April 29, 1947. A. O. HURXTHAL 2,419,645

PREBOARDING MACHINE

Filed May 6, 1946

Fig. 1

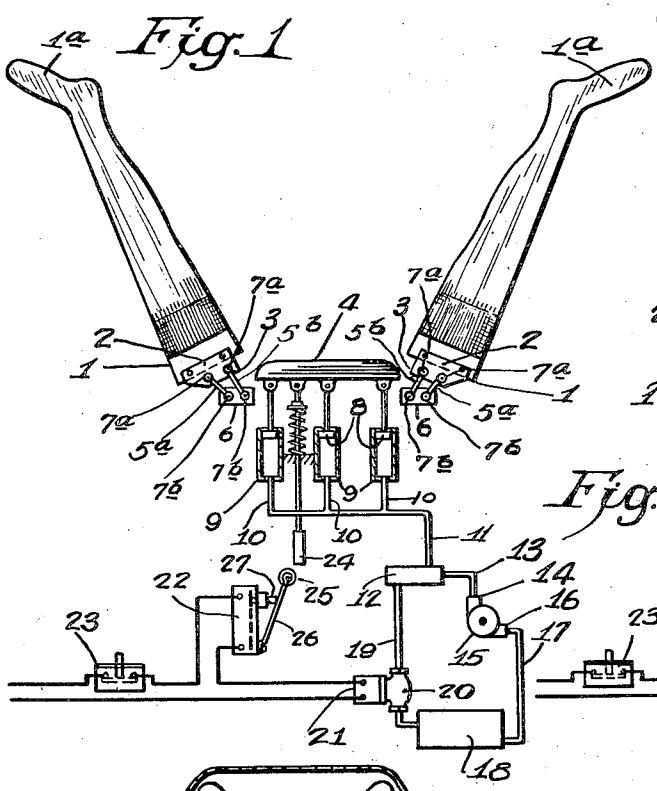


Fig. 2

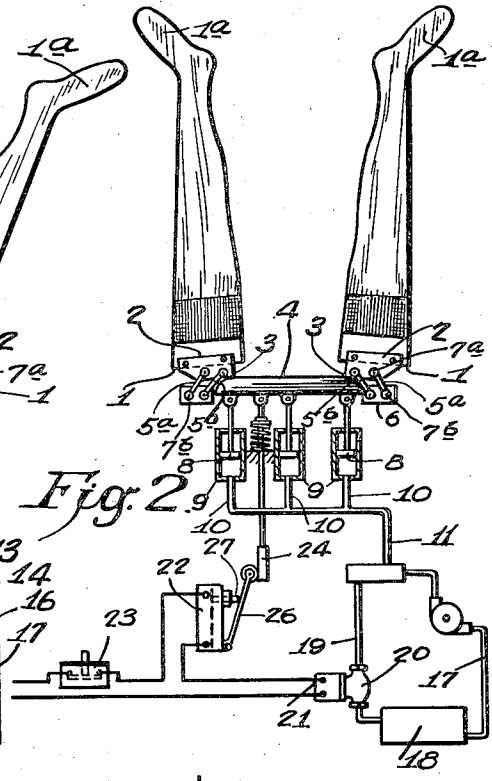


Fig. 3.

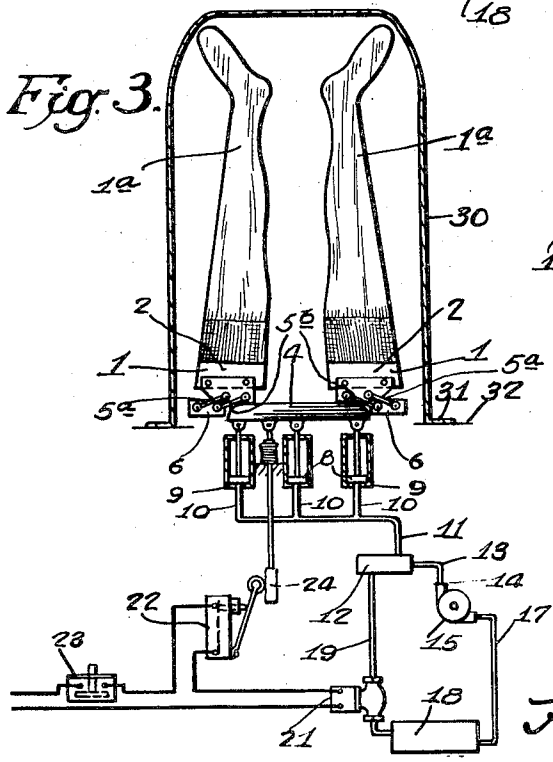


Fig. 4.

