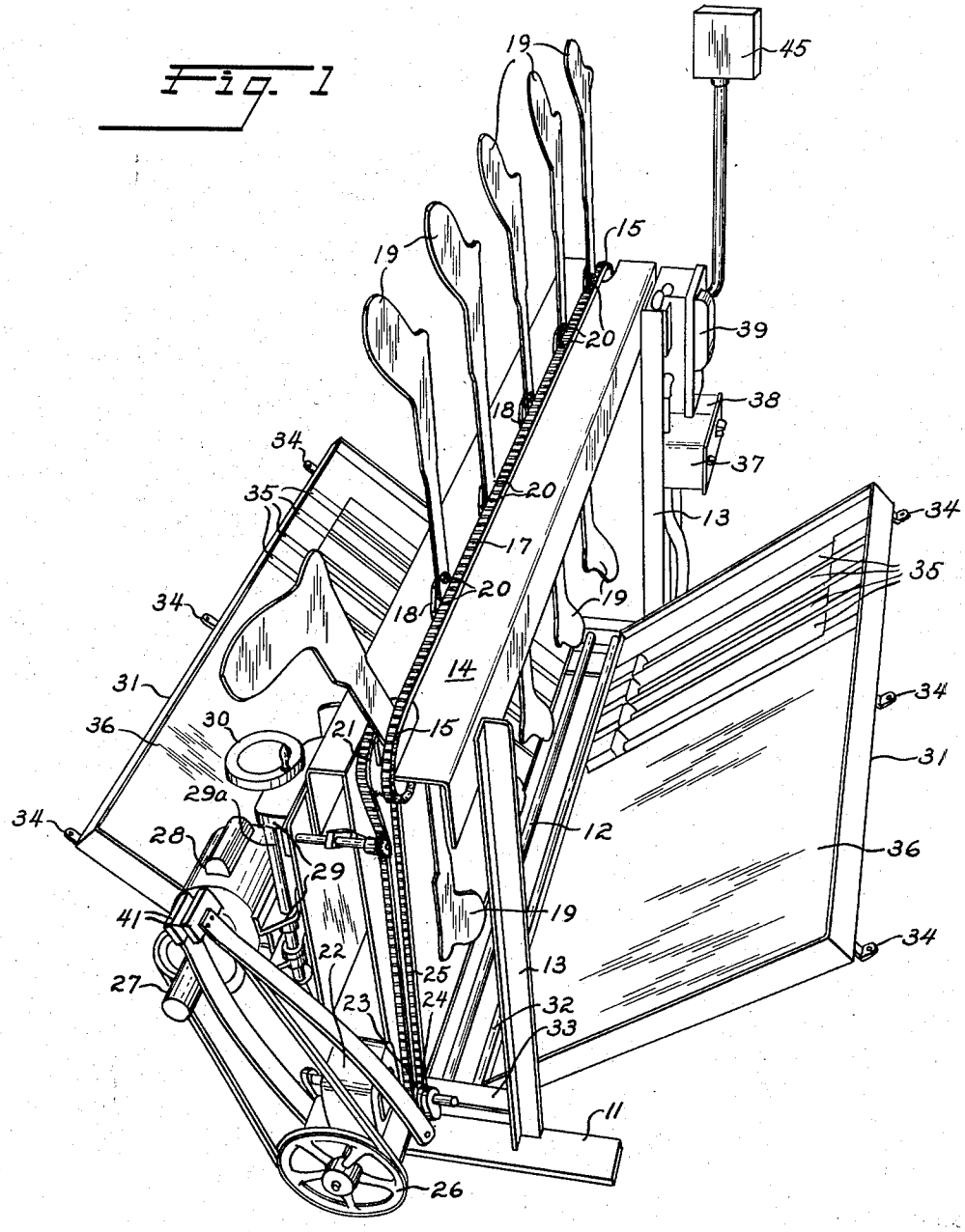
Sept. 4, 1956 J. C. BERRY 2,761,221

STOCKING TREATING MACHINE

Filed Dec. 20, 1954 2 Sheets-Sheet 1

Fig. 1



INVENTOR

JOHN C. BERRY

BY Jones & Young

AGENTS

Sept. 4, 1956 J. C. BERRY 2,761,221

STOCKING TREATING MACHINE

Filed Dec. 20, 1954 2 Sheets-Sheet 2

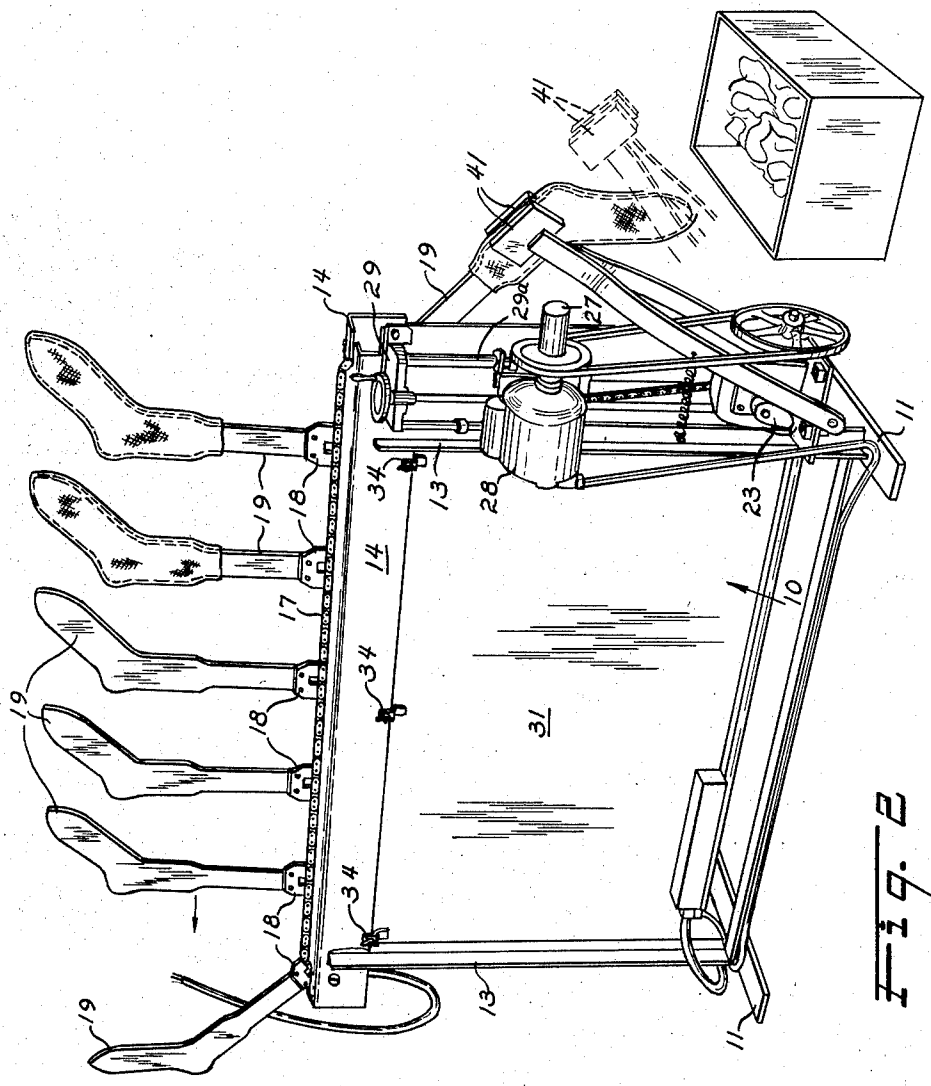


Fig. 2

INVENTOR

JOHN C. BERRY

BY Jones & Young

AGENTS

United States Patent Office

2,761,221

Patented Sept. 4, 1956

2,761,221

STOCKING TREATING MACHINE

John C. Berry, Durham, N. C., assignor to Process Machinery Company, Inc., Durham, N. C., a corporation of North Carolina

Application December 20, 1954, Serial No. 476,399

3 Claims. (Cl. 34—103)

The present invention relates to a machine for conditioning shaped, textile articles, and more particularly to a machine for conditioning stockings and like knitted articles made from synthetic thermoplastic yarn as a final treatment thereto.

