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(54) **AUTOMATIC ANGLE ADJUSTING SLEEVE GRIPPERS FOR A GARMENT PRESS**

(71) Applicant: **Forenta, LP**, Morristown, TN (US)

(72) Inventor: **David G. Crockett**, Morristown, TN (US)

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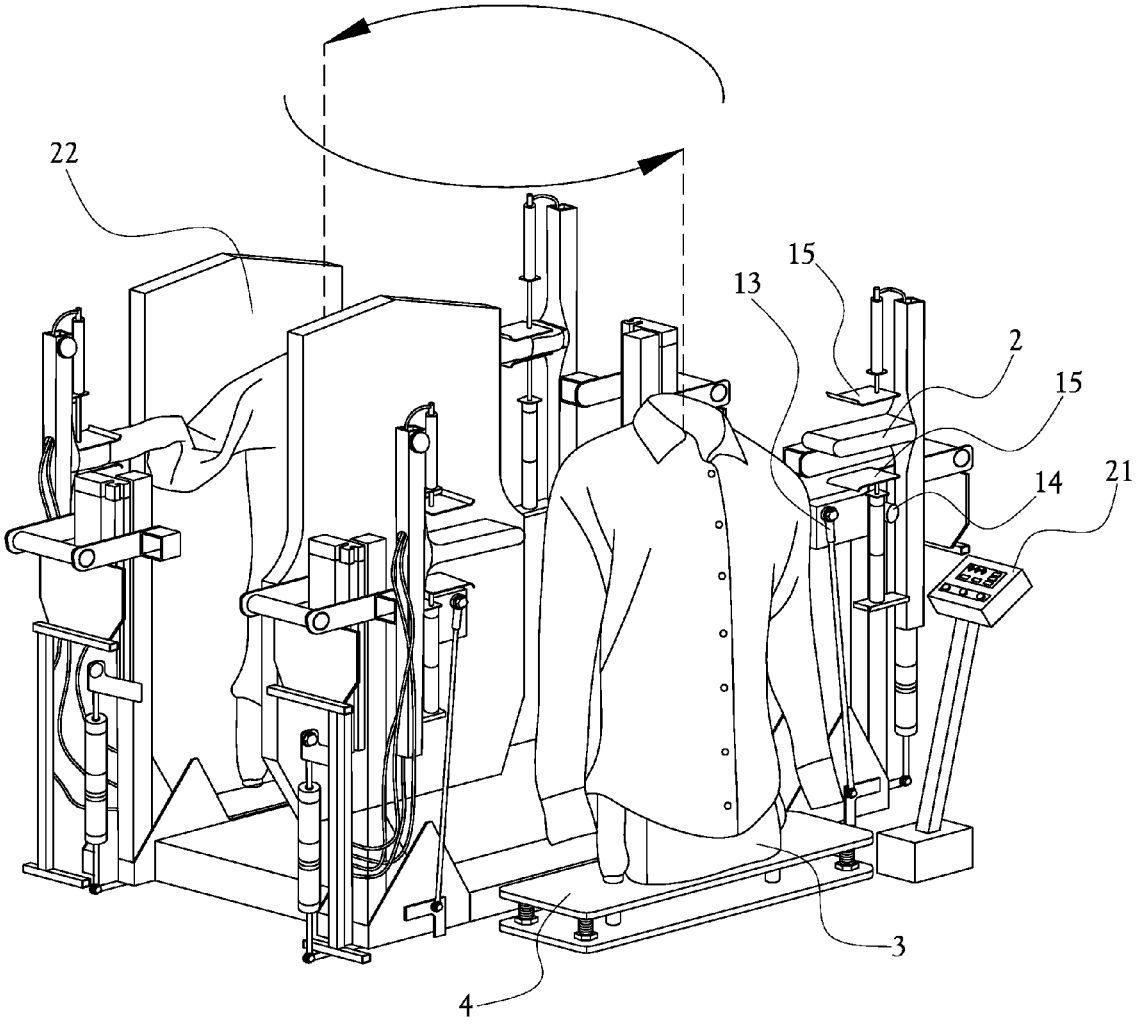
(57) **ABSTRACT**

A shirt or garment finishing machine with a mannequin or buck for holding the body of the garment or shirt with sleeve holders or grippers mounted on pivoting arms on each side of said mannequin or buck to hold the open end of the sleeve. The pivoting arms with sleeve holders/grippers pivot laterally to support various lengths of sleeves and provide tension to remove wrinkles. The sleeve holders/grippers move vertically on the pivoting arm to support sleeves that are attached to the garment body at a various angles. During either or both of these motions, the sleeve holder/gripper automatically adjusts its angle relative to the garment body to provide even sleeve tension.