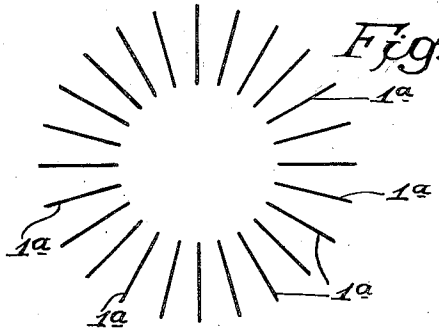
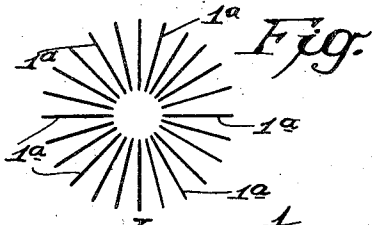


Fig. 5.



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Patented Apr. 29, 1947 2,419,645

UNITED STATES PATENT OFFICE

2,419,645

PREBOARDING MACHINE

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Application May 6, 1946, Serial No. 667,650

4 Claims. (Cl. 223—76)

1

This invention relates to what is known in the hosiery industry as a preboarding machine. These machines are commonly used in the processing of nylon stockings of both the flat knit full fashioned type and the circular knit seamless type.

Nylon stockings, after structural completion, and usually before dyeing and finishing, are initially placed on individual forms to receive a setting treatment wherein the stockings are caused to conform to and permanently acquire the shape and size of these initial forms. After the setting treatment, the stockings are stripped from the initial forms to be run through the usual hosiery finishing process which includes the placing of the stockings on other individual forms for final drying.

The present invention relates to a type of preboarding machine wherein a plurality of the initial forms are respectively arranged, for relative pivotal movement, in vertical planes radiating from a common vertical axis, whereby the initial forms with stockings thereon may be closely nested, to be enclosed by a vertical movable dome arranged with its axis coinciding with the common axis from which the vertical planes of operation of the forms radiate.

The vertically operable dome is adapted to be lowered around the nested forms until the open base surface of the dome makes contact with a horizontal surface on the base of the machine, above which the forms project. A fluid pressure seal is formed between the base surface of the dome and the base surface of the machine, after which the stockings on the forms are subjected to the setting process which includes the entrance into the dome of steam under a predetermined pressure.

After the stockings have been exposed to the setting treatment for a predetermined length of time, the pressure fluid is evacuated from the dome and the dome is raised to an extent where the open base surface of the dome assumes a plane above the upper ends of the nested forms.

The nested forms are then caused to swing outwardly, about pivot points located adjacent the lower ends of the forms or boards, in their respective radial planes, to spread the forms apart laterally with respect to each other to facilitate stripping of the treated stockings from

2

the individual forms and the placing of a new group of stockings thereon.

The radially outward swinging of the forms is effected by a common actuator in the form of an operating ring disposed concentrically with respect to the axis from which the stocking boards or forms radiate. The spreading of the stocking forms is effected by an upward axial movement of said ring.

After the individual forms have been swung outwardly, the common operating ring descends gravitationally to a maximum low horizontal plane, which the common actuator normally assumes while the stocking forms are in their widely spread position above noted.

The machine operator then strips the treated stockings from the radially spread forms and, during or after the placing of a new group of stockings on the forms, the forms are swung inwardly into their formerly occupied closed nested position. This inward swinging of the forms in their radial planes is effected manually, preferably as the machine operator completes the redressing of the forms one after another.

