Dec. 23, 1969 F. R. GRUNER ET AL 3,484,966

IRONING MACHINE

Filed Sept. 14, 1965 3 Sheets-Sheet 1

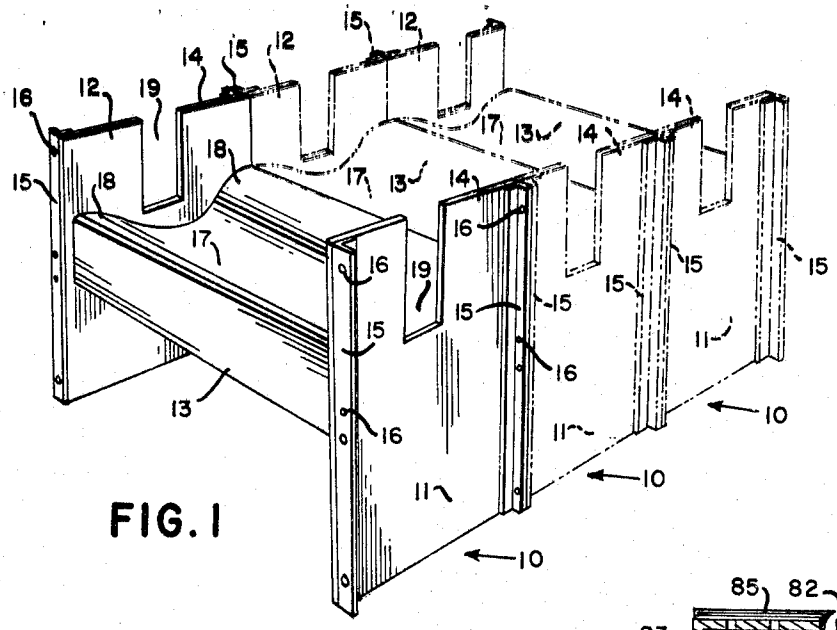

FIG. 1

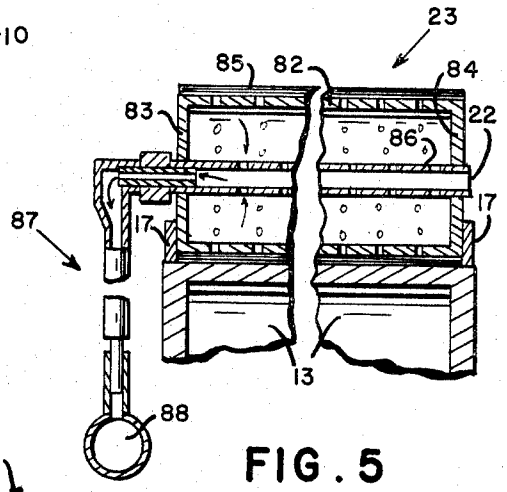

