereon during use of the apparatus and to insure firm dry creases in the pleats of the garments.

Still further objects are to provide a garment treating apparatus having an enclosed, permeable, inflatable, textile fabric air bag assembly which corresponds substantially to the shape of garments, or portions thereof, to be treated, and which air bag assembly features a series of permeable padded sections each of which is stitched or otherwise suitably secured to the inner surface of the textile fabric air bag assembly in corresponding relationship to their respective members of the expansible pressing form, and having means for securing the padded sections on their respective members of the expansible pressing form, and having an opening provided in the top of the air bag assembly and means for securing the latter to the discharge opening of the air duct structure in a substantially airtight relationship, and having the portions of the air bag assembly which are covered by a garment comprised of a textile fabric having comparatively high porosity, and having the portions thereof which are not covered by a garment having limited or restricted porosity, and having the air bag assembly provided with slide fasteners, or other suitable access means, for facilitating the removal and/or replacement of the said air bag assembly in respect to the garment treating apparatus; and to provide such a garment treating apparatus which is simple and durable in construction, economical to manufacture, and which is rapid and positive in operation.

Other objects and advantages of this invention will become apparent from the following description taken in connection with the accompanying drawings wherein are set forth by way of illustration and example certain embodiments of this invention.

FIG. 1 is a perspective view of a garment treating apparatus embodying features of the present invention and is shown with an expansible pressing form in an expanded state and pleat pressing clamps closed in a pressing relationship thereto.

FIG. 2 is a side elevational view of the garment treating apparatus with portions broken away to better illustrate the component parts and having the expansible form in a retracted state and having a small pair of trousers mounted thereon.

FIG. 3 is an enlarged horizontal sectional view through an upper portion of the garment treating apparatus particularly illustrating portions of steam heating and steam discharge means.

FIG. 4 is an enlarged fragmentary top plan view of an upper portion of the garment treating apparatus having portions broken away to better illustrate the construction thereof.

FIG. 5 is an enlarged fragmentary side elevational view of a forward portion of the garment treating apparatus particularly illustrating a portion of the expansible form and having certain parts broken away to better illustrate the construction thereof.

FIG. 6 is an enlarged fragmentary sectional view through the garment treating apparatus taken on line 6–6, FIG. 4, and showing pleat clamping and pressing means in respect to the expansible pressing form.

FIG. 7 is an enlarged fragmentary top plan view of the expansible pressing form particularly illustrating the relation of the permeable air bag assembly to the members of the expansible pressing form and is taken substantially along line 7–7, FIG. 2.

FIG. 8 is an enlarged fragmentary perspective view showing several contoured members of the expansible form, having the permeable air bag assembly mounted thereon and having portions thereof broken away to better illustrate the construction thereof, and is shown in an expanded state.

FIG. 9 is an enlarged fragmentary transverse sectional view through an upper portion of a steam discharge manifold and is taken substantially along line 9–9, FIG. 5.

FIG. 10 is an enlarged fragmentary perspective view of one of the several contoured sections of the expansible form particularly illustrating the construction of the expansible form section and showing the relationship of a pad and the air bag assembly thereto.

Referring more in detail to the drawings:

The reference numeral 1 generally designates a garment treating apparatus for steam treating, pressing, forming, finishing and drying the upper portions of various sized trousers and the like. The garment treating apparatus 1 is supported on a tubular upright portion or hollow stand 2 which is secured to a base 3 and the stand 2 extends upwardly therefrom and has a generally horizontal tubular upper support portion 4 thereof which extends forwardly from the stand 2. An expansible garment treating or pressing form 5 depends from the upper sup-

port portion 4 and is adapted to expand and contract to conform to a garment 6, such as trousers, slacks and the like. A pair of self adjusting pleat pressing clamps 7 and 8 are operable in conjunction with the expansible form 5.

In the illustrated structure, the upper support portion 4 is a hollow horizontal extension of the stand 2 and is provided with a steam discharge manifold 9 which is carried by, and which is positioned adjacent a forward end of the upper support portion 4. The steam discharge manifold 9 extends downwardly into the center of the expansible form 5, as best seen in FIG. 5.

Heated air supply means are provided for inflating a permeable air bag assembly 10 which is mounted on and encloses the expansible form 5. The air supply means comprises a motor driven blower 11 which is carried on a rear portion of the base 3, and the air discharge opening of the blower 11 communicates with a corresponding opening provided adjacent the bottom of the hollow stand 2. Air entering the upright stand 2 is directed upwards into the stand 2 by means of a diverter plate 12 which is carried therein and which may be seen in FIG. 2. Air passing upwards through the tubular stand 2 is heated by means of a suitable steam radiator 13 which is mounted in a lower portion of the stand 2 and the radiator 13 comprises a series of serpentine steam heating tubes 14 which are provided with fins 15 to increase the heat radiating capacity thereof, as best seen in FIGS. 2 and 3.