Knitted wearing apparel made from synthetic yarn, such as stockings or the like, must be given some form of treatment at an elevated temperature on the order of 200–275° F. to set the stitch of the article. Heretofore, this treatment has taken place in two stages on a single machine, or on two separate machines. The first stage of treatment heretofore has consisted of a "pre-boarding" operation in which the stocking is subjected to heat and steam to plasticize the same. The second stage of treatment consists of a "final boarding" operation in which the stockings in a moist or damp condition are subjected to a drying operation while in a shaped state.

The machines principally employed commercially today to effect the desired treatment to the stockings consists of an endless conveyor track mounted for movement in a horizontal plane. A plurality of flat forms having the general configuration of a foot and leg are mounted on the track at spaced intervals thereon, and in vertical, upright relationship therewith. The machine is provided with a large heat chamber through which the endless conveyor passes. The heat chamber includes hot water sprayers, live steam generators, blowers, and heaters. The function of the heat chamber is to supply a zone of heat and moisture to wet and heat the stockings. Generally, in order to provide the necessary high heat, the live steam is under pressure.

If both operations are to be accomplished on a single machine, a drying compartment is provided through which the endless conveyor will pass. The drying operation is usually accomplished by means of gas heat and a blower. If the drying operation is performed on a separate machine, the machine generally consists of a drying compartment through which a conveyor passes.

The operation of the machine just described is believed apparent. The operator places and positions the stockings on the slowly moving upright forms as they pass a fixed station. The forms carrying the stockings then pass into the heat compartment where the stockings are sprayed with hot water to saturate them. The stockings then pass into a live steam zone in which the steam is under pressure and is circulated by a blower. An auxiliary gas heater may be used to increase the temperature of the zone to insure the stockings reaching a plasticizing temperature. The stockings in a damp state then pass into the drying zone where they are dried by means of gas heat. The conveyor then carries the stockings back to the initial station where they are withdrawn from the form and replaced by untreated stockings.

These prior steam boarding or conditioning machines have many features which are not considered to be desirable. The machines are extremely large and cumbersome, and a considerable amount of floor space is required for their installation and operation. Moreover, the machines are rather complicated in their design and operation, and necessitate the installation of gas lines and auxiliary equipment, such as, for example, pressure boilers and the like. Further, the initial expenditure in the purchase of machines of this character and their installation is extremely burdensome on small hosiery manufacturers.

The machines are quite noisy and produce a great amount of excess heat, thus requiring their installation and operation in a separate room away from other phases of hosiery finishing. The excess heat generated by the machines are not conducive to desirable working conditions for mill personnel, particularly during the summer months. The boards which constitute the forms for the stockings are quite heavy, which makes it necessary, as a general rule, to permit only men to operate the machines. Further, these prior machines have a great number of boards mounted on the conveyor, thus requiring a lengthy shutdown period when boards of one size are taken off to be replaced by boards of a different size. Further, the size and mode of operation of the machine result in a low degree of production of finishing stockings. This is occasioned by the fact that each stocking must be subjected to the heat zone for several minutes in order for the fabric to reach a plasticizing temperature. Further, such operation makes it mandatory for the manual withdrawing of the stockings from the forms by the operator. Moreover, such a mode of operation does not permit the attainment of close temperature control at high levels.

In the elimination of the foregoing related disadvantages, it is a principal object of the present invention to provide a machine for conditioning shaped articles that is extremely simple in design and construction and requires no auxiliary equipment.

Another object of the present invention is the provision of a stocking conditioning machine that will increase the rate of production many fold over machines heretofore employed commercially.

Still another object of the present invention is the provision of a stocking conditioning machine that is extremely quiet in operation and imparts virtually no heat to the surrounding area.

A still further object of the present invention is the provision of a stocking conditioning machine that is of such design and operation that a continuous dry heat zone is established in which the stockings reach a plasticizing temperature in a matter of seconds.