The forms, being supported solely by their pivots at the lower ends of the forms, are subject to lateral flexing in the upper portions thereof as the forms are swung inwardly into their nesting position. As a result of the close relationship of the heel portions of the forms, when the forms are in their nested position, it frequently happens that the stockings on some of the forms will engage and rub against the stockings on adjacently disposed forms, as the forms are being moved into their nested position.

Such contact and rubbing of the forms against each other with the stockings thereon frequently damages the stockings to an extent which requires the stockings being sold as seconds.

The object of the present invention is to provide a method and apparatus for controlling the movement of the stocking forms as they move into their final nested position, to avoid damaging of the stockings thereon by the aforesaid accidental contacting of adjacent forms as they are swung into their final nesting position.

This object is attained by moving the common actuator ring from its maximum high position, by attainment of which the stocking forms were swung outwardly in their radial planes for strip-

ping and reclothing, to a position intermediate said maximum high position and the maximum low position of said ring, as attained when the stocking forms are in their final nested position.

With the operating ring in the aforesaid intermediate position, the operator, after reclothing the individual forms, swings the forms inwardly, manually, until the base edges or butts of the forms engage the operating ring in its intermediate position.

With the common actuator ring in this intermediate position, the heels of the forms are separated laterally a sufficient distance to prevent interengagement between adjacent forms as resulting from lateral flexing or vibration of the upper parts of the forms during the inward swinging of the forms.

By the time the last of the complement of hosiery-laden forms has been swung inwardly into engagement with the common operating ring in its intermediate position, the entire complement of forms has become completely quiescent. The common operating ring is then lowered to its maximum low position, causing all the forms to simultaneously move uniformly in their individual radial planes until the maximum low position of the operating ring is attained. The upper ends of the radial forms thus move strictly in their own planes without lateral flexing or vibration and thus the stockings on the forms are prevented from making contact with the stockings on adjacent forms.

In the accompanying drawing:

Fig. 1 is a diagrammatic view, partly in section, illustrating a pair of diametrically opposite forms in their radially spread position for stripping and reclothing;

Fig. 2 is a similar diagrammatic view showing the diametrically opposite forms in an intermediate position;

Fig. 3 is a similar diagrammatic view showing the diametrically opposite forms in their final closely nested position;

Fig. 4 is a diagrammatic plan view showing the foot portions of the forms in their intermediate positions illustrated in Fig. 2; and

Fig. 5 is a similar diagrammatic plan view illustrating the foot portions of the forms in their final closely nested positions.

As shown in Figs. 1, 2 and 3, the lower base or leg portions of the forms 1, 1 are each provided with a camming plate 2 which has a lower inner edge surface or corner 3 adapted to be engaged by the vertically movable common actuator or operating ring 4. The plates 2, 2 are connected by links 5*a*, 5*b* to stationary pivot blocks 6, 6 mounted on the base of the preboarding machine.

It will be noted that the links 5*b* are relatively longer than the links 5*a*, and that the pivots 7*a*, 7*a* for the links 5*a*, 5*b* are spaced apart a greater distance on the planes 2, 2 of the forms 1, 1 than the pivots 7*b*, 7*b* for the links 5*a*, 5*b* on the stationary pivot blocks 6, 6; whereby the lower or base ends of the forms 1, 1 are bodily moved radially outward while the upper foot portions 1*a*, 1*a* of the forms swing outwardly on arcs complementary to the arcs followed by the wider spaced pivots 7*a*, 7*a* of the different length links 5*a*, 5*b* about their closer spaced pivots 7*b*, 7*b* on the pivot blocks 6.

The operating ring 4 is raised by a series of relatively spaced pistons 8, 8 respectively operating in cylinders 9, 9, the lower ends of which are connected by pipes 10, 10 to a common feed

pipe 11. The pipe 11 is connected to a control reservoir 12 and this reservoir, in turn, is connected by a pipe 13 to the discharge side 14 of a rotary fluid pump 15. The suction side 16 of the pump 15 is connected by a pipe 17 to a storage tank 18.

The operating fluid employed in the system is preferably a low viscosity liquid, such as light oil or water.