FIG. 5

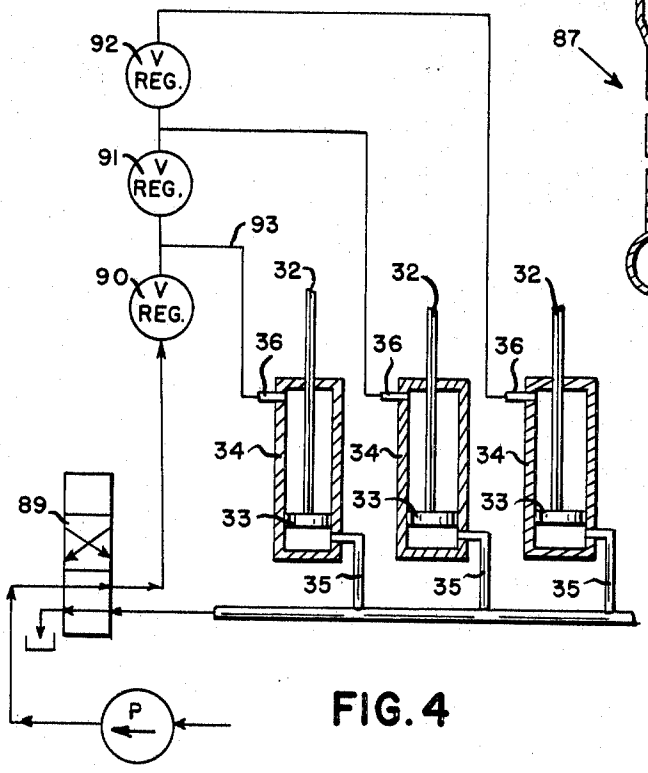

FIG. 4

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IRONING MACHINE

Filed Sept. 14, 1965 3 Sheets-Sheet 2

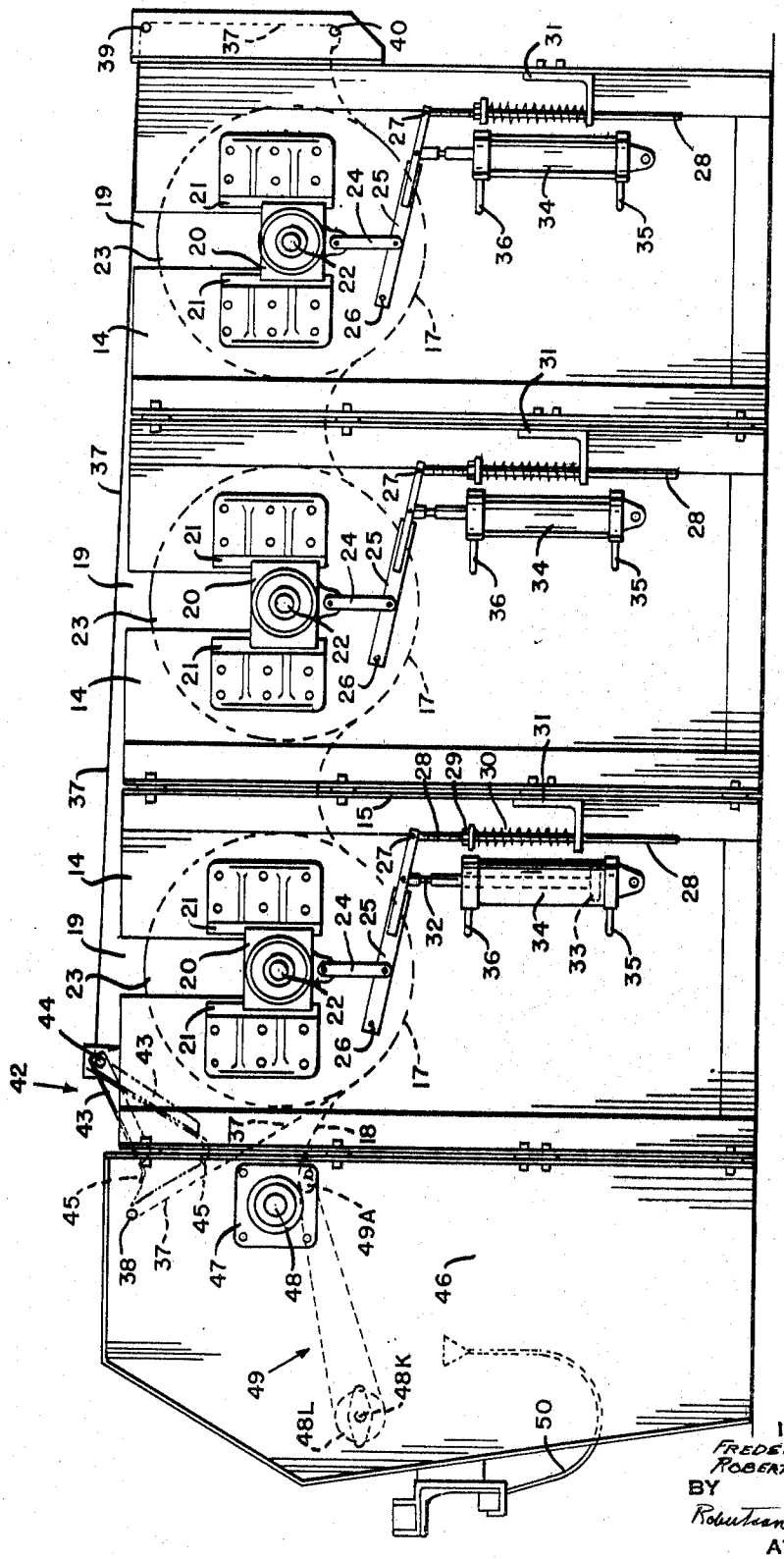