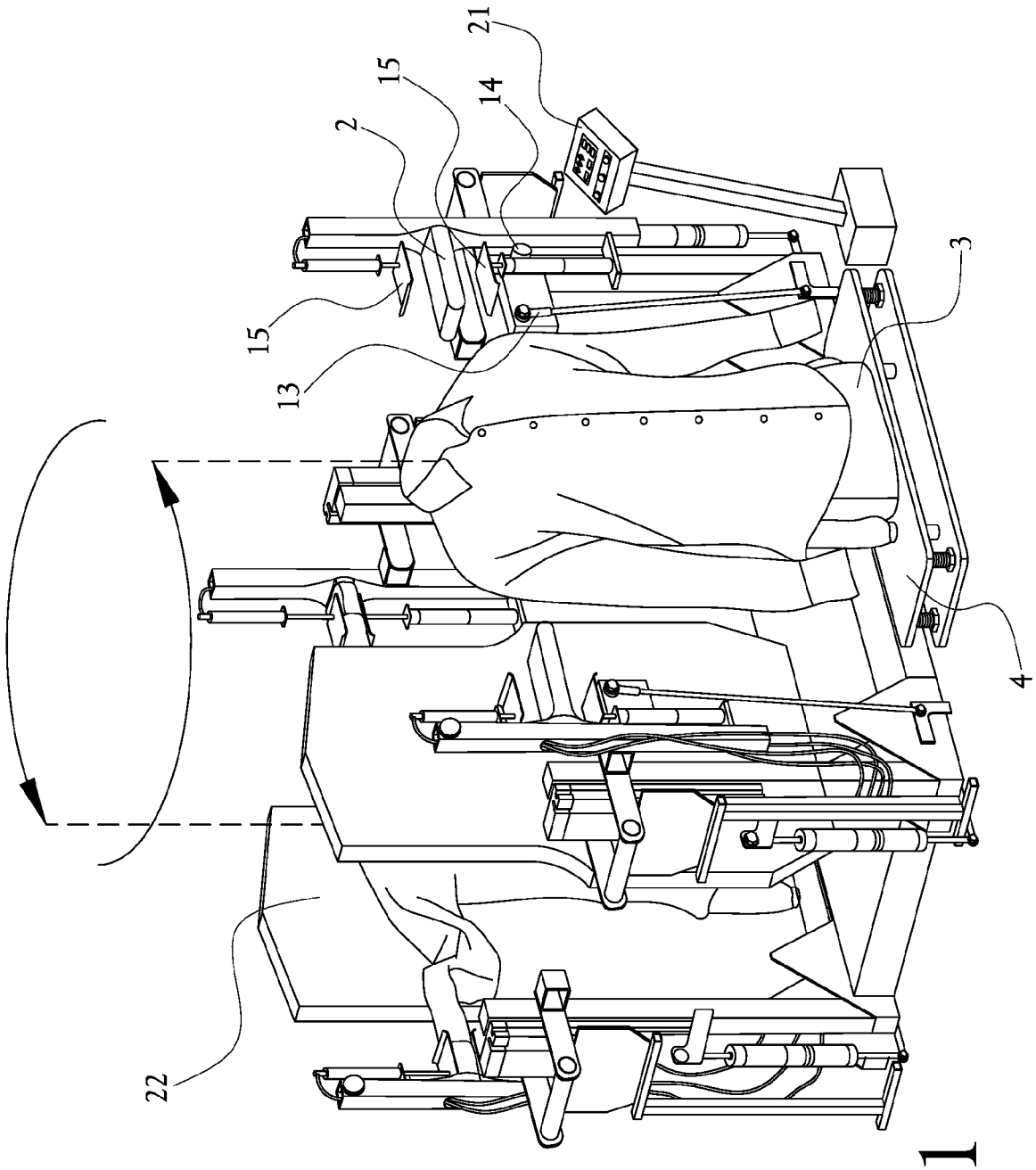


Fig. 1

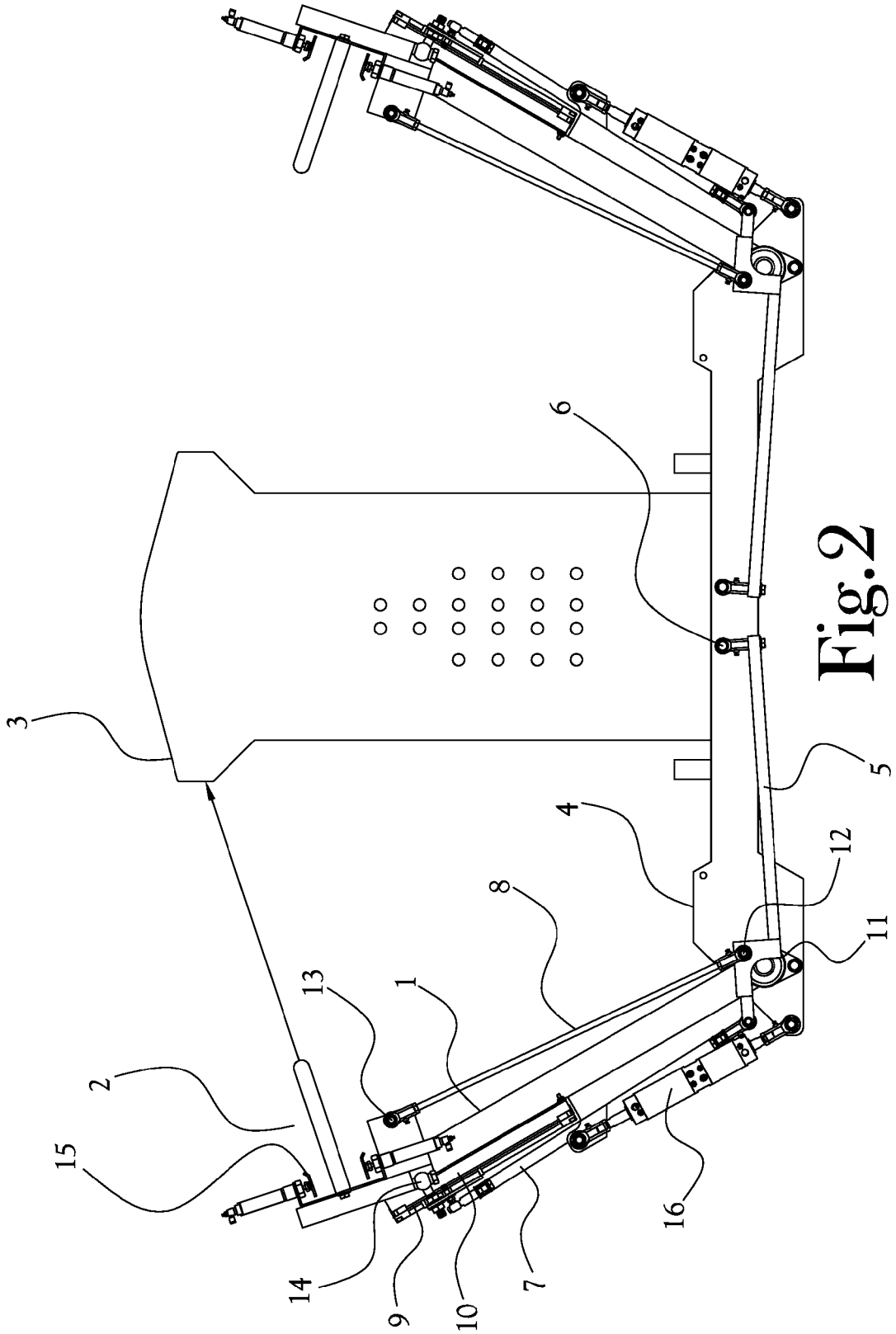


Fig.2

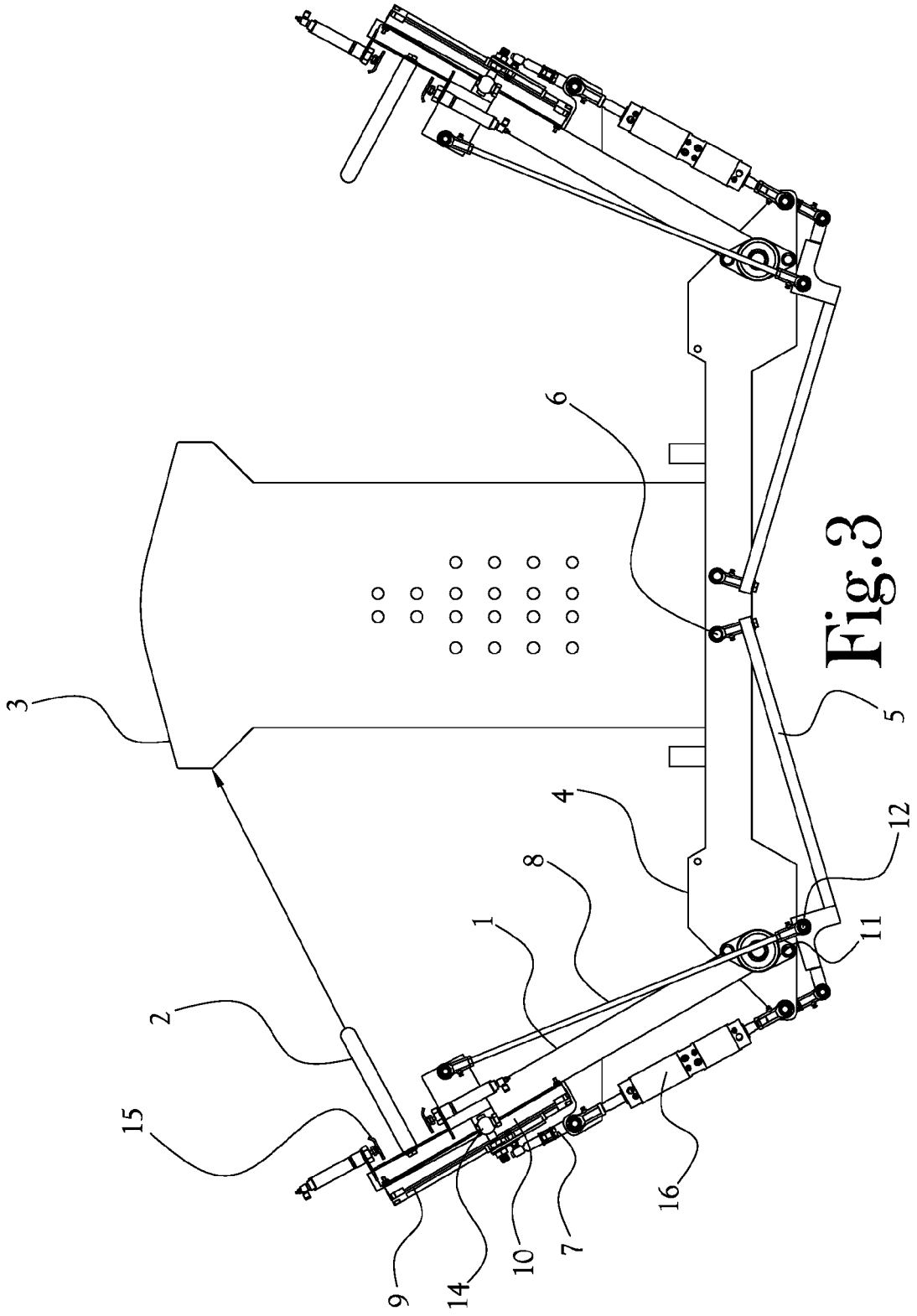


Fig.3

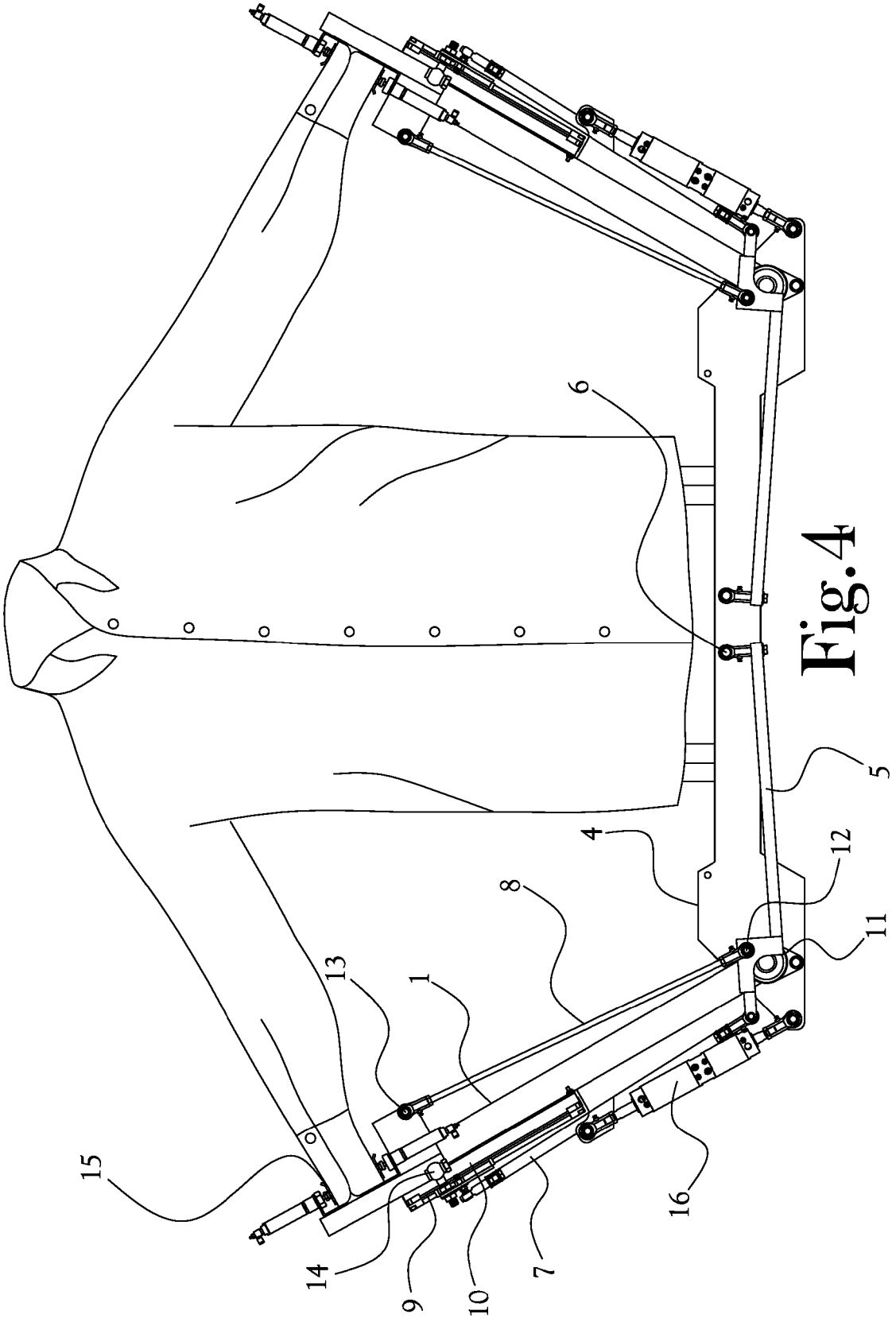


Fig.4

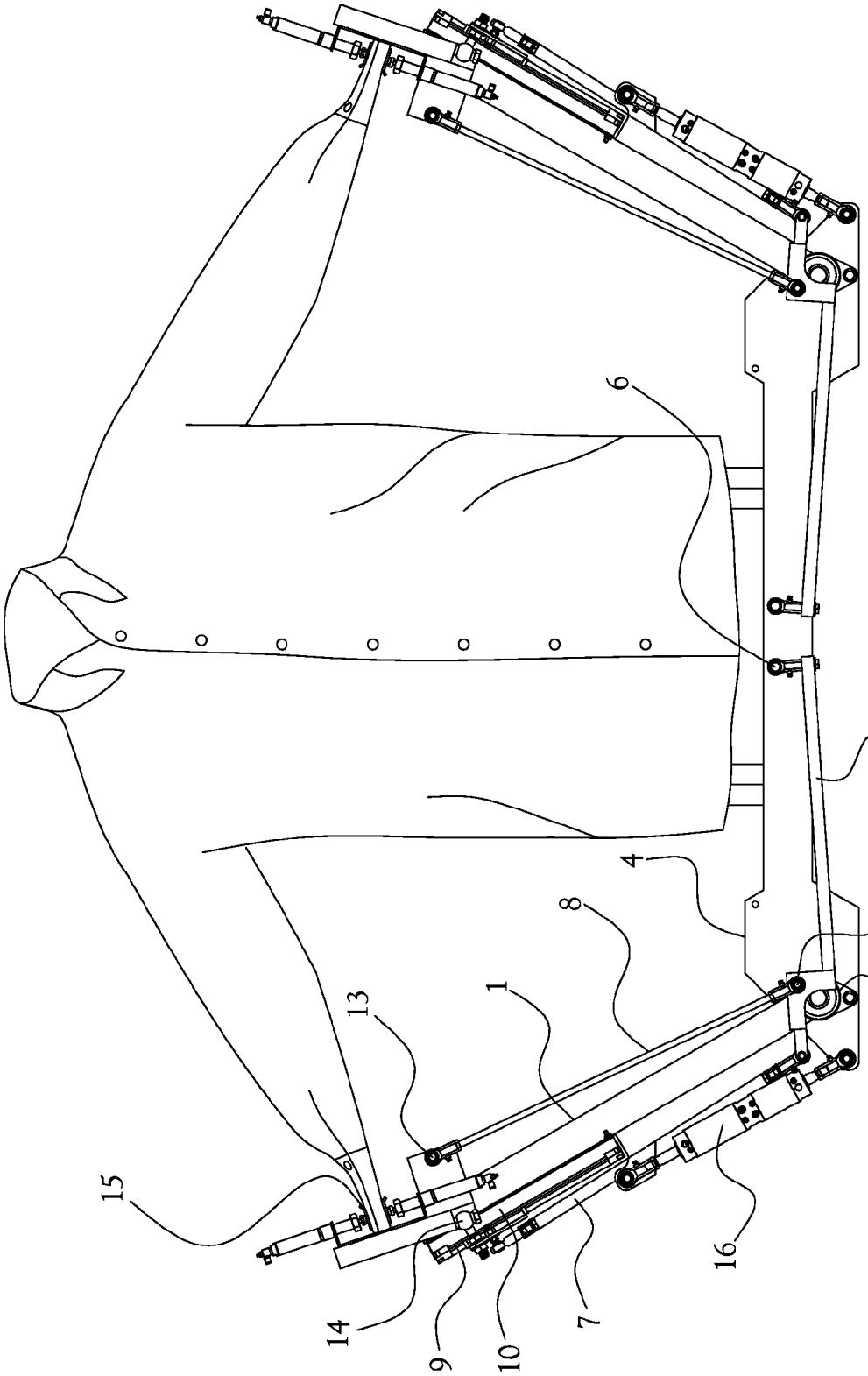


Fig.5

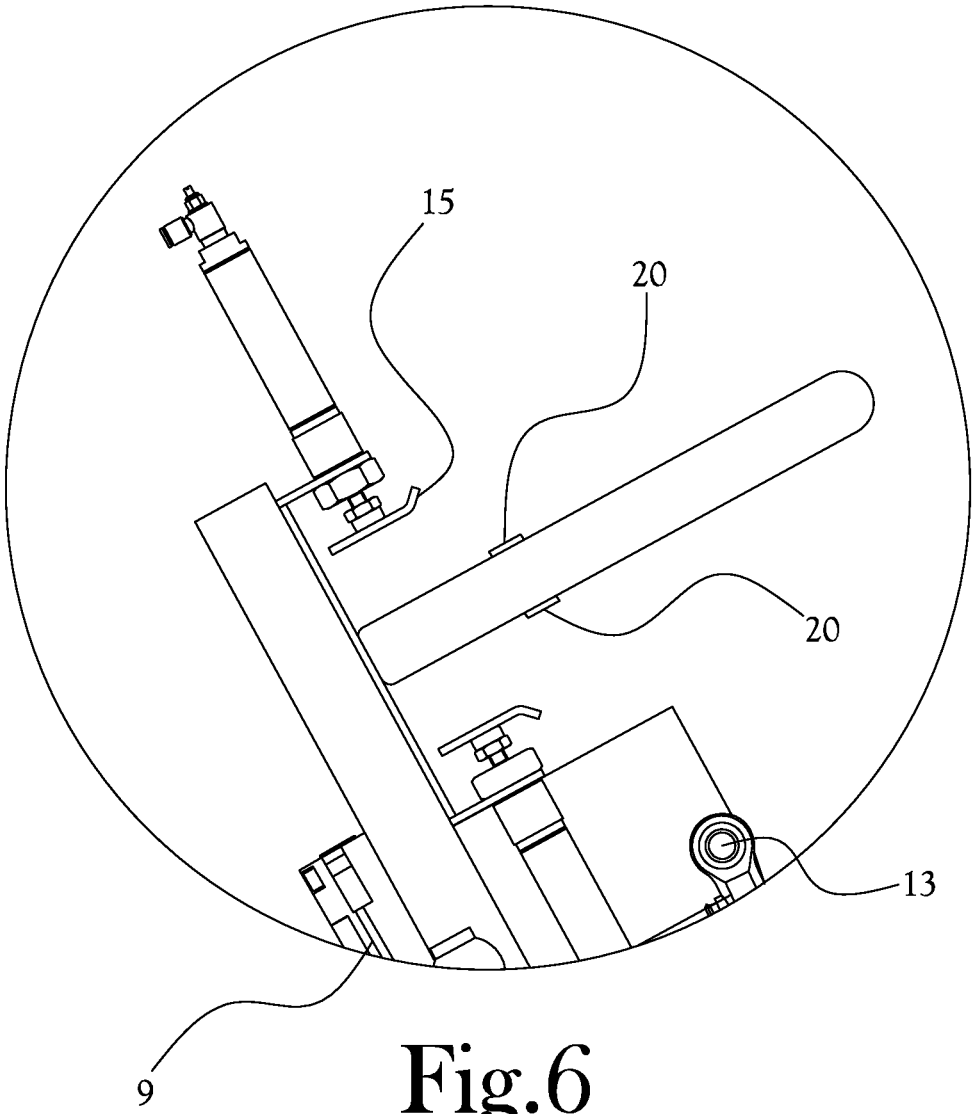


Fig.6

AUTOMATIC ANGLE ADJUSTING SLEEVE GRIPPERS FOR A GARMENT PRESS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims benefit of U.S. Provisional Application No. 62/362,843, filed on Jul. 15, 2016.

FIELD OF THE INVENTION

[0002] The present general inventive concept relates to the field of garment or shirt finishing machines, and more particularly a shirt finishing machine with a mannequin or buck used to support the garment during the removal of wrinkles.

BACKGROUND

[0003] Shirt pressing machines are known in the industry and generally comprise a shirt supporting body, or buck, which is movable on a track or turntable between a