Another object of the present invention is the provision of a stocking conditioning machine that provides a high degree of control with regulated zones of temperature.

Still another object of the present invention is the provision of a stocking conditioning machine that can be fully operated by women with no discomfort to them whatsoever.

Yet another object of the present invention is the provision of a stocking conditioning machine that can be disassembled very quickly for cleaning and repair.

Another object of the present invention is the provision of a stocking conditioning machine in which the stocking carrying forms are few in number and can be detached instantly in the event different size forms are used.

Still another object of the present invention is the provision of a stocking conditioning machine that performs all necessary conditioning treatments during a single operation without requiring steam or water.

A further object of the present invention is the provision of a stocking package machine in which the stockings are automatically withdrawn from the machine.

Other and additional object will become manifest from the ensuing description taken in conjunction with the accompanying drawings.

Broadly stated, the knitted textile article conditioning machine made in accordance with the present invention

comprises rectangular open-ended frame means having side walls secured thereto to define a compartment having each end open, infra red heating means positioned within the defined compartment adjacent one end and on either side thereof in opposite spaced relation with one another to define a heating zone therebetween, said compartment having a non-heated zone, endless conveyor means carried by said frame means for movement in a vertical plane into and out of said compartment, a plurality of article carrying forms, each being secured at one end to said conveyor means in spaced vertical relation therewith for movement in a vertical plane, and means to drive said endless conveyor means.

To the accomplishment of the foregoing and related ends, the present invention then consists of the means hereinafter fully described and particularly poined out in the claims, the annexed drawings and the following description setting forth in detail certain means in the carrying out of the invention, such disclosed means illustrating, however, but one of various ways in which the principle of the invention may be employed.

The present invention is illustrated, by way of example in the accompanying drawings in which:

Figure 1 is a perspective view of a stocking conditioning machine made in accordance with the present invention with the sides in open condition illustrating the internal construction of the machine.

Fig. 2 is a perspective view of the stocking conditioning machine shown in Fig. 1 with the sides in locked position.

Referring now to the drawings, an illustrative embodiment of a stocking conditioning machine made in accordance with the present invention, and generally designated by reference numeral **10**, is shown.

The stocking conditioning machine **10** comprises a pair of spaced base plates **11** connected to one another by means of a pair of elonagted spaced connecting plates **12**. A pair of complementary spaced upright frame members **13** are secured to each of the base plates **11** at right angles to and in vertical upright relationship therewith. A U-shaped elongated channel support member **14** is secured at its respective four corners to the upper free end of each of the upright frame members **13** carried by the base plates **11**. This construction just described defines the basic support frame means of the stocking conditioning machine **10**. In general appearance, the frame means are of rectangular configuration, being relatively narrow in width and elongated in length. The height of the machine must be such that a stocking form can be moved lengthwise of the machine between the base plate **11** and the undersurface of the channel support member **14**, the necessity for which being discussed more fully hereinafter.

The respective free ends of each of the channel support members **14** are each provided with a cut-out area in which a sprocket wheel **15** is journaled in each for rotation in a vertical plane. Endless conveyor means **17** are mounted in driving relationship with and carried by the sprocket wheel **15**. This construction will result in this chain **17** moving lengthwise of the channel support member **14**, both above and below its respective surfaces. A plurality of small mounting plates **18** are secured to the conveyor means **17** at spaced intervals thereon. A plurality of flat strip, light weight stocking forms **19** having a general configuration of a foot and angle are detachably secured at their ankle end to the mounting plates **18** by means of a nut and bolt **20**. Each of the forms **19** has the foot portion disposed in angular relationship with respect to the ankle portion. The heel portion of each of the forms **19** will be inclined in the direction of the line of travel of the conveyor means **17**. The stocking forms **19** may be made from any suitable material. However, the preferred material is polished aluminum in order to provide a slick smooth surface which will tend to prevent damage to stocking carried thereon, and to also permit instantaneous insertion and withdrawal of the stockings without damage. The number of forms **19** to be mounted for movement by the endless conveyor means **17** may vary in number. However, one machine in commercial use today, and illustrated in the drawings, employs ten separate forms.