FIG. 2

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IRONING MACHINE

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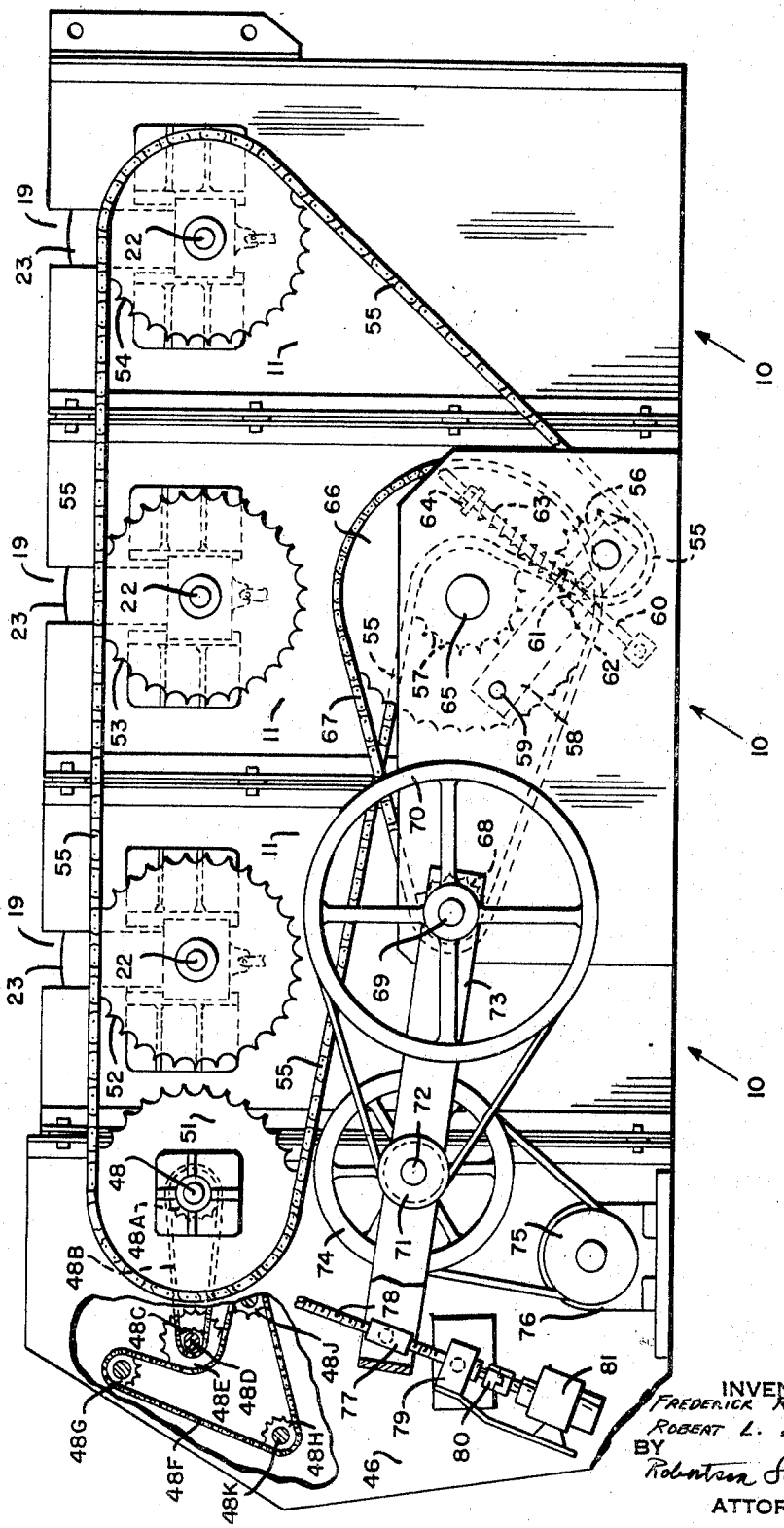

