

July 9, 1968

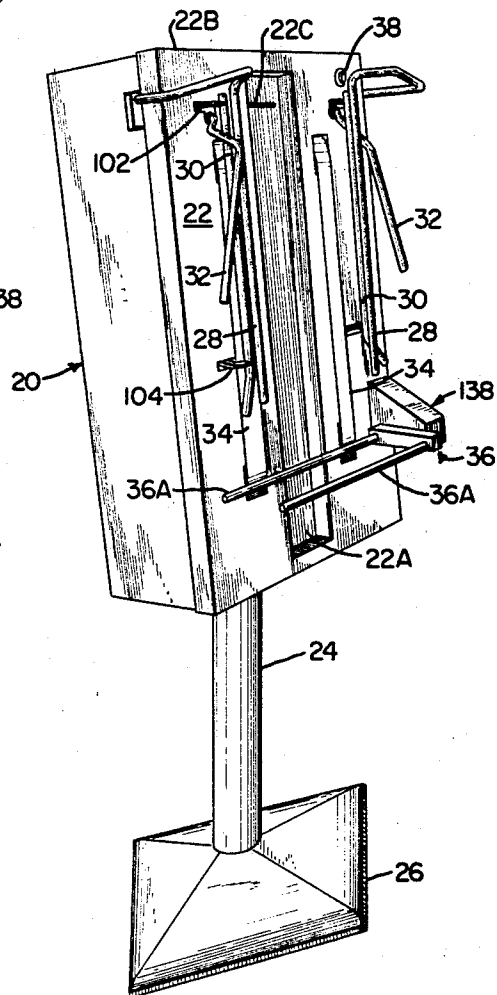
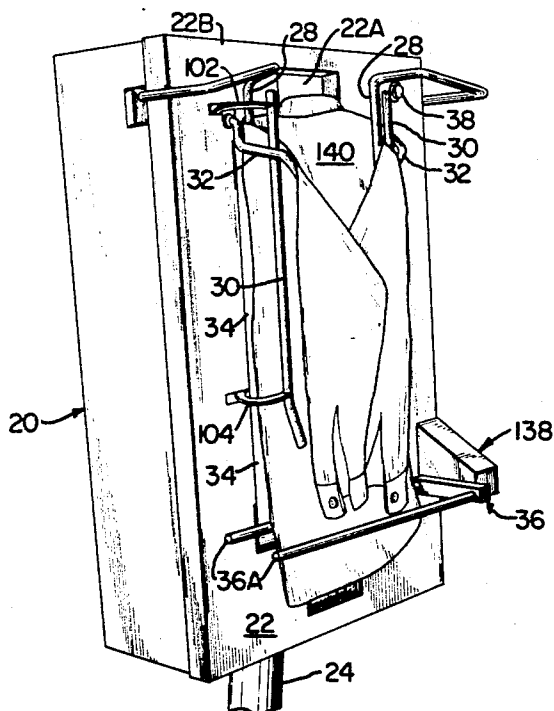
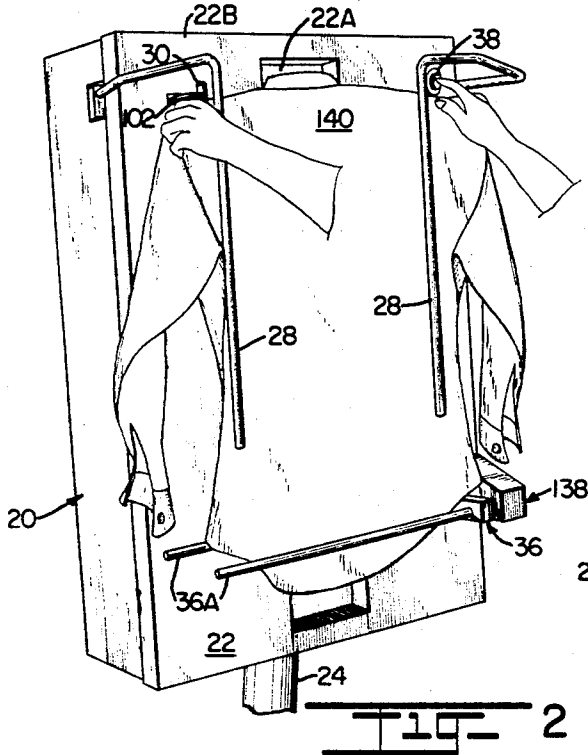
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3,391,839