The upper support portion 4 of the apparatus 1 has a horizontal air duct structure 16 therein and the air duct structure 16 is in pneumatic communication with the upper portion of the stand 2. The air duct structure 16 extends forwardly from the tubular stand 2 to a position directly over the expansible form 5, as best seen in FIG. 2. The air duct structure 16 has a separate forward compartment 17 therein positioned above the expansible form 5. The compartment 17 is formed by an air damper 18 which extends across the air duct structure 16 for the purpose of selectively admitting heated air to the forward compartment 17 or pneumatically sealing off the compartment 17 from the air duct structure 16.

The air damper 18 is operable by means of a suitable electric cylinder or solenoid 19 which is carried by a sidewall of the air duct structure 16 and which is best seen in FIG. 4. The forward compartment 17 of the air duct structure 16 is provided with a series of apertures 20 in one wall thereof, preferably the bottom thereof, for discharging heated air therethrough into the expansible form 5 and air bag assembly 10 by means of an adapter or transition 21 which is secured to the underside of the upper support portion 4 and the transition 21 has an air discharge nozzle or duct 22 for communicating with an air inlet opening in the top of the inflatable air bag assembly 10. The transition 21 acts also as a venturi to increase the velocity of the air entering the air bag assembly 10, as best seen in FIGS. 3 and 5.

The steam discharge manifold 9 has a pair of inner steam chambers 23 and 24, a centrally positioned, open tubular bore or cavity 25 extending completely through the manifold, and an outer steam discharge chamber 26 which is formed by a tubular jacket 27 having a plurality of orifices 28 therein for the discharge of steam therethrough, as best seen in FIGS. 5 and 9. The steam chambers 23 and 24 are divided by means of diametrically opposed baffle plates 29 and 30 which extend downwardly between the chambers 23 and 24 to a point near the bottom thereof in order that condensate will not be allowed to remain in the chambers 23 and 24 but will be discharged from the manifold 9. The tubular cavity 25 provides a central access through the manifold 9 for a driving rod or plunger of the form expansion mechanism, which plunger passes independently and completely through the manifold 9, as will be later described.

Steam enters the garment treating apparatus 1 from a suitable source of supply (not shown) which is connected to a steam conduit 31 which enters at the rear of the apparatus and extends upwardly within the stand 2 and is connected to an angular steam conduit 32 which terminates in a steam inlet junction block 33. A steam conduit 34 is connected to the block 33 and communicates with a steam inlet opening 35 of the steam discharge manifold 9, as best seen in FIGS. 2, 3 and 9.

Steam entering the manifold 9 will be admitted through the inlet opening 35 and discharged into the chamber 23 and will be conducted downwardly therein passing below the baffle plate 29 and 30 and will rise on the opposite side of the baffle plates in the chamber 24. Condensate entering the manifold 9 with the steam (or condensate forming therein) will be forced upwardly within the chamber 24 and will be discharged with the steam flow through an outlet opening 36 of the manifold 9 into a steam conduit 37 which communicates with a steam junction block 38 as best seen in FIGS. 2 and 3.

An arcuate steam heating conduit 39 is connected at one end to the steam inlet junction block 33 and is connected at its opposite end to the steam junction block 38. The conduit 39 is soldered, or otherwise suitably secured, to the underside of the upper support portion 4 and to the transition 21 for the purpose of maintaining these members in heated condition in order that free moisture in the form of condensate will not form thereon during use of the apparatus, as best seen in FIGS. 3 and 5.

An angular conduit 40 (which is similar to the angular steam conduit 32) has one end connected to the steam junction block 38 and the other end connected to a steam conduit 41 which extends downwardly into the stand 2 and communicates with a sidewall of a suitable steam separator 42.

The steam separator 42 is enclosed within an enlarged cylindrical tank which is carried within the stand 2 by means of brackets 43. A steam conduit 44 has one end connected to the bottom of the separator 42 and the other end connected to an inlet manifold 45 of the steam radiator 13. A suitable conduit, such as a pipe nipple 46, is connected to an outlet manifold 47 of the radiator 13 and extends laterally out the rear of the stand 2 and communicates with a conventional steam trap (not shown) for the purpose of discharging spent steam and condensate from the garment treating apparatus 1.

An inlet side of a magnetic steam valve 48 communicates with the top center of the steam separator 42 for obtaining dry steam therefrom and a steam conduit 49 has one end connected to a discharge side of the steam valve 48 and the other end connected to a steam conduit 50 which passes between the angular conduits 32 and 40, as best seen in FIGS. 2 and 3. The steam conduit 50 communicates with the steam discharge chamber 26 of the steam manifold 9 by means of a steam conduit 51 and an inlet opening 52 connected to the tubular jacket 27 of the manifold 9.

The steam conduits 32 and 40 are secured to the conduit 50 as by being soldered or otherwise suitably secured thereto and to the upper support portion 4 for maintaining these members in heated condition to avoid the formation of condensate during use of the garment treating apparatus 1.

When the magnetic steam valve 48 is actuated, dry steam will flow from the separator 42 into the conduits 49, 50 and 51 and will be discharged through the orifices 28 in the jacket 27 of the steam manifold 9 into and through the expansible form 5 and air bag assembly 10 and thence through the fibers of the garment under treatment, thereby resulting in a reduction of pressure within the separator 42. Simultaneously, new steam from the source of supply (not shown) will be caused to flow through the steam conduits 31, 32, 34 and 39; the steam chambers 23 and 24; and the conduits 37, 40 and 41, thereby maintaining the upper support portion 4, the conduit 50, the manifold 9, and the transition 21 in heated conduction during use of the garment treating apparatus, as best seen in FIGS. 2, 3, 5 and 9.