The endless conveyor means **17** may be driven by any suitable prime mover. As illustrated, this may be accomplished by mounting a driving sprocket **21** on the same shaft carrying the sprocket wheel **15**. A gear box **22** is mounted on the base plate **11**, and is provided with a shaft **23** carrying a sprocket wheel **24** in parallel spaced complementary relationship with the driving sprocket **21**. A sprocket chain **25** is mounted on the driving sprocket **21** and the gear box sprocket wheel **24**. The gear box **22** is provided with a driving wheel **26** adapted to be driven by a drive shaft **27** of a motor **28**. The motor **28** is mounted on a mounting plate **29**, which, in turn, is connected to the channel support member **14** and its adjacent upright frame member **13**. The mounting plate is provided with a plurality of guide rods **29a** on which the motor **28** is mounted. The motor has a wheel adjuster **30** for raising and lowering the motor **28** whereby the speed of the gear box **22** and the corresponding speed of rotation of the conveyor means **17** may be controlled. The motor assembly and control just described is conventional and is a standard commercially available item.

Identical side members **31** are secured to the frame means of the machine **10** on either side thereof to define in conjunction therewith an enclosed compartment having each end open to permit the longitudinal passage of the forms **17** therethrough, as will be discussed more fully hereinafter. The side members **31** are each secured along their respective bottom edges to an elongated rod **32**. Each of the elongated rods **32** are mounted at their respective free ends in pivotal relationship in a transverse bracket **33**, which, in turn, is connected to and spans the bottom ends of each pair of upright frame members **13** at each end of the machine **10**. The side members **31** are secured along their respective top edges to the opposite side edges of the channel support member **14** by means of nuts and bolts **34**. When in locked position, the side members **31** define, as hereinbefore indicated, a compartment or tunnel having each end open so that when the stocking forms **19** are moved by the endless chain **17**, they will pass longiudtinally between the side members **31**.

Each of the side members **31** are provided with a bank of infra red heaters **35** adjacent or at one end thereof. The remaining inner portion of each side member **31** is insulated and provided with a polished aluminum surface **36**. The thickness of the insulated portion must be such that it will be no greater than the thickness of the bank of infra red heaters **35**. As indicated, each side member **31** is provided with four infra red heater units **35**. The number of heaters that may be used may vary, but in determining the number of heater units to employ, a sufficient reflected insulating area in each side member **31** will be necessary. That is to say, within the formed compartment there must be a heating zone and a separate reflective non-heating zone to permit the stockings to cool before emergence from the compartment. An important feature of the invention is that by using a plurality of infra red heater units **35**, it is possible to achieve zone temperature control having different temperature zones. This can be accomplished by having two opposed infra red heater units of each of the side members **31** connected together electrically with the remaining two infra red heater units of each of the side members **31** likewise being connected together. For example, the first and second heater units of each side member **31** will be connected together electrically to provide one zone of temperature. Similarly, the third and fourth infra red heater units of the side members **31** likewise will be connected together to provide a separate or different zone of temperature. The heat generated in the heat zone of the compartment by the infra red units will generally be in the range of 200° to 275° F. The preferred range

for most textile articles of the type requiring treatment, however, will be about 240° F. for the actual conditioning, such as stitch setting. Two separate and different temperature control switches **37** and **38** are provided to give the separate temperature control for the two zones in the manner just discussed. The temperature control switches **37** and **38** are connected to a switch box **39**, which is, in turn, connected to a power source **40**.

The stripping mechanism **41** will be mounted to the frame means at the discharge end of the formed treating compartment of machine **10**. The stripping mechanism will be positioned to lie in the line of travel of the forms **17**. The stripping mechanism **41** is so positioned as to have its fingers engage the surface of the stockings carried by the forms **19** on the upward movement of the forms **17**, and by a retaining action hold the stockings resulting in their withdrawal from the forms as the forms move upward. If desired, a thread clipper mechanism may be positioned on the machine to clip loose threads as the forms move by.