The control reservoir 12 and the storage tank 18 are connected by a pipe 19 in which is installed a magnetically operated control valve 20. The magnetic valve 20 is normally open and is adapted to be closed temporarily at predetermined times by a solenoid 21. The solenoid 21 is electrically connected in series with a mechanically operated switch 22, and a manually operable switch 23.

The switch 22 is normally open and is adapted to be temporarily closed, at predetermined times, by a cam 24 which is connected to and is adapted to travel up and down with the form actuator ring 4. The cam 24 is adapted to engage a roller 25 on the outer end of a spring lever 26 to which the movable element 27 of the switch 22 is connected.

When the forms 1, 1 are in their fully nested position as shown in Fig. 3, the dome 30 is lowered over the nested forms and the lower open end 31 of the dome is in engagement with a horizontal surface 32 on the base of the machine, with a suitable gasket (not shown) therebetween.

The means for raising and lowering the dome 30, the means for forming the pressure-tight seal between the lower end 31 of the dome 30 and the flat horizontal surface 32 of the machine, and the means for admitting the treating fluid to and exhausting it from the interior of the dome 30 have not been shown in the present instance, as these structures form no part of the present invention, but are complementary adjuncts thereto.

In operation, starting from the stripping and clothing position of the form 1, 1 as shown in Fig. 1, with the common actuator or operating ring 4 in its maximum high position after throwing the forms 1, 1 radially outward to said stripping and clothing position, the upward movement of the ring 4 is arrested by stopping the pump 15. During the upward movement of the ring 4 by the operating fluid delivered by the pump 15 to the control reservoir 12 and through the pipes 11 and 10, 10 to the lower ends of the cylinders 9, 9, the control valve 20 and the switches 22 and 23 have been closed. As soon as the cam 24 clears the roller 25 of the switch 22 said switch is automatically opened, which interrupts the flow of current to the solenoid 21 whereupon the valve 20 returns to its normal open position and permits the ring 4 to descend under its own weight.

As the ring 4 descends, the cam 24 reengages the roller 25 and closes the switch 22, whereupon the solenoid 21 is again energized and effects closing of the control valve 20. This interrupts the descent of the ring 4 and brings said ring to rest in its intermediate position.

During this time, the machine operator has been stripping the processed stockings from the forms 1, 1 and placing other stockings thereon for treatment. As the operator places a new stocking on a form, the reclothed form is manually moved by the operator from the position shown in Fig. 1 to the position shown in Fig. 2, with the inner lower edge of the plate 2 on the form 1 resting on the top surface of the ring 4.

After the last of the boards or forms 1, 1 has been reclothed and moved from the primary position shown in Fig. 1 to the intermediate position of Fig. 2, the operator manually opens the switch 23, which again deenergizes the solenoid 21 and opens the control valve 20, thereby permitting the flow of fluid from the lower ends of the cylinder 9 through the pipes 10 and 11, the control reservoir 12 and the pipe 19 into the fluid storage tank 18. The ring 4 is thereby permitted to descend under its own weight plus the weight of the boards or forms 1, 1 resting thereon.

As the ring 4 descends from its intermediate position shown in Fig. 2 to its maximum low position shown in Fig. 3, the foot portions 1a, 1a of the forms 1, 1 move radially inward from their intermediate positions shown in Fig. 4 to their fully nested positions shown in Fig. 5 with the heels of the foot portions 1a, 1a in close laterally spaced relation to each other, without making contact and without any relative rubbing action occurring therebetween.

When the boards attain their fully nested relationship shown in Figs. 3 and 5, the dome 30 is lowered around the nested forms and the seal between the lower end 31 of the dome and the horizontal surface 32 of the machine base is effected. The treating fluid is then caused to flow to the interior of the dome 30 for treatment of the stockings therein. After a predetermined period of time has elapsed, the treating fluid is exhausted from the interior of the dome 30 and said dome is raised to the height sufficient to clear the toe portions of the forms encased thereby.

When the dome 30 reaches its high position, the pump 15 is automatically started and the operating fluid is pumped from the tank 18 into the lower ends of the cylinders 9, causing the pistons 8 to be raised therein and effecting a corresponding upward movement of the operating ring 4.