A suitable vacuum valve 53 is mounted on the top of the air duct structure 16 and is in communication with the forward compartment 17 thereof by means of a nipple extension 54. The vacuum valve 53 is operable by means of a solenoid 55 which is positioned adjacent the vacuum valve 53 and is carried on the top of the air duct structure 16, as best seen in FIGS. 2, 4 and 5. An outlet side of the vacuum valve 53 communicates with an angular vacuum conduit or tube 56 which

extends out through the rear of the stand 2 and communicates with a central vacuum system (not shown). When the vacuum valve 53 is actuated, a vacuum will be formed within the forward compartment 17 and within the expansible form 5 and associated air bag assembly 10. The air damper 18 will be closed by means of a suitable compression spring (not shown) within the damper cylinder or solenoid 19 at all times except when the air blower 11 is in use. The vacuum means and the air supply means are not employed simultaneously during use of the garment treating apparatus, therefore, the vacuum valve 53 and the air damper 18 will not be in conflict one with the other.

The expansible form 5 has a series of contoured padded sections, designated by the letters A, B, C, D, E, F, G and H. The sections A to H, inclusive, form a small circular shape when contracted, as shown in FIG. 7, and form an enlarged circular shape when expanded, as shown in FIG. 8. The form may be made oval or elliptical, if desired, using the same type expansion mechanism, as later described.

The means for expanding and contracting the expansible form 5 are best illustrated in FIG. 5. The expansible form sections A to H, inclusive, are each carried by a pair of parallel generally arcuate arms 57 and 58 which have their upper ends pivotally secured to the underside of the upper support portion 4 by means of brackets 59. The parallel arms 57 and 58 depend from the upper support portion 4 and pass through the air discharge opening 22 of the transition 21 and have their lower ends pivotally secured to their respective form sections A to H, inclusive, by means of brackets 60 which are suitably secured to an interior surface of the respective expansible form sections. The pairs of parallel arms 57 and 58 are arranged in a cluster about the steam manifold 9 and are positioned completely below the upper support portion 4 and within the transition 21 and air bag assembly 10.

An air cylinder 61 is centrally disposed above the compartment 17 of the duct 16 and within a forward part of the upper support portion 4 and is carried on a bracket 62 which is secured to the upper support portion 4. The air cylinder 61 has an elongated rod or plunger 63 which extends downwardly through the compartment 17 and the bore or cavity 25 of the steam discharge manifold 9. The plunger 63 extends completely through the manifold 9 and its lower end is guided in reciprocable movement within a bushing 64 which is fixed on the lower end of the manifold 9. A circular plate 65 is secured to the lower end of the plunger 63 and has a plurality of ears or lugs 66 which extend upwardly therefrom. A series of pivotal links 67 interconnect the plate 65 with the form expansion arms 57. In the illustrated structure, the links 67 are elongate arcuate members each having one end pivotally connected to a respective lug 66 and the other end pivotally connected to a respective arm 57, as best seen in FIGS. 5 and 7.

A compression spring 68 is sleeved on the plunger 63 for retracting the plunger 63 and the mechanism appended thereto when the air cylinder 61 is void of compressed air. The spring 68 is seated at its lower end on the top of the steam manifold 9, and is seated at its upper end on a fixed disc 69 carried on the plunger 63.

The plunger 63 passes through a suitable electrically operated collet type brake 70 which is carried on the underside of the fixed bracket 62 for engaging the plunger 63 when the brake 70 is energized, thus providing a means for locking the expansible form 5 in selective positions, as best seen in FIG. 5, and as will be later described.

A suitable fluid under pressure, such as compressed air, enters the apparatus 1 from a suitable source of supply (not illustrated) through an angular air conduit or tube 71 which enters at the rear of the stand 2 and communicates with a suitable electrically operated form adjustment air valve 72 which is mounted on an air inlet opening of the air cylinder 61, as best seen in FIGS. 2, 4 and 5. When the form adjustment air valve 72 is energized, compressed air will be admitted to the air cylinder 61, expanding the latter, thus causing the links 67 and the pairs of parallel arms 57 and 58 to bring the expansible form 5 into a retracted state as shown in FIGS. 2, 6 and 7. When the form adjustment air valve 72 is deenergized and exhausted, the compression spring 68 will retract the plunger 63 into the air cylinder 61, thus carrying the expansible form 5 outwardly into an expanded state as shown in FIGS. 5 and 8.

The form adjustment air valve 72 and the brake 70 will not be energized simultaneously, as will be later described in relation to the operation of the garment treating apparatus 1.