METHOD AND APPARATUS FOR PACKAGING SHIRTS

Filed Aug. 27, 1964

5 Sheets-Sheet 1



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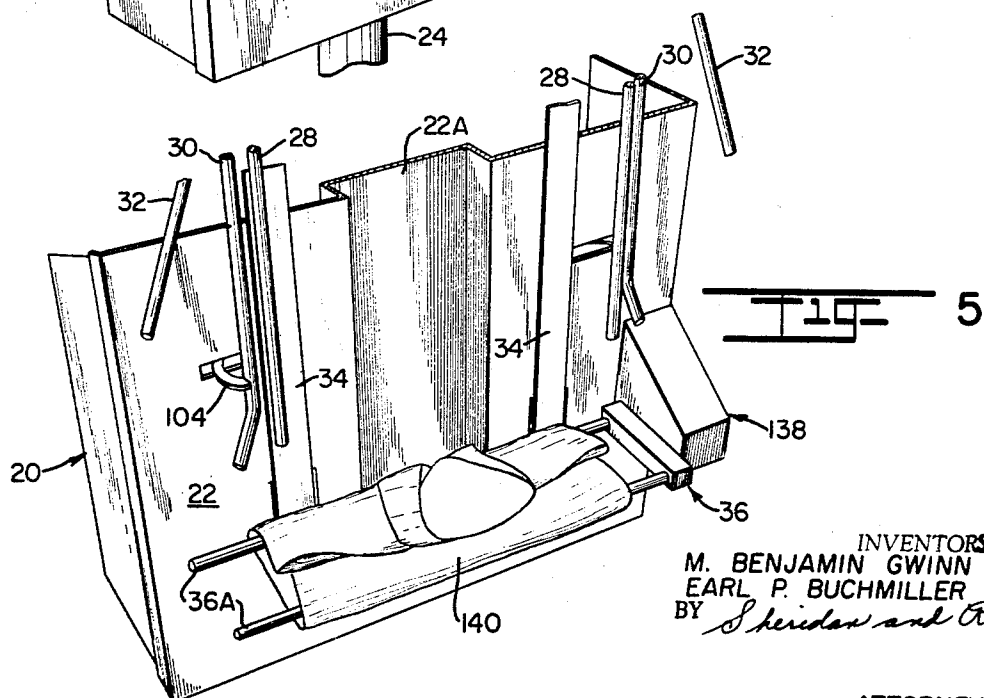
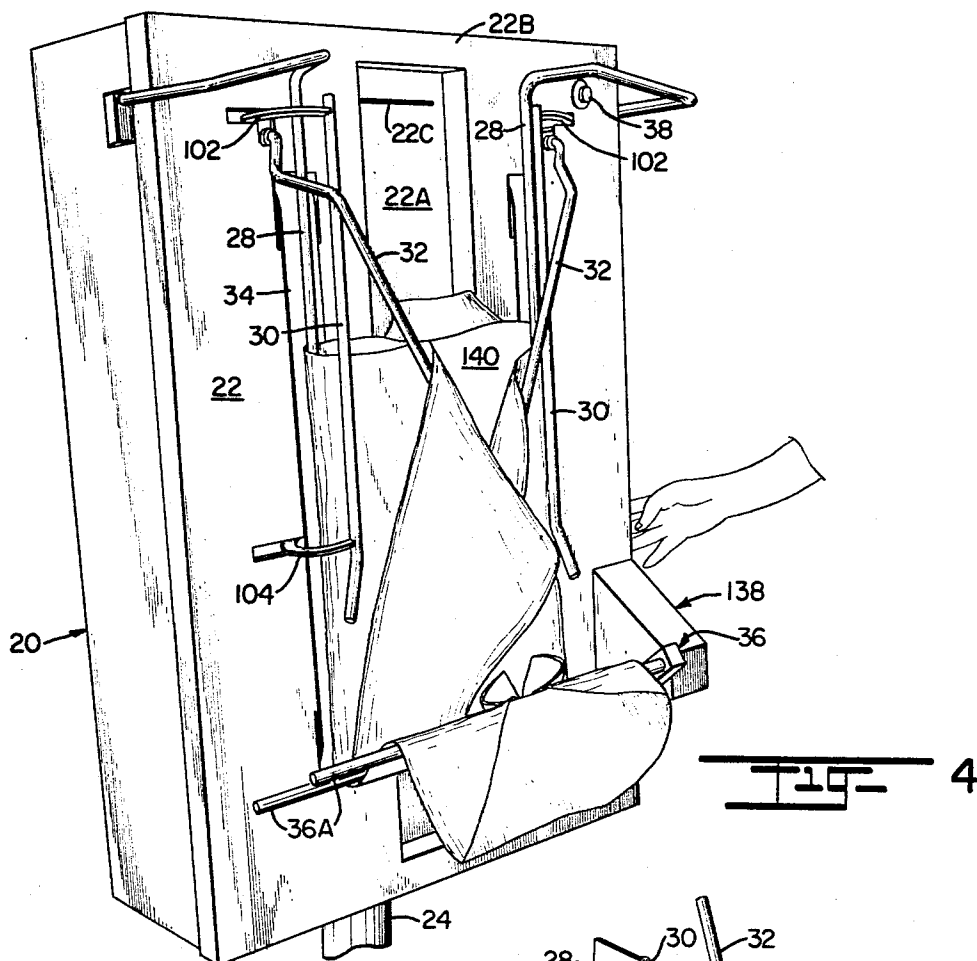
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5 Sheets-Sheet 2