The upward movement of the ring 4 moves the forms 1, 1 radially outward, through the intermediate position shown in Fig. 2 to the maximum high position of the ring 4 which causes the forms 1, 1 to move radially outward to the stripping and clothing position shown in Fig. 1. Coincidental therewith, the pump 15 is automatically stopped, bringing to an end one complete cycle of operation of the apparatus.

I claim:

1. In a stocking treating machine including a plurality of vertical stocking forms pivotally mounted at their lower ends for movement from an inner close laterally spaced relation to an outer wide laterally spaced relation in planes radiating from a common vertical axis, a common actuator movable from a maximum low elevation to a maximum high elevation along said axis for simultaneously effecting radial outward movement of said forms into said wide laterally spaced relation, said actuator being adapted to descend from said high elevation to said low elevation free of said forms gravitationally; the combination therewith of means for controlling the descent of said actuator to stop at an elevation intermediate said high and low elevations thereof for engagement by said forms when manually moved radially inward from said outer widely spaced relation to assemble said forms in an intermediate spaced relation determined by said intermediate elevation of said actuator, and means for controlling further descent of said actuator to simultaneously move said assembled forms radially inward from said intermediate spaced relation to said inner closely spaced relation.

2. In a stocking treating machine including a plurality of vertical stocking forms pivotally mounted at their lower ends for movement from an inner close laterally spaced relation to an outer wide laterally spaced relation in planes radiating from a common vertical axis, a common actuator movable from a maximum low elevation to a maximum high elevation along said axis for simultaneously effecting radial outward movement of said forms into said wide laterally spaced relation, fluid operated means for raising said actuator from said low to said high elevation, said actuator being adapted to descend from said high elevation to said low elevation free of said forms gravitationally; the combination therewith of a valve for controlling discharge of fluid from said actuator raising means and the descent of said actuator, means including an element movable concurrently with said actuator for operating said valve to stop said actuator at an elevation intermediate said high and low elevation thereof for engagement by said forms when manually moved inwardly from said outer relation to assemble said forms in an intermediate relation determined by said intermediate elevation of said actuator, and means for controlling the further descent of said actuator to simultaneously move said assembled forms inwardly from said intermediate spaced relation to said inner closely spaced relation.

3. In a stocking treating machine including a plurality of vertical stocking forms pivotally mounted at their lower ends for movement from an inner close laterally spaced relation to an outer wide laterally spaced relation in planes radiating from a common vertical axis, a common actuator movable from a maximum low elevation to a maximum high elevation along said axis for simultaneously effecting radial outward movement of said forms into said wide laterally spaced relation, fluid operated means for raising said actuator from said low to said high elevation, said actuator being adapted to descend from said high elevation to said low elevation free of said forms gravitationally; the combination therewith of a valve for controlling discharge of fluid from said actuator raising means and the descent of said actuator, means including an element movable concurrently with said actuator for operating said valve to stop said actuator at an elevation intermediate said high and low elevation thereof for engagement by said forms when manually moved inwardly from said outer relation to assemble said forms in an intermediate relation determined by said intermediate elevation of said actuator, and means for actuating said valve independently of said concurrently movable element to control further descent of said actuator into said maximum low elevation to move said forms simultaneously from said intermediate spaced relation thereof to said inner closely spaced relation thereof.

4. In a stocking treating machine including a plurality of vertical stocking forms pivotally mounted at their lower ends for movement from an inner close laterally spaced relation to an outer wide laterally spaced relation in planes radiating from a common vertical axis, a common actuator movable from a maximum low elevation to a maximum high elevation along said axis for effecting radial outward movement of said forms simultaneously, said actuator being adapted to descend from said high elevation to said low elevation gravitationally; the combination therewith of an electric circuit including a magnetic valve, a switch, and a cam element movable con-

currently with said actuator for operating said switch to close said valve for controlling the descent of said actuator to stop at an elevation intermediate said high and low elevations thereof for engagement by said forms when manually moved radially inward from said outer widely spaced relation to an intermediate spaced relation determined by said intermediate elevation of said actuator, and a manually operable switch in said circuit for opening said valve to control further descent of said actuator to move said forms radially inward from said intermediate

spaced relation to said inner closely spaced relation simultaneously.

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