FIG. 3

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United States Patent Office 3,484,966 Patented Dec. 23, 1969

3,484,966

IRONING MACHINE

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U.S. Cl. 38—55 6 Claims

ABSTRACT OF THE DISCLOSURE

An ironing machine including a plurality of similar cooperating frame modules, each having a contoured hot chest means therein, and a plurality of driven ironing rolls having a suitable compressible covering material. Fluid operated means is provided for selectively forcing the rolls into contact with the contoured surfaces of the hot chest means with progressively less force along the path of travel of flatwork through the machine so as to provide a greater effective radius for each succeeding roll therealong to draw the flatwork therethrough.

This invention relates to laundry ironers and particularly to an improved laundry ironer for flatwork.

Prior known ironers usually employ a multiplicity of parallel arranged ironing rolls of relatively small diameter between which and suitable heating means, laundry flatwork is fed for effecting an ironing operation.

An object of this invention is to provide an ironing machine for flatwork in which rolls of substantially greater diameter than that previously employed are used, and fewer rolls being used than in prior devices.

Another object of the invention is to provide such an ironing machine in which the rolls are lowered into engagement with a contoured surface of a hot chest and raised therefrom by fluid operated means that can be independently adjusted for each roll.

Still another object of the invention is to provide such an ironer in which an endless tape surrounds the rolls in belt fashion and proper tension of the tape is maintained at all times, and scorching of the tape by the hot chest is prevented when the rolls are raised.

A further object of the invention is to provide such an ironer that is composed of substantially identical frame modules so that it can be extended or contracted by inserting or withdrawing a module to provide an ironer of a desired length.

A still further object of the invention is to provide such an ironer in which a transmission in modular form is employed to accommodate the modular construction of the ironer frame.

Another object of the invention is to provide such an ironer in which the speed of ironing can be varied.

Still another object of the invention is to provide such an ironer in which the rolls are hollow, having a porous, resilient, padded covering, and in which the interior of the rolls is evacuated through a simple sealed joint means leading to an evacuating header means.

A further object of the invention is to provide such an ironer in which the roll last to contact the work passing through the ironer has a peripheral speed slightly greater than the other rolls to apply tension to the work.

In one aspect of the invention, a laundry ironer may comprise a plurality of hot chest frame means of modular construction having a contoured upper surface over which the flatwork is caused to pass in performing an ironing operation. The frame means may comprise frame end members between which a hot chest extends and which chest is freely supported on angle brackets on said end members. The end members may include aligned slidable

bearings for supporting an ironing roll that has an outside radius corresponding to the contour of the top of the hot chest. An endless tape extends around a plurality of such rolls that are mounted in succeeding modules, said rolls having perforated peripheral surfaces covered with padding, which latter is adapted to be forced into intimate contact with the contoured surface of the hot chest means. Laundry flatwork is adapted to be fed between said contoured surface and tape to perform the ironing operation.

In another aspect of the invention, the rolls supporting the tape may be forced in a direction to cause the tape to bear against the contoured hot chest surface by fluid operated means and in such fashion that, beginning with the padded roll adjacent the lefthand end or the entrance to the ironer (FIG. 2), the rolls are forced into contact with the contoured surface of their corresponding modules with progressively less force so as to provide a greater effective radius of each succeeding roll (from the inlet to the outlet, or righthand end, FIG. 2, of the ironer) to effect a drawing of the flatwork through the ironer from the entrance end thereof.