dressing station and a pressing station, where the front and back of the shirt is contacted by heated pressing plates for the purpose of removing wrinkles and, at the same time, drying the shirt.

[0004] Some types of prior art shirt finishing machines comprise a buck to hold the garment, a pair of right and left supporting arms arranged at each side of the buck with sleeve holders to support and provide tension for the sleeves. Tension on the sleeves is provided by rotating the supporting arms from a fixed point on the frame of the device. Pressing heads or irons may or may not be provided to remove wrinkles near the open end of the sleeve. Steam and hot air are typically injected into the sleeve while the sleeve is supported and in tension to remove wrinkles.

[0005] This type of prior art finishing machine sometimes has a problem removing wrinkles from the sleeve because the sleeve holder does not adjust vertically. Garment sleeves are attached to the garment body at various angles and the sleeve holder applies tension at only one fixed angle that may not provide the same tension on both the top and bottom surface of the sleeve.

[0006] Embodiments of the present general inventive concept can provide a garment finishing machine that prevents forming sleeve wrinkles due to uneven sleeve tension caused by various sleeve lengths and angles.

BRIEF SUMMARY OF THE INVENTION

[0007] Embodiments of the present general inventive concept provide a garment finishing machine that removes wrinkles from the body and sleeves of the garment or shirt.

[0008] Example embodiments of the present general inventive concept can be achieved by providing a garment finishing machine comprising a mannequin to hold the body of the garment, a pair of pivoting arms located on either side of the mannequin to support and tension the sleeves of the garment, a stable frame on which the mannequin rests, sleeve holders on each of said pivoting arms to hold each sleeve in position during the finishing process, pivot points on the frame, pivoting arms, and sleeve holders to allow for rotation around a pivot point, and a slider attached to the sleeve holders to allow for vertical motion of the sleeve holders during the finishing process, wherein a movement of the finishing arms around its pivot point on the frame of the garment finishing machine provides tension to the sleeves of the garment by increasing the distance between the garment and the position of the sleeve holder, wherein the movement of the slider causes a proportional movement of the pivot arms and causes the sleeve holder to rotate on its axis, and wherein the motion of the sleeve holder is automatic in response to the movement of the slider and creates an even tension on the top and bottom portions of a sleeve attached at the sleeve holder.