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5 Sheets-Sheet 3

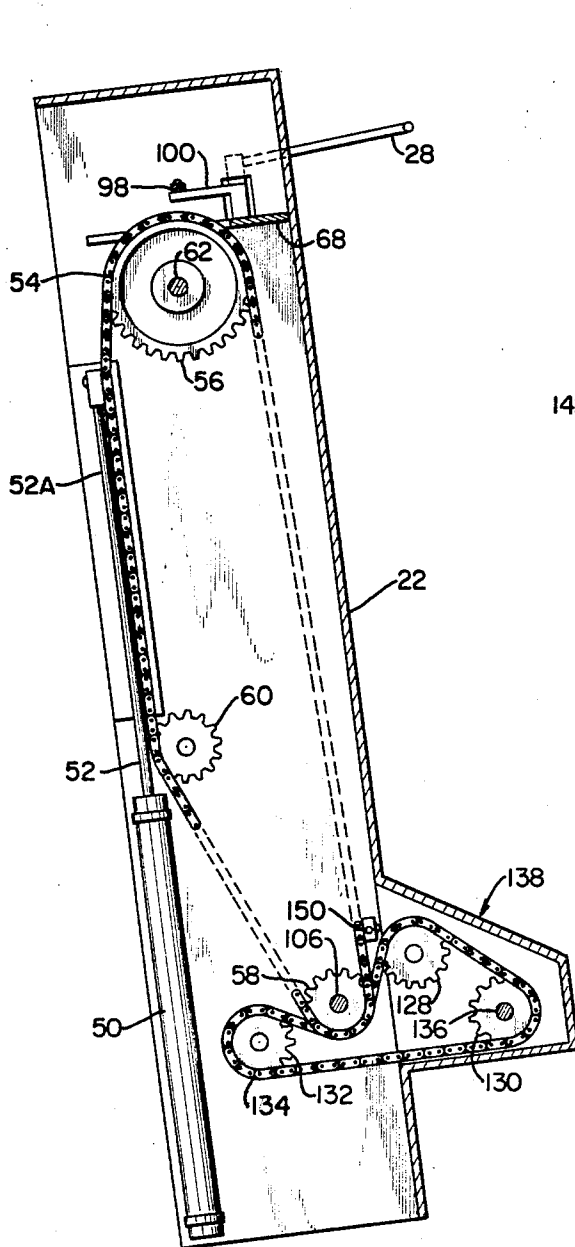


FIG. 11

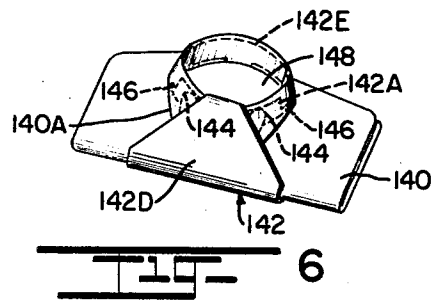


FIG. 6

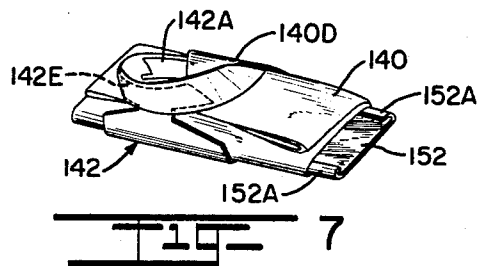