In the operation of the present machine, the operator stands midway of the machine **10** on one side thereof with the articles to be treated in close proximity thereto. The machine is placed in operation after the desired heating temperature of the heat zone has been achieved. The conveyor means **17** will rotate around the two sprocket wheels positioned at one end of the channel member. The forms **19** carried by the conveyor means **17** move past the operator with the heel portion of the forms forward in the direction of the line of travel. As the forms **19** continuously move past the operator, a stocking is pulled over and positioned thereon. The forms carrying the stocking are moved on by the conveyor means **17** along the top surface of the channel member **4**, and then down over and back into the formed compartment, thus reversing the direction of line of travel of the conveyor **17**. The stockings pass between the opposed infra red heat units which are the heat zone of the compartment to receive the desired heat treatment, such as stitch setting. As hereinbefore indicated, the heat zone is capable, with the present construction, of being operated at two different levels. In the usual operation, the first heat level will be lower than that of the second, although with some yarns, the reverse may be true. The contact time required for the fabric in the heat zone to effect the desired conditioning is extremely short and on the order of only a few seconds. This materially increases the rate of throughput when compared with previous machines.

The stockings then pass through the insulated non-heat zone where the fabric, as it passes through, dissipates its heat and emerges from the discharge end in a fairly cool state. The necessity for such a zone cannot be over-emphasized since all of the stockings or other articles are handled in a hot state, the articles may tend to become misshapened or stretched out of shape. The stockings, after emergence from the compartment, pass up and over and back onto the top surface of the channel member **14**. During this movement of coming back up, the stripping of the stockings from the forms by the stripping mechanism **41** will be accomplished. If no stripper is employed, the forms **19** carrying the stockings will return back to and pass the operator's station where they may be manually withdrawn. The entire operation just described is continuous with the throughput being adjusted solely to the speed, dexterity and skill of the operator in applying the stockings to the forms as they pass by.

By the term "stockings" used herein and in the appended claims, it is used to define men's, women's, and children's socks and stockings of the type known as ankle socks or half hose, as well as socks extending as far as part way up on the calf of a wearer, such as argyles. The term "stockings" is not to include ladies' full length full-fashioned sheer hosiery normally sold in full leg length as so-called "nylons." However, knee length ladies' hosiery as well as the recently-introduced ladies' stretchable multiple size hosiery can be conditioned on the present machine. Other wearing apparel capable of being conditioned on the present machine are ladies' nylon undergarments, such as panties or the like.

I claim:

1. A stocking conditioning machine comprising rectangular, open ended, upright frame means having side walls secured thereto to define a compartment having each end open, infra red heating means positioned within a portion only of the defined compartment and on either side thereof in opposite spaced relation with one another, said compartment having a non-heated area, rotatable means mounted at substantially the opposite ends of and at the top of said frame means, endless conveyor means mounted on said rotatable means for rotation in a vertical plane about the opposite ends of the top of said frame means into and out of said compartment, a plurality of stocking forms having the configuration of a foot and angle detachably connected at one end to said conveyor means in spaced vertical relationship therewith for movement in a vertical plane between said heating means and through said non-heated area in series, and means to drive said rotatable means.

2. A stocking conditioning machine in accordance with claim 1 including means to adjust said heating means to provide two separate and distinct temperature zones.

3. A stocking conditioning machine in accordance with claim 1 in which the non-heated area of said compartment is insulated and provided with a reflective surface.

References Cited in the file of this patent

UNITED STATES PATENTS

1,436,037	Heliot	Nov. 21, 1922
1,466,868	Witherell	Sept. 4, 1923
2,136,902	Griffin	Nov. 15, 1938
2,370,432	Wesely	Feb. 27, 1945
2,391,195	Ross et al.	Dec. 18, 1945
2,474,093	Collidge et al.	June 21, 1949
2,498,878	Carlson	Feb. 28, 1950
2,574,970	Heldmaier	Nov. 13, 1951
2,660,723	Delamarre	Dec. 1, 1953

FOREIGN PATENTS

1,055,794	France	Oct. 21, 1953