The sections A to H, inclusive, of the expansible form 5, are illustrated as a series of permeable, contoured padded sections which are enveloped in, and interconnected by, an enclosed textile fabric air bag assembly 10. One of the expansible form sections B is illustrated in FIG. 10, where it may be seen that a contoured base or frame 73 of the respective form section has an open latticework or foraminous member 74 carried in a border or surround 75 to which is secured the support bracket 60, as best seen in FIG. 8. The contoured frames 73 are formed or arched to conform to the proper shape of the garment section they are to fill and are provided with individual pads 76 and pad covers 77 which are stitched to and form a part of the air bag assembly 10, as best seen in FIG. 8. The pad 76 is illustrated as having inner and outer layers of highly porous padding material 78 and 79 respectively between which is stitched, or otherwise suitably secured, a layer of fine metal mesh or screen 80. Each of the layers of porous padding material 78 and 79 has a permeable textile fabric pad cover 81 which secures the respective padding material 78 and 79 on the frame 73 by means of a drawstring 82, thus a smooth, resilient, permeable, contoured outer surface is provided for each of the expansible form sections A to H inclusive.

If desired, the screen 80 may be mounted directly on the frame 73. The purpose of "sandwiching" the screen 80 between the two padding layers 78 and 79 is to prevent free moisture, in the form of condensate, which may gather on the screen 80 during the steaming operation, from flying loosely around within the air bag assembly 10 during the air drying operation. Thus any moisture which may gather on the screen 80 will be retained by the pad layers 78 and 79 and will be quickly dissipated or evaporated by the heated air passing through the pad 76 during the drying operation.

The expansible form sections C and G are formed or arched corresponding with the proper shape of a pair of trousers at the sides or outseams thereof. Section A is formed to fit the center front or fly section of the trousers and is bifurcated near its lower end, forming an elongated slot 83 for receiving a crotch portion of the garment 6 therein and section E is formed or arched to fit the center rear of the trouser top. Sections B and H are shaped to fit the front portions of the trouser top where pleats may appear, and sections D and F are formed or arched to properly fit the bias rear portions of the trouser top above the hip pockets. These sections engage and support these critical portions of the trouser top. These critical sections of the trouser top will all be further apart, one from the other, as the trouser size increases, and when the expansible form 5 is expanded or contracted in size, the path of travel of the expansible form sections A to H inclusive will be such that each form section will automatically be in the proper position and will fit its respective critical section of the trouser top, whether the expansible form is in a retracted state for small trousers, as shown in FIGS. 2 and 7, or in a fully expanded state for large trousers, as shown in FIGS. 5 and 8, or in any expanded state therebetween for intermediate sized trousers.

The form sections D, E and F are considerably shorter in length than are the remaining sections of the expansible form 5, thus leaving the lower seat portions of the trouser top, as well as the crotch portion and the noncritical portions between the expansible form sections, to be treated and finished by the inflatable air bag assembly 10, as will later be described.

The inflatable air bag assembly 10 is similar in shape to the upper portions of a pair of trousers, and as large in size as the largest size of trousers to be treated on the apparatus. The air bag assembly 10 is a closed member having the pads 76 and

the pad covers **77** sewn to the inside surface thereof, and the air bag assembly **10** is mounted in covering relationship on the expansible form sections A to H inclusive, and is secured thereto as previously described. The air bag assembly **10** has a crotch portion **84** which extends from the top of the crotch slot **83** of section A to the lower end of the center rear section E, as best seen in FIG. **5**. The air bag assembly has a closed top portion **85** and leg end portions **86** and **87** which are closed at their lower ends, as best seen in FIGS. **1**, **5** and **8**.

Exclusive of the top portion **85** and lower ends of the leg portions **86** and **87** of the air bag assembly **10**, the air bag **10** is preferably made of a suitable textile fabric which is woven with sufficient tightness to maintain a desired static air pressure therein, yet having sufficient porosity to permit the free passage of steam and a portion of the static air therethrough.

The top portion **85** and lower ends of the leg portions **86** and **87** of the air bag assembly **10** is preferably formed of a textile fabric which is woven with sufficient tightness and is treated to prevent the excessive escape of steam, air or vacuum therethrough. The top portion **85** of the air bag assembly **10** has a central opening therein which corresponds to, and which is fitted over, the air discharge duct **22** and is secured thereto in a substantially airtight relationship by any suitable means, such as by a drawstring **88**, as best seen in FIG. **5**.

Since the air bag assembly **10** is a closed member, it will retain sufficient heat as radiated by the steam discharge manifold **9** and the heated transition **21** to maintain the members of the expansible form **5** in heated condition when the garment treating apparatus **1** is not in use. When the garment treating apparatus **1** is in use, the heated air discharged into the air bag assembly **10** will keep the expansible form members dry and in a heated condition regardless of the intermittent discharge of steam therein, as will be later described.

Unsupported portions **89** of the air bag assembly **10**, between the form sections A to H inclusive, of the expansible form **5**, will be "rounded out" to fit the noncritical areas of the garment **6** when the expansible form **5** is expanded and the air bag assembly **10** is inflated with heated air during the pressing operation, and any excess of the unsupported portions or sections **89** of the air bag assembly **10** will simply be gathered in folds between the sections of the expansible form **5**, depending on the size of the trousers under treatment, and will not transfer impressions of the bag or the folds therein upon the face cloth of the garment.