FIG. 7

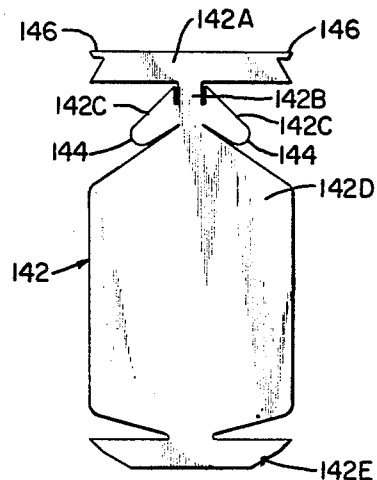


FIG. 12

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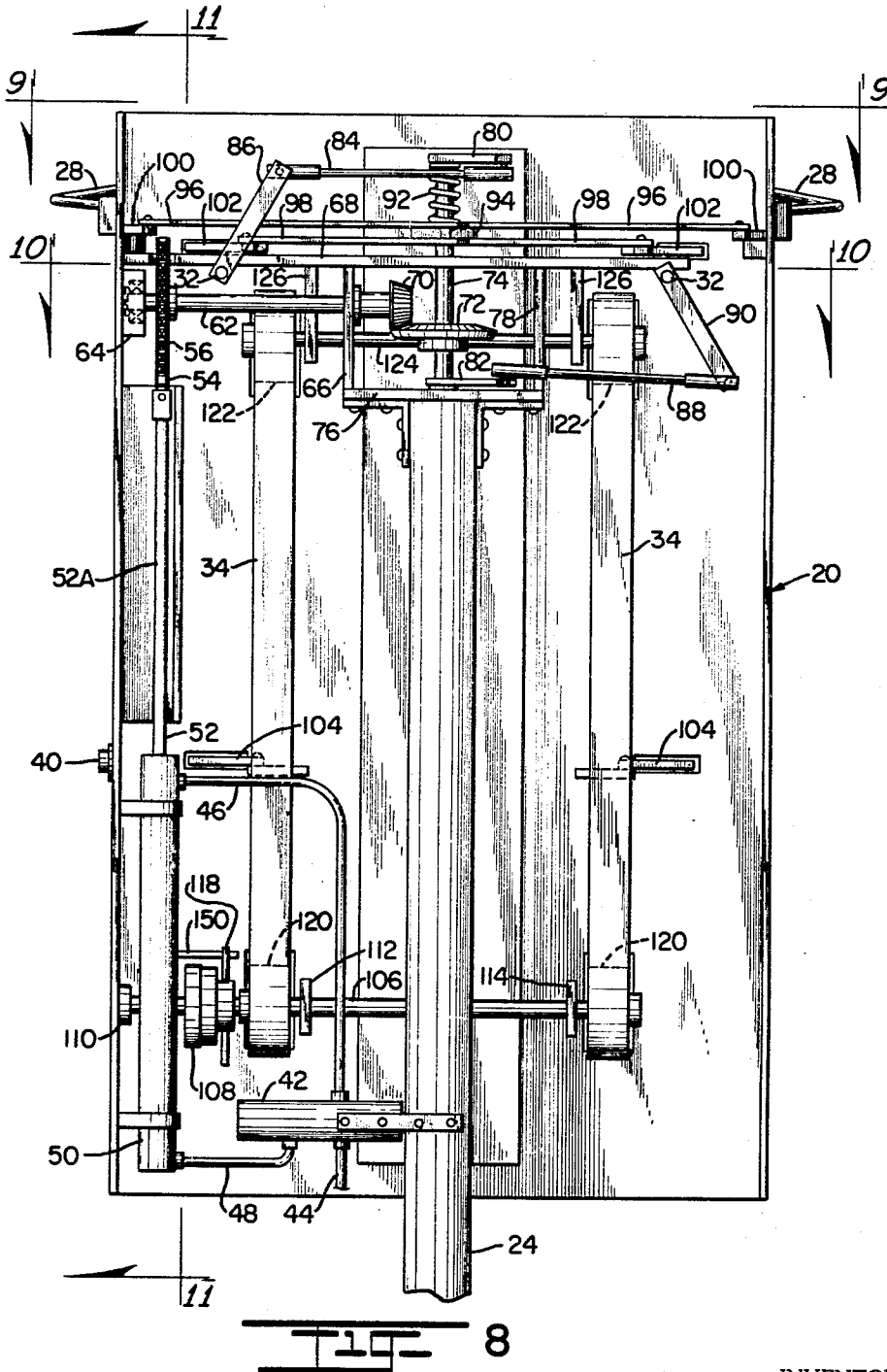
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