In still another aspect of the invention, the fluid operated means may be capable of raising the padded rolls, together with the tape, away from the contoured surface so as to prevent overheating and scorching of the tape and padded rolls when laundry is not being fed through the ironer.

In a still further aspect of the invention, the main drive to the ironer may be adjusted to vary the rate at which the laundry is ironed, and it may also be of modular construction to accommodate the modular construction of the frame means.

In another aspect of the invention, the fluid operated means to raise the rolls may be assisted by a spring which by itself is capable of raising the rolls away from the heated contoured surface sufficiently to prevent overheating and scorching of the padded rolls should the source of fluid power become lost during operation.

In still another aspect of the invention, the rolls of the ironer are provided with sealed joint means for evacuating the steam formed during the ironing operation.

The above, other objects and novel features of the invention will become apparent from the following description and accompanying drawings which are merely exemplary.

In the drawings:

FIG. 1 is a perspective view of a plurality of modular frame members for a laundry ironer to which the principles of the invention have been applied;

FIG. 2 is an elevational view of an ironer made up of a plurality of frame modules of FIG. 1;

FIG. 3 is a view similar to FIG. 2, showing the driving means for the ironer rolls;

FIG. 4 is a diagram of the fluid circuit for the apparatus of FIGS. 1 and 2; and

FIG. 5 is a detail of the invention.

Referring to the drawings, and particularly to FIGS. 1 and 2, the principles of the invention are shown as applied to an ironer made up of a plurality of frame modules **10**, each comprising end walls **11** and **12** between which a hot chest **13** extends and which latter is freely supported on angle members fixed to walls **11** and **12**. This construction allows relative movement so that the chest can align itself to its roll and can also move when expanding and contracting under changes in temperature.

The end walls **11**, **12** may include a plate **14** at each edge of which an angle member **15** may be attached, said member **15** including holes **16** therethrough so that adjacent modules can be connected together by bolts or the like.

The hot chests 13 may be of a hollow construction including a contoured upper surface 17 having a concave portion of a radius to be described later, and convex curved portions 18 extending from said concave portion that mate with corresponding hot chest convex portions of adjacent hot chests 13 in adjacent modules 10.

The side plates 14 may include aligned cut-out portions 19 adapted to receive bearing blocks 20 (FIG. 2) that are mounted for vertical sliding movement along ways 21 fixed to plates 14 on each side of the cut-out portions 19. The bearings 20 in the aligned cut-out portions 19 of each module 10 journal hollow shafts 22 that extend from each end of an ironing roll 23 for each hot chest, which roll when wrapped with suitable padding has a radius that mates with the radius of the concave portions 17 of the corresponding hot chest 13.

Each roll may include a link 24 (only one end of each roll 23 is disclosed) that is connected to its bearing 20 and is pivoted to an arm 25, the one end 26 of the latter being pivoted on the end member 14 by a pivot pin 26. The opposite end of arm 25 is connected by a pin 27 to a vertically disposed rod 28, the upper end of which is threaded to receive a nut and washer 29. The washer rests on the top of a spring 30, the bottom of which spring is supported by a bracket 31 fixed to the angle member 15. Bracket 31 includes a hole through which rod 28 extends. The construction is such as to provide an auxiliary lifting force on arm 25 to lift the rolls away from their hot chests in the event the fluid pressure source fails during operation of the ironer or whenever the chests are hot and the rolls are in their lowered position. The force available for this action is adjustable through the nut and washer 29. The construction also provides a shock-absorbing action for the roll 23 as it is moved into the concavity 17 of the hot chest 13.