[0009] The present invention also provides a garment finishing machine with uniform tension of the upper and lower surfaces of the sleeve for various sleeve lengths.

[0010] The present invention also provides a garment finishing machine with uniform tension of the upper and lower surfaces of the sleeve for various sleeve angles.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] Example embodiments of the present general inventive concept will become more clearly understood from the following detailed description of the present general inventive concept read together with the drawings in which:

[0012] FIG. **1** is a perspective view of a garment finishing machine system and a pair of garments each resting on garment finishing machine bucks, according to an example embodiment of the present general inventive concept.

[0013] FIG. **2** is a front elevation view of a garment finishing machine buck, pivoting arms, actuators and sleeve holder in a raised position at two distinct arm tilt positions, according to an example embodiment of the present general inventive concept.

[0014] FIG. **3** is a front elevation view of a garment finishing machine buck shown with attached garment, pivoting arms, actuators, and sleeve holders in the lowered position at two distinct arm tilt positions, according to an example embodiment of the present general inventive concept.

[0015] FIG. **4** is a front elevation view of a garment finishing machine buck with attached garment showing cuffs in an unclamped position, according to an example embodiment of the present general inventive concept.

[0016] FIG. **5** is a front elevation view of the garment finishing machine buck with attached garment showing cuffs in a clamped position, according to an example embodiment of the present general inventive concept.

[0017] FIG. **6** is a close up front elevation view of sleeve holders, clamps and attached sensor, according to an example embodiment of the present general inventive concept.

DETAILED DESCRIPTION

[0018] FIG. **1** illustrates an example embodiment of the current invention which comprises a pair of mannequins or bucks **3** which reside on respective buck frames **4**. A garment can be placed on one of the bucks **3** during a process of finishing the garment such that the garment conforms substantially to the shape of the buck **3**. A pair of sleeve holders **2** can be provided for each buck **3**, which may be raised and lowered by the garment finishing machine operator as he or she sees fit. The sleeve holders **2** can also rotate freely around the pivot point **14** to provide even sleeve tension for the particular type of garment construction, including sleeves which are sewn onto the body of the garment at various angles. The garment finishing machine provides for rotation of the left and right pivoting arms **1** in

a lateral position from the base of the mannequin in order to provide tension on the sleeve by increasing the distance from the sleeve cuff to the body of the garment located on the buck **3**. The sleeve holders **2** may include sleeve holder clamps **15** to temporarily secure the open end of the garment sleeve to the sleeve holder **2** during the wrinkle removal process. A user may place the garment on one of the bucks **3**, attach the sleeve onto the sleeve holders **2**, secure the open end of the garment using the sleeve holder clamps **15**, and adjust the pivoting arms **1**, until the garment is in a desired position. The buck frames **4**, can rotate, as shown in FIG. **1**, in a circular fashion 180 degrees, such that each of the **2** buck frames **4**, have exchanged positions. The buck frames **4** can rest upon a platform. A motor can power the rotation of a platform on a set of rollers. Other means of providing rotation known in the art may be utilized. Further, the buck frames **4** could rotate at another angle or in a linear fashion. After rotation of the buck frames **4**, a garment that has not been finished can be finished by means of steam or pressing, for example, and the finished garment can be removed to be replaced by a subsequent unfinished garment. Movement of the pivoting arms **1** is effectuated by the machine operator through the use of a controller device **21**. The controller device **21** might include, for example, a general purpose computer with processor and input/output interface for communicating with the mechanical linkages, or other type devices known by those skilled in the art.

[0019] FIG. **2** illustrates an example embodiment of the current invention which comprises a mannequin or buck **3**, simulating the upper part of a human body, for holding a garment in place and a pair of right and left pivoting arms **1** arranged at both sides of the mannequin or buck **3**. A garment can be placed on the buck **3** during a process of finishing the garment such that the garment conforms substantially to the shape of the buck **3**. The buck **3** can be rigidly attached to the buck frame **4**. A pair of sleeve holders **2** can be provided, which may be raised and lowered by the garment finishing machine operator as he or she sees fit. The sleeve holders **2** can also rotate freely around the pivot point **14** to provide even sleeve tension for the particular type of garment construction, including sleeves which are sewn onto the body of the garment at various angles. The garment finishing machine provides for rotation of the left and right pivoting arms **1** in a lateral position from the base of the mannequin in order to provide tension on the sleeve by increasing the distance from the sleeve cuff to the body of the garment located on the buck **3**.

[0020] A series of linkages are provided to connect the sleeve holders **2** and the pivoting arms **1** to the garment buck frame **4**. The lower link **5** can be attached to the garment buck frame **4** with a bearing **6** or other such pivoting device, enabling rotation of the lower link **5** in either a clockwise or counter-clockwise direction. The lower link **5** can rotate from the base of the garment buck frame **4** to a position either higher or lower in elevation than the frame. This lower link **5** can be connected to two other links, the slide link **7** and tilt link **8**. The slide link **7** can be attached to the slide **9** which is controlled up and down by the machine operator. Motive force to move the slide **9** can be provided by a pneumatic actuator **10** or other such actuators such as hydraulic or electric current. The slide **9** can be attached to the pivoting arm **1** enabling it to move in a generally vertical direction. Also, the pivoting arm **1** can be attached to the buck frame **4** via the main arm pivot **11** that enables the pivoting arm **1** to pivot or rotate in a clockwise or counter-clockwise direction. Motive force to move the pivoting arm **1** in a clockwise or counter-clockwise direction can be provided by a pneumatic actuator **16** or other such actuators such as hydraulic or electric current. Movement of the pivoting arms **1** can be effectuated by the machine operator through the use of the controller device **21**.