The lower seat portion of the air bag assembly **10** is left free to fill a lower seat portion of the trouser top when the air bag assembly **10** is inflated in order that there will be no pocket impressions on the outer cloth of the trousers, and also in order that the air bag assembly **10** will automatically compensate for any variation in the size or shape of the crotch or lower seat portions of the trousers which may be due to alterations having been made in the garment.

When the expansible form **5** is to be retracted from the expanded state, the vacuum valve **53** will first be actuated, thereby introducing a vacuum within the air bag assembly **10**, with the vacuum drawing the unsupported portions **89** of the air bag assembly **10** into neat folds between the sections of the expansible form **5**, and simultaneously drawing the top portion **85**, lower seat portion **90**, the crotch portion **84**, and the leg end portions **86** and **87** of the air bag assembly **10** into folds or puckers within the expansible form **5** as it is brought into a retracted state. The excess of the air bag assembly **10** is thereby out of the way when the expansible form **5** is retracted for loading a garment thereon, as will later be described.

The pleat pressing clamps **7** and **8** are mounted on a pair of fixed brackets **91** and **92** respectively which are positioned within the forward end of the upper support portion **4** and are disposed on directly opposite sides thereof substantially in line with the pleat pressing sections B and H of the expansible form **5**. Each of the brackets **91** and **92** has a pair of offset bosses **93** and **94** for supporting horizontally disposed shafts **95** and **96** respectively. One end of each of a pair of elongate angular arms **97** and **98** are pivotally mounted on the shafts **95** and **96** respectively. An angular bracket **99** is pivotally mounted on the other or free ends of the arms **97** and **98** and the bracket **99** has a press shoe or plate **100** mounted thereon.

The press plates **100** may be provided with a suitable coating, such as Teflon, to avoid the objectionable gloss or shine which may be imparted to some fabrics by the contact of bare metal surfaces, and each press plate **100** has a suitable electric strip heater **101** which is mounted on the exterior or backside of each of the press plates **100** for maintaining the press plates in heated condition to avoid the formation of condensate thereon and to insure firm dry creases in the pleats of the garment. The strip heaters **101** each have automatic heat regulating controls **7'** and **8'** for maintaining a controlled temperature of the respective press plates **100** on the pressing clamps **7** and **8** respectively.

A pair of air cylinders **102** and **103** are secured to the tops of the fixed brackets **91** and **92** respectively for operating the pleat clamp assemblies **7** and **8** respectively, as best seen in FIGS. **4** and **6**.

Each shaft **95** is journaled in its respective boss **93** and each shaft **96** extends into its respective bracket housing **91** and **92**. Each shaft **96** has a spur gear **104** mounted thereon to mesh with a toothed rack **105** which is an extension of a plunger of the respective air cylinders **102** and **103**, and each rack **105** is maintained in mesh and alignment with its respective spur gear **104** by means of a needle roller bearing **106**, as best seen in FIG. **6**.

Each angular arm **97** is complementary to, and is in parallel conjunction with, the respective angular arm **98** and serves the purpose of keeping the press plate **100** coordinated and in proper alignment with the respective pleat pressing section of the expansible form **5**, as best seen in FIG. **6**, and as will later be described.

A pair of double solenoid air valves **107** and **108** are mounted on the air inlet openings of the air cylinders **102** and **103** respectively, for controlling the operation of the pleat clamps **7** and **8** respectively, and the valves **107** and **108** are each provided with a pair of solenoids **109** and **110**, and **111** and **112**, respectively. Compressed air is supplied to the valves **107** and **108** through an air conduit **113** which is connected to the air supply conduit **71** by means of tee fittings **114** and **115** and an interconnecting branch air conduit **116**, as best seen in FIG. **4**.

The pleat pressing clamps **7** and **8** are each held in the open or disengaged position **117** by means of a compression spring (not shown) within the respective air cylinder **102** and **103** which retracts operative parts of the respective air cylinder **102** and **103** when the cylinder is void of compressed air. The pleat pressing clamps **7** and **8** are movable from the open position **117** to engaged or pressing positions **118** and **119** engaging the expanded and retracted positions of the expansible form **5** respectively, as best seen in FIGS. **1**, **4** and **6**.

The vertical rise of the expansible form **5** between the retracted position and the expanded position is commensurate with the vertical rise of the pleat pressing clamps **7** and **8** between position **119** and position **118**. There is no vertical overlapping or underlapping of the pleat pressing clamps **7** and **8** in respect to the expanded or contracted position of the expansible form **5**, thereby providing means for maintaining the expansible form **5** and the pleat pressing clamps **7** and **8** coordinated and in exact alignment, in all respects, one with the other in all of the pressing positions of their movements by the particular use and arrangement of the parallel form expansion arms **57** and **58** and the parallel pleat clamp arms **97** and **98**, as best seen in FIG. **6**.

The pleat supporting and pressing sections B and H of the expansible form **5** will automatically be in line with, and in the proper position behind, the pleats of trousers regardless of the size of the trousers placed on the expansible form **5**, as previously described. The pleat clamps **7** and **8** will also automatically be in alignment with the expansible form sections B and H of the expansible form **5** and with the pleats of the trousers regardless of the size of the trousers under treatment.