In order to raise each roll 23 away from its hot chest 13 during periods when ironing is not occurring to prevent scorching of the padding on the roll 23, a piston rod 32 may be pivotally connected to the arm 25 between link 24 and pin 27. The piston rod 32 may be connected to a piston 33 that is adapted to be reciprocated within a cylinder 34 attached to the end plate 14. Lines 35 and 36 connected to opposite ends of cylinder 34 supply and exhaust fluid under pressure to control the reciprocation of piston 33. From the foregoing it is evident that admission of pressure fluid to line 35 while exhausting line 36 will raise roll 23 away from contact with concave surface 17 of the hot chest; and upon exhausting line 35 and supplying line 36 with pressure fluid, roll 23 will descend into concavity 17 against the snubbing action of spring 30. There is, of course, an identical linkage and piston arrangement on the opposite end of each roll 23.

An endless belt 37 or a plurality of endless narrow tapes spaced axially along the rolls 23 are provided such that they lie between the rolls 23 and the hot chests 13 along the lower flight thereof, and in spaced relation from said rolls on the upper flight thereof during an ironing operation. To this end, the belt or tapes 37 pass over idler rolls 38, 39 and 40. A belt or ribbon tightener 42 may comprise a plurality of axially spaced, pivotally mounted, channel-shaped arms 43 on a shaft 44. Each arm may include a curved lip 45 at the free end thereof. There is a tightener 42 for each tape, and the construction is such that the corresponding tape passes from idler roll 38 beneath the curved lip 45, thence upwardly between the legs of the channel-shaped arm 43, thence over the shaft 44, thence to idler roll 39, etc. When the rolls 23 are in their lower working positions, the arms 43 are in an elevated, solid line position, and when the rolls 23 are raised, the arms 43 are in the dotted line position, taking up the slack in the tapes as the rolls move upwardly away from the concave surface 17 of the hot chests 13.

Referring to FIGS. 2 and 3, there is provided a framework 46 that is different from the modules 10 in that it

forms the entrance to the ironer for starting and handling the ironed work to be passed through the ironer. The framework 46 includes aligned bearings 47 for journaling a shaft 48 for a purpose to be described later.

Referring to FIG. 3, the shaft 48 extends through both side walls of the framework 46 and supports a sprocket 48A on the outside of the far wall thereof. A chain 48B connects sprocket 48A to a sprocket 48C on a shaft 48D. Another sprocket 48E fixed to shaft 48D drives a chain 48F that passes around sprockets 48G, 48H and 48J. The sprocket 48J is fixed to a shaft 48K (see also FIG. 2).

A roll 48L is fixed to shaft 48K, and an endless belt or tape arrangement 49 extends around roll 48L and a roll 49A that is located adjacent the convex portion 18 of the first module 11. This arrangement provides a conveyor 49 for feeding flatwork to the hot chests of the ironer, which conveyor 49 is driven by the shaft 48 in the framework 46.

The endless belt or tape arrangement 49 is employed to feed articles into the entrance of the ironer. A trough-like holder 50 is provided for holding unironed articles prior to an operator feeding them along belt 49 to the inlet of the ironer.

Referring to FIG. 3, sprockets 51, 52, 53 and 54 are fixed to shaft 48 and to one of the trunnions 22 of each of the rolls 23 in the three modules 10. An endless sprocket chain 55 connects all four sprockets together and extends over a tightener sprocket 56, a drive sprocket 57. and thence back to sprocket 51. Shaft 48 and bearings 47 take the double tension load of the chain 55 to prevent uneven loading of the roll 23 nearest it. Shaft 48 also transfers power to the opposite side of the ironer and drives belt arrangement 49 as previously described. The tightening sprocket 56 is mounted on an arm 58 pivoted to end wall 11 of the central module 10 by a pin 59. A pivoted rod 60 extends through an eye of an element 61 that slides in a slot 62 in arm 58. Rod 60 supports a spring 63 between element 61 and an adjustable nut 64 threaded onto rod 60. The arrangement is such that when the rolls 23 are raised, chain 55 remains in driving relation with all of the sprockets by virtue of arm 58 pivoting counterclockwise.

Drive sprocket 57 is fixed to a shaft 65 to which another sprocket 66 is fixed. A sprocket chain 67 connects sprocket 66 to a sprocket 68 that is fixed to a shaft 69. A V-belt pulley 70, or the like, is also fixed to shaft 69 and it is connected to another puley 71 that is fixed to a shaft 72 mounted on an arm 73 having one of its ends pivoted on shaft 69.