[0021] When the slide **9** moves up or down, this causes the slide link **7** to move and in turn causes the lower link **5** to pivot about its bearing or pivot **6** on the garment buck frame **4**. The tilt link **8** can be attached to the lower link **5** via a pivot or such bearing **12** and moves proportionately to the movement of the slide link **7**. The tilt link **8** can be attached to the sleeve holder **2** via a pivot or such bearing **13**. The sleeve holder **2** can be attached to the slide **9** by the sleeve holder pivots **14** and moves substantially vertically with the slide **9**. The combined motion of the sleeve holder **2** in the vertical direction as a result of the movement of the slider as well as the rotation of the sleeve holder **2** around the pivot **14** as a result of the movement of the tilt link **8**, determines the position and directional angle of the sleeve holder **2** in relation to the buck **3**. The sleeve holder **2** includes sleeve holder clamps **15** to temporarily secure the open end of the garment sleeve to the sleeve holder **2** during the wrinkle removal process. An arrow is drawn from the sleeve holder **2** toward the garment buck **3** to indicate the orientation of the sleeve holder **2** to the garment buck **3**.

[0022] As can be seen in FIG. **2**, the lower link **5**, pivoting arm **1**, tilt link **8**, slide **9**, slide link **7**, garment buck frame **4** and sleeve holder **2** comprise a linkage. The positions of the pivot points determine the orientation of the sleeve holder **2** as the slide **9** moves up and down and/or as the pivoting arm **1** pivots. In FIG. **2**, the two pivoting arms **1** are in similar tilt positions, with each pivoting arm **1**, as seen from the front side of the buck, at approximately thirty degrees from a vertical line represented by the length of the garment buck **3**. The lower links **5** can be substantially parallel with a horizontal line representing the base of the garment buck frame **4**.

[0023] FIG. **3** illustrates the garment finishing machine in a lowered position, in comparison with its position in FIG. **2**. The two pivoting arms **1** are in the same position relative to vertical, but the lower links **5** have been rotated downward, relative to the horizontal, and the sleeve holder **2** has been lowered relative to its position in FIG. **2**. At the same time, the angle of the sleeve holder **2** has been rotated upward such that it is still in line with the garment buck, as illustrated by the arrow. The foregoing description is one possible alternative, and one skilled in the art can realize that a range of vertical, horizontal, and orientation angles of the sleeve holders **2** and pivoting arms **1** are possible. As is clear from the above, the movement of the slide **9** up and down causes the sleeve holder **2** to rotate around the pivot point **14** automatically, thus keeping the orientation of the garment sleeve in line with the garment buck **3**. This allows the tension to remain even on the bottom and top of the sleeve, reducing, or even eliminating, the likelihood of wrinkles, even when sleeves of different angles are used.

[0024] FIG. **4** illustrates a shirt placed on the garment buck **3** with the shirt conforming substantially to the shape of the garment buck **3**. The shirt cuffs can be placed over the sleeve holder, which cannot be seen in this figure. The sleeve holder clamps **15** are in an open or retracted position and there would be minimal tension on the sleeve in this position.

[0025] FIG. **5** illustrates a shirt placed on the garment buck **3** with the shirt conforming substantially to the shape of the garment buck **3**. The shirt cuffs can be placed over the sleeve holder. The sleeve clamps **15** are in a closed position, applying compression to the cuff and the underlying sleeve holder. In this position, tension can be applied to the shirt sleeve prior to finishing.

[0026] As illustrated in FIG. **6**, alignment sensors **20** may be attached to the sleeve holder **2** and the shoulder of the garment buck **3** to determine when the garment sleeve is in proper orientation with the shoulder. In some embodiments, a laser, or other light source, can be attached to the sleeve arm so that it emits light in a direction in line with the sleeve holder. An optic sensor can be placed on a fixed point on the mannequin shoulder, such that when it detects the light from the laser, it sends a message to the controller **21** that the sleeve arm is now aligned with the shoulder of the buck **3** and for the controller **21** to stop the motion of the tilt link **8**. In some embodiments, a microprocessor can calculate the angle of orientation of the sleeve holder so that it is in alignment with the shoulder of the buck **3**. Positioning information in regards to the location of the tilt link **8**, slide **9**, and sleeve holders **2** can be stored in memory in the microprocessor, and a mathematical algorithm can calculate the orientation angle based on the input it receives from the controller **21**. The controller **21** can then interface with the tilt link **8**, slide **9** and sleeve holder **2**, to position the sleeve holder **2**, so that it is in alignment.

[0027] As illustrated in FIG. **6**, the sleeve holders **2** may include one or more sensors **20** which are tension detector sensors for measuring the tension of the sleeve against the mannequin to ensure that the tension is within required limits. A tension detection sensor can be an electro-mechanical device for determining sleeve tension feedback. For instance, it is possible to mount strain gauge(s) or other load cell(s) to the sleeve holders **2** in order to measure forces, which can be directly related to the tension of the sleeve connection. These gauges or load cells can be mounted to the clamps on the sleeve holder **2**, such that strains or loads on these members might be correlated to the tension of the sleeve as shown in FIG. **6**. In some embodiments, the gauges or load cells may also be mounted on the garment buck **3** shoulder in order to determine belt tension. The gauges or load cells may also be mounted in other locations of the buck **3** or support structures, in order to determine forces related back to sleeve tension. The feedback from these torque and/or tension sensors can be used to indicate to the garment finishing machine controller **21** when the pivot arm motive mechanism should be stopped due to reaching desired tension. Any combination of these measurement techniques can be used in concert to more accurately or robustly provide sleeve tension feedback.

[0028] Movement of the pivoting arm **1** can be facilitated by applying motive force to it, causing the pivoting arm **1** to pivot or rotate in a clockwise or counter-clockwise direction around the main arm pivot **11**. In this fashion, garment sleeves of different lengths, including short-sleeve shirts, are able to be finished using the garment finishing machine of the current invention. By applying the movement of the pivoting arm **1** with the up and down movement of the sleeve holder **2** as well as the automatic angle adjust of the sleeve holder **2**, shirts of various sleeve lengths and sleeve angles can be finished by this garment finishing machine without the introduction of wrinkles.