A control panel 120 is mounted on the front of the upper support portion 4 and has electrical pushbuttons 121, 122, 123, 124, 125 and 126 for controlling the operation of the garment treating apparatus 1. A series of foot pedals 127, 128, 129 and 130 are mounted in the lower front of the stand 2 where they are in easy reach of an operator. Each of the foot pedals 127 to 130 inclusive is operatively connected to a suitable electrical switch (not shown) mounted within the forward portion of the stand 2 and the switches are operated individually by their respective foot pedals during use of the garment treating apparatus 1.

The pleat pressing clamps 7 and 8 are controlled by the pushbuttons 121 to 124, inclusive. When the pushbutton 121 is depressed, the solenoid 109 will be energized, thereby opening the air valve 107 admitting compressed air into the air cylinder 102 to expand same to move the pleat clamp 7 to close against the face of the expansible form 5, as shown in FIG. 1. And simultaneously, with the energization of the solenoid 109, the electric circuit to the brake 70 will be closed, thereby locking the expansible form 5 in position. When the pushbutton 122 is depressed, the solenoid 110 will be energized, thereby returning the air valve 107 to the closed position and exhausting the air cylinder 102 thus allowing the air cylinder compression spring (not shown) to return the clamp 7 to the open or disengaged position 117, and simultaneously with the depression of the pushbutton 122 the electric circuit to the brake 70 will be opened.

Pushbutton 123 is operatively connected to solenoid 111 and pushbutton 124 is operatively connected to solenoid 112 for controlling the air valve 108 to provide a similar action of the pleat clamp 8 on the directly opposite side of the garment treating apparatus 1. The pleat clamps 7 and 8 may be operated individually, and the expansible form 5 will remain in a locked position as long as either or both of the pleat clamps 7 and 8 are in an engaged or pressing position.

The foot pedals 127 to 130 inclusive are operative to control the contraction and expansion of the expansible form 5 for loading a garment thereon. When the foot pedal 127 is depressed its respective electric switch (not shown) within the stand 2 will be caused to close and will: (1) energize the solenoids 110 and 112 thereby releasing the pleat clamps 7 and 8 (if closed) and simultaneously unlocking the expansible form 5 (if locked); (2) energize the vacuum control solenoid 55 thereby introducing a vacuum within the air bag assembly 10, and simultaneously energizing a time delay segment 131 which will, after a few seconds delay, energize the form control solenoid air valve 72 thereby admitting compressed air to the air cylinder 61 causing the expansible form 5 to retract to its minimum size, and simultaneously, with the retraction of the expansible form 5, the vacuum will cause the air bag assembly 10 to be gathered in folds within the expansible form 5 as the form is brought into a retracted state for loading a garment thereon.

Depressing the foot pedal 127 will cause the pleat clamps 7 and 8 to open (if closed); will cause the expansible form 5 to be unlocked (if locked); will cause the expansible form 5 to fully retract; and will cause the air bag assembly 10 to be gathered in folds within the expansible form 5 as the form retracts. When the foot pedal 127 is released, the vacuum will be shut off, the form will expand, the pleat clamps 7 and 8 will remain opened, and the expansible form 5 will remain unlocked.

Contraction and expansion of the expansible form 5 for removing a finished garment from the garment treating apparatus 1 is controlled by operation of the foot pedal 128. When the foot pedal 128 is depressed, the respective electric switch (not illustrated) within the stand 2 will be caused to close and will create the same action in the garment treating apparatus 1 as does the foot pedal 127, with the exception that the vacuum control solenoid 55 and the time control segment 131 are not energized when the foot pedal 128 is depressed. A vacuum is not desired when removing a finished garment from the expansible form 5 as the vacuum may tend to draw the pockets of the garment into the spaces between the expansible form sections where they could become ensnared as the expansible form 5 retracts.

When it is desired to presteam the garment 6, the operator may select either of two means which are provided in the garment treating apparatus 1: (1) the operator may depress the foot pedal 129 which will close its respective electrical switch (not shown) within the stand 2 thereby energizing the magnetic steam valve 48 discharging steam into the expansible form 5 and air bag assembly 10; or (2) the operator may use the automatic means for presteaming the garment by depressing the pushbutton 125 which will cause a preset electrical timing device 132 to be energized, which will, in turn, energize the magnetic steam valve 48 for a predetermined length of time; thus the operator may absent himself from the garment treating apparatus 1 during the presteaming cycle. When either the foot pedal 129 or the electrical timing device 132 are in use, the brake 70 will be energized also, thus locking the expansible form 5 in position during the presteaming operation in order to prevent stretching or distorting the garment 6.

It is desirable to draw the pleat portions of the garment 6 into firm engagement with the respective areas of the expansible form 5 prior to operation of the pleat clamps 7 and 8, therefore, when the foot pedal 130 is depressed, its respective electrical switch (not shown) within the stand 2 will be closed and will energize the vacuum control solenoid 55 thereby introducing a vacuum into the expansible form 5 and air bag assembly 10 for the purpose of holding the pleats of the trousers fast against the face of the expansible form 5 prior to closing the pleat clamps thereon, as will be later described.