Another V-groove pulley 74 is also connected to shaft 72 and it is belt-connected to an expansible V-groove pulley 75 geared to, or otherwise attached to, the output shaft of an electric motor 76. The construction is such that pivoting of arm 73 clockwise about shaft 69 will decrease the speed of rotation of drive sprocket 57; and movement of arm 73 in a counterclockwise direction will increase the speed of sprocket 57.

A threaded nut 77 is pivotally mounted at the free end of arm 73 and it threadingly receives a threaded rod 78 which is fixed against axial movement but permitted to rotate in a journal 79. A coupling 80 connects rod 78 to the output shaft of a reversible electric motor 81 mounted on an end plate of the frame 46. Accordingly, energizing motor 81 to cause it to rotate in a forward or reverse direction will vary the speed of chain 55 and hence the speed of rotation of the ironing rolls 23.

Referring to FIG. 5, each roll 23 is made up of a perforated peripheral element 82 and imperforate end wall discs 83, 84. Padding 85 is wound about the outer peripheral surface of roll 23 and when properly applied, fits into the concavity 17 of its corresponding hot chest 13.

The articles that are ironed contain a preferred percentage of moisture, and during the ironing operation steam is formed by the rolls 23 pressing the moist article against the hot chest 13. Hollow shaft 22 includes radial holes 86

therethrough and a telescoping or other coupling means **87** connects the interior of roll **23** to an exhaust manifold **88**. Accordingly, the steam that is generated during ironing is continuously drawn off through manifold **88** regardless of the vertical position of roll **23**.

Referring to FIG. 4, the cylinders **34** are connected to a pump P through a valve **89** and separate pressure regulators **90**, **91** and **92**. The regulator **90** is connected through a line **93** to cylinder **34** at the entrance to the ironer or nearest to frame **46**; the regulator **91** is connected to cylinder **34** of the next farthest module **10** from frame **46**; and the regulator **92** is connected to cylinder **34** of the module **10** farthest from frame **46**. In this way, the regulators can be set so that the pressure acting to lower each roll **23** can equal but not be greater than the pressure acting on the roll or rolls **23** in modules nearer the entrance end (lefthand end, FIG. 2) of the ironer. Thus, regulator **90** could be set at 30 pounds per square inch, regulator **91** set at 25 pounds per square inch, and regulator **92** set at 20 pounds per square inch. In this way, the radius of each succeeding roll **23** from the entrance end of the ironer can be greater than the preceding one so that the peripheral speed of the rolls progressively increases, thereby causing a force to be applied to the material being ironed, thus drawing the material through the ironer toward its exit end.

Moving valve **89** to its other position causes pressure fluid to pass through lines **35**, raising all of the rolls **23** while the lines **36** are connected to exhaust.

What is claimed is:

1. In an ironing machine, a plurality of modules each having end frames aligned transversely of said ironer; a hot chest extending between the end frames of each module, said hot chest having a concave intermediate surface and convex surfaces on each side of said concave surface over which laundry flatwork is adapted to be passed to perform an ironing operation; a plurality of hollow ironing rolls, one for each module mounted above its corresponding hot chest for vertical movement from a point in contact with the concave surface; sprockets on each roll and a drive sprocket, all of said sprockets being aligned and arranged in a single plane with a chain engaging all of said sprockets; compressible material covering said rolls; evacuating means for said rolls, separate fluid operated means for raising and lowering each of said rolls; variable speed means for driving said chain; pressure regulating means for each of the fluid operated means, the inlet of pressure fluid to one of said pressure regulating means being connected to the outlet of the other, whereby the force moving said rolls into contact with said hot chest successively decreases on the said rolls from the entrance roll to the exit roll thereof and whereby the effective radius of each succeeding roll is greater than its preceding rolls and the peripheral speeds thereof progressively increase from the entrance to the exit rolls thus drawing the material being ironed therethrough; and conveyor means driven from said drive sprocket for feeding sheet material into said ironing machine.