[0029] Example embodiments of the present general inventive concept can be described as follows. An operator places the garment on the buck **3** such that the front of the garment is situated towards the front of the garment finishing machine. Tensioning members in the buck **3** could be used to apply tension to the body of the shirt so that wrinkles will not form prior to pressing. The operator causes the each pivoting arm **1** to rotate inward from the torso so that the cuff end of the garment is within proximity to the sleeve holder clamps **15**. The operator can attach the cuff end of each sleeve of the garment into the sleeve holder clamps **15**, as illustrated in FIGS. **4** and **5**, to temporarily secure the end of the garment sleeve to the sleeve holder **2**, taking care to orient the cuff end such that the garment sleeve is oriented in the direction of the garment as manufactured. The amount of tension on the sleeve, after the garment sleeve is attached to the sleeve holder **2**, may be minimal. At this point, the operator can cause the buck frames **4** to rotate by 180 degrees, as shown in the system representation of FIG. **1**, so that the buck frames **4** exchange positions. The operator, through usage of the controller device **21**, can then initiate the motion of the pivoting arm **1** in the outward direction, causing increased tension on the sleeve, while simultaneously, the slide **9** moves in an either upward and downward direction until a desired tension is achieved on the sleeve arm, the tension in the lower and upper part of the cuff arm are the same, and the sleeve holder **2** is oriented in the direction of the shoulder on the garment buck **3**. The controller **21** can stop the action of the linkages. The unfinished garment may now be located within the finishing compartment **22**, so that it can be steamed, pressed, or other methods of finishing a garment known to those within the art. After finishing and rotation of the buck frames **4**, the finished garment can be removed and replaced with an unfinished garment to repeat the process.

[0030] While example embodiments have been illustrated and described, it will be understood that the present general inventive concept is not intended to limit the disclosure, but rather it is intended to cover all modifications and alternate devices and methods falling within the spirit and the scope of the invention as defined in the appended claims.

What is claimed is:

1. A garment finishing machine comprising a mannequin to hold the body of the garment, a pair of pivoting arms located on either side of the mannequin to support and tension the sleeves of the garment, a stable frame on which the mannequin rests, sleeve holders on each of said pivoting arms to hold each sleeve in position during the finishing process, pivot points on the frame, pivoting arms, and sleeve holders to allow for rotation of the pivoting arms around a pivot point, and a slider attached to the sleeve holders to provide vertical motion of the sleeve holders during the finishing process,

wherein a movement of the finishing arms around its pivot point on the frame of the garment finishing machine provides tension to the sleeves of the garment by increasing the distance between the garment and the position of the sleeve holder,

wherein the movement of the slider causes a proportional movement of the pivot arms and causes the sleeve holder to rotate on its axis, and

wherein the motion of the sleeve holder is in response to the movement of the slider and creates an even tension on the top and bottom portions of a sleeve attached at the sleeve holder.

2. The garment finishing machine of claim **1**, comprising a means of automatically adjusting the angle of the sleeve holder, mounted on a pair of pivots, so the sleeve holder faces the shoulder of the buck as the pivoting arm pivots outwardly or inwardly.

3. The garment finishing machine of claim **1**, comprising a means of automatically adjusting the angle of the sleeve holder, mounted on a pair of pivots, so the sleeve holder faces the shoulder of the buck as the sleeve holder is raised or lowered.

4. The garment finishing machine of claim **1**, comprising a means of automatically adjusting the angle of the sleeve holder so the sleeve holder, mounted on a pair of pivots, faces the shoulder of the buck as the pivoting arm rotates outwardly or inwardly, and as the sleeve holder is raised or lowered.

5. A garment finishing machine comprising a molded form to support the body of the garment, a pair of pivoting arms located on either side of the mannequin to support and tension the sleeves of the garment, and sleeve holders on each of said pivoting arms to hold each sleeve in position during the finishing process,

wherein the sleeve holders are configured to rotate clockwise or counter-clockwise on an axis point attached to the pivoting arms to keep the sleeves aligned with a shoulder of the mannequin,

wherein the sleeve holders are configured to move vertically, up or down, and

wherein the motion of the sleeve holder is performed automatically and creates an even tension on the top and bottom portions of a sleeve attached at the sleeve holder.

6. The shirt or garment finishing machine of claim **5**, wherein a tilt link attached to the sleeve arm controls the angle of orientation of the sleeve holder.

7. The shirt or garment finishing machine of claim **6**, wherein the tilt link is moved based on feedback received from alignment sensors attached to the sleeve holders and a fixed point on the mannequin.

8. The shirt or garment finishing machine of claim **6**, wherein the tilt link is moved based on feedback received from a microprocessor which calculates the angle of orientation.

9. A garment finishing machine system comprising at least two mannequin to hold the body of the garment, at least two frames to support the mannequins, a pair of a pair of pivoting arms located on either side of the mannequins to support and tension the sleeves of the garment, at least two stable frames on which the mannequin rests, sleeve holders on each of said pivoting arms to hold each sleeve in position during the finishing process, pivot points on the frames, pivoting arms, and sleeve holders to allow for rotation around a pivot point, and a slider attached to the sleeve holders to allow for vertical motion of the sleeve holders during the finishing process,

wherein a movement of the finishing arms around its pivot point on the frame of the garment finishing machine provides tension to the sleeves of the garment by increasing the distance between the garment and the position of the sleeve holder,

wherein the movement of the slider causes a proportional movement of the pivot arms and causes the sleeve holder to rotate on its axis,

wherein the motion of the sleeve holder is in response to the movement of the slider and creates an even tension on the top and bottom portions of a sleeve attached at the sleeve holder, and

wherein at least one of the mannequins holds the garment during the finishing process and at least one of the mannequins holds the garment prior to finishing.

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