Automatic steaming and drying operations are controlled by an automatic timing device 133 in the garment treating apparatus 1, and the automatic timing device 133 has two phases of operation and will be started by depression of the pushbutton 126. The first phase of the automatic timing device 133 is the steaming cycle wherein the timing device 133 will energize the magnetic steam valve 48 and the brake 70 thereby discharging a blast of steam into the expansible form 5 and air bag assembly 10 and simultaneously locking the expansible form 5 in position, and at the end of the first phase the automatic timing device 133 will interrupt the current to the steam valve 48, thus terminating the steaming cycle.

The second phase of the automatic timing device 133 is the static air cycle wherein the automatic timing device 133 continues current to the brake 70, thus keeping the expansible form 5 in a locked position during the air cycle, and simultaneously the automatic timing device 133 energizes a blower motor 134 and the damper control solenoid 19, thereby discharging heated air into the expansible form 5 and air bag assembly 10 for drying and setting the trouser top. Near the end of the second phase, the automatic timing device 133 interrupts current to the blower motor 134, the damper solenoid 19, the brake 70, and will energize the solenoids 110 and 112, thereby releasing the pleat clamps 7 and 8 (if closed) and at the end of the second phase the automatic timing device 133 shuts itself off automatically.

It is to be understood that all necessary electrical wiring, switches and controls which are not illustrated shall all be of conventional design and manufacture and, therefore, an illustration thereof is not considered necessary for the purpose of the present disclosure.

When idle, the garment treating apparatus 1 has the pleat clamps 7 and 8 in the disengaged position 117 and the expansible form 5 in fully expanded state, therefore, in placing the garment treating apparatus 1 in operation, the operator will have the trousers to be treated in hand and will first adjust the controls 7' and 8' to select the temperature for the heaters 101 of the pressing clamps 7 and 8 respectively, if the garment 6 has pleats, and then depress the foot pedal 127, thus bringing the expansible form 5 into a fully retracted state, as previously described, and the trousers 6 are then slipped over the expansible form 5 and the foot pedal 127 is released, thus allowing the expansible form 5 to expand to the corresponding

size of the trousers placed thereon. Then, if necessary, the trouser top may be presteamed by either of the two means previously described (depression of the foot pedal **129** or the pushbutton **125**); thus if the trousers are badly wrinkled, this presteaming will relax the fibers of the garment and allow same to drape properly on the expansible form **5**. If the trousers are of the pleated variety, the pleats are then adjusted on the face of the expansible form **5**, in sequence, and the pleat clamps **7** and **8** are closed thereon by depression of the pushbuttons **121** and **123**. The vacuum may be employed in this phase of the operation, as previously described, by depression of the foot pedal **130**. The pushbutton **126** is then depressed, thereby inducing the automatic steaming and air drying cycle, as previously described, and during which time the operator may absent himself from the garment treating apparatus **1**, for example, to press the legs of a previously topped pair of trousers on another machine. At the end of the automatic steaming and air drying cycle the trouser top will be finished and ready for removal from the garment treating apparatus **1**, and the operator will then depress the foot pedal **128**, thereby unlocking and retracting the expansible form **5**, as previously described, and at which point the topped trousers may be easily slipped from the garment treating apparatus **1**, and upon release of the foot pedal **128**, the expansible form **5** will again expand to its fullest degree where it will be ready for reloading, and the cycle of operation may be repeated.

It is to be understood that while I have illustrated and described one form of my invention, it is not to be limited to the specific form or arrangement of parts herein described and shown.

I claim:

1. A garment treating apparatus comprising:

a. a support structure having a tubular upright portion and a tubular upper support portion extending from said upright portion;

b. an expansible treating form having a plurality of padded sections and depending from said upper support portion of said support structure;

c. in inflatable permeable air bag mounted on and enclosing said expansible form in a substantially airtight relationship;

d. an air flow duct within said upper support portion and communicating with said upright portion, said air flow duct having a compartment above said expansible form, said compartment being defined by a plurality of walls;

e. flow means for communicating said compartment with said air bag;

f. damper means for selectively opening and closing said compartment of said duct;

g. adjustment means associated with said expansible form for expanding and contracting said sections to conform to a garment to be treated;

h. steam means communicating with said expansible form for discharging steam into said expansible form;

i. vacuum means communicating with said compartment of said duct for introducing a vacuum within said expansible form; and

j. control means operatively connected to said damper means and said adjustment means and said steam means and said vacuum means for controlling operation thereof.

2. The garment treating apparatus as set forth in claim **1** including:

a. a pair of pleat pressing clamps each having self adjusting linkage for moving said respective pleat pressing clamps into pressing engagement with a garment on said expansible form;

b. control means associated with said self adjusting linkages for moving same into and out of said pressing engagement;

c. heating means on each of said pleat pressing clamps for maintaining same at a selected temperature; and

d. control means operatively connected to said heating means for adjusting the temperature of said heating means.

3. The garment treating apparatus as set forth in claim **1** including:

a. heating means within said upright portion for heating air within said air flow duct; and

b. motor driven air blower means communicating with said tubular upright portion for directing air to said heating means and to said air duct.