2. In an ironing machine, a hot chest having a contoured surface including concave portions joined by convex portions; a plurality of ironing rolls mounted above said hot chest for vertical movement from a point in contact with said concave portions to a point above said convex portions; compressible material covering said rolls; separate fluid operated means for raising and lowering each of said rolls; and means for causing said fluid operated means for the roll at the exit of said ironing machine to apply less force in moving it into contact with its corresponding concave portion of said hot chest than the forces that are decreasingly applied to the preceding rolls of said ironing machine in the same direction, whereby said exit roll has a greater radius of compressible material and a greater peripheral speed than the others so as to draw flatwork under tension through said ironing machine.

3. In an ironing machine, a hot chest having a contoured surface including concave portions joined by convex portions; a plurality of ironing rolls mounted above said hot chest for vertical movement from a point in contact with said concave portions to a point above said convex portions; compressible material covering said rolls; separate fluid operated means for raising and lowering each of said rolls; and pressure regulating means for each of the fluid operated means, the inlet of pressure fluid to one of said pressure regulating means being connected to the outlet of the other, whereby the force moving the roll at the exit of said machine into contact with its corresponding concave surface of said hot chest never exceeds the forces that are decreasingly applied to the others so that said exit roll has a greater radius of compressible material and a greater peripheral speed than the others to draw flatwork under tension through said ironing machine.

4. In an ironing machine, a hot chest having a surface over which laundry flatwork is adapted to be passed to perform an ironing operation; at least two ironing rolls of hollow construction and a porous padded periphery; hollow trunnion means of said rolls journaled in reciprocable bearing block means, whereby said rolls can be moved from a point in contact with said surface of said hot chest to a point thereabove; a non-rotatable hollow fitting within which said hollow trunnion means is journaled in sealing relation; extensible tube means connecting said fitting to an exhausting means; separate fluid operated means for raising and lowering each of said rolls; pressure regulating means for each of the fluid operated means, the inlet of pressure fluid to one of said pressure regulating means being connected to the outlet of the other, whereby the force moving said rolls into contact with said hot chest successively decreases on the said rolls from the entrance roll to the exit roll thereof and whereby the effective radius of each succeeding roll is greater than its preceding rolls and the peripheral speeds thereof progressively increase from the entrance to the exit rolls thus drawing the material being ironed therethrough, and variable speed means for driving said rolls.

5. In an ironing machine, a hot chest having a surface over which laundry flatwork is adapted to be passed to perform an ironing operation; at least two ironing rolls having compressible covering and mounted above said hot chest for vertical movement from a point in contact with said surface of said hot chest to a point above said surface; separate fluid operated means for raising and lowering each of said rolls; resilient means adapted to be adjusted to maintain said rolls out of contact with said hot chest, whereby upon failure of said fluid operated means, said rolls will not lie in contact with said hot chest; pressure regulating means for each of the fluid operated means, the inlet of pressure fluid to one of said pressure regulating means being connected to the outlet of the other, whereby the force moving said rolls into contact with said hot chest successively decreases on the said rolls from the entrance roll to the exit roll thereof and whereby the effective radius of each succeeding roll is greater than its preceding rolls and the peripheral speeds thereof progressively increase from the entrance to the exit rolls thus drawing the material being ironed therethrough, and variable speed means for rotating said rolls.

6. In an ironing machine having a plurality of rolls adjustably mounted above a hot chest, compressible material covering said rolls, fluid means associated with each of said rolls for selectively, successively, and positively controlling the pressure thereto, characterized by the fact that the force acting to move the exit roll into contact with said hot chest is less than the force acting to move the preceding roll into contact with said hot chest, whereby the effective radius of each succeeding roll is greater than its preceding rolls and the peripheral speeds thereof

progressively increase from the entrance to the exit rolls thus drawing the material being ironed therethrough.

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