4. The garment treating apparatus as set forth in claim **3** wherein said flow means includes:

a. a plurality of apertures through one wall of said compartment of said duct;

b. duct means mounted on said upper support portion and depending therefrom, said duct means surrounding said apertures; and

c. means for mounting said air bag on said duct means in a substantially airtight relationship therewith whereby heated air to expand said air bag and vacuum to contact said air bag may be selectively communicated to said air bag.

5. The garment treating apparatus as set forth in claim **1** wherein said steam means includes:

a. An elongate tubular manifold extending into said expansible form, said tubular manifold having a plurality of orifices for discharge of steam into said expansible form and air bag;

b. first steam flow means communicating with said tubular manifold for flow of steam into said expansible form and air bag;

c. an elongate inner tubular member within said manifold and having a pair of steam chambers therein separated by a partition having one edge spaced from one end of said inner tubular member for flow of steam between said steam chambers; and

d. second steam flow means communicating with each of said steam chambers for flow of steam through said expansible form.

6. The garment treating apparatus as set forth in claim **5** wherein said adjustment means includes:

a. a bore through said inner tubular member;

b. a power member having a reciprocable rod extending through said bore of said inner tubular member;

c. a self adjusting linkage operatively connected to each of said respective form sections; and

d. links connecting a free end of said reciprocable rod and said respective self adjusting linkage to effect coordinated movement of said respective form sections in response to operation of said power member.

7. The garment treating apparatus as set forth in claim **6** wherein:

a. said self adjusting linkages each are a pair of elongate parallel arms having their upper ends pivotally secured to a lower surface of said upper support portion and their lower ends pivotally secured to said respective form sections; and

b. said self adjusting linkages are enclosed within said duct means and said air bag.

8. The garment treating apparatus as set forth in claim **5** wherein:

a. said first steam flow means has a steam separator associated therewith; and

b. said second steam flow means has an inlet conduit for communicating a source of steam with one of said steam chambers and an outlet conduit for communicating the other of said steam chambers with said steam separator.

9. The garment treating apparatus as set forth in claim **1** wherein said padded sections of expansible form each include:

a. a contoured frame member having a foraminous member mounted within a surround, said frame member being connected to said adjustment means;

b. porous padding material;

c. a pad cover secured to said padding material and secured to said air bag; and

d. mounting means for removably mounting said pad cover and padding material in covering relation with an exterior side of said frame member.

10. The garment treating apparatus as set forth in claim **9** wherein:

a. said padding material has an inner and outer layer of porous material separated by a screen member; and

b. said screen member is a layer of fine mesh metal for collecting condensate formed within said expansible form.

11. The garment treating apparatus as set forth in claim **1** including:

a. time delay means operatively connected to said vacuum means and said power member of said adjustment means for drawing unsupported portions of the air bag between the form sections prior to retracting said expansible form.

12. The garment treating apparatus as set forth in claim **2** wherein:

a. said adjustment means has a plurality of pairs of elongate parallel arms, one pair of arms for each section of said expansible treating form to effect coordinated movement of all of the sections of said expansible form simultaneously to conform to the critical areas of a garment to be treated;

b. two of said expansible form sections are aligned with pleat pressing areas of the garment to be treated and said respective pairs of elongate parallel arms connected to said two form sections effect positioning of the two form sections to conform to the pleat pressing areas of variable sized garments to be treated; and

c. said self-adjusting linkage for each of said pleat pressing clamps is a pair of elongate parallel arms connected to said respective pleat pressing clamp to effect coordinated movement of the pleat pressing clamps with the movement of said two form sections in all of the pressing positions of the pleat pressing clamps and the two form sections.

13. The garment treating apparatus as set forth in claim **12** wherein:

a. said pleat pressing clamps each have a face engageable with the pleat pressing areas of the garment to be treated; and

b. said self-adjusting linkages are shaped and positioned to maintain said face of said respective pleat pressing clamps parallel with the surface of the two expansible form sections in all positions of said pleat pressing clamps.

14. A garment treating apparatus comprising:

a. a support structure;

b. an expansible treating form having a plurality of padded sections and depending from said support structure;

c. an inflatable permeable air bag mounted on and enclosing said expansible form in a substantially airtight relationship;

d. an air flow duct having a compartment above said expansible form;

e. flow means for communicating said compartment with said air bag;

f. damper means for selectively opening and closing said compartment of said duct;

g. steam means communicating with said expansible form for discharging steam into said expansible form;

h. adjustment means associated with said expansible form for expanding and contracting said sections to conform to a garment to be treated, said adjustment means being positioned within said expansible form and said steam means;

i. vacuum means communicating with said compartment of said duct for introducing a vacuum within said expansible form; and

j. control means operatively connected to said damper means and said adjustment means and said steam means and said vacuum means for controlling operation thereof.

15. The garment treating apparatus as set forth in claim **14** wherein:

a. said support structure has a tubular upright portion and a tubular upper support portion extending from said upright portion;

b. said air flow duct is within said upright portion and said upper support portion of said support structure; and

c. said adjustment means has a portion thereof positioned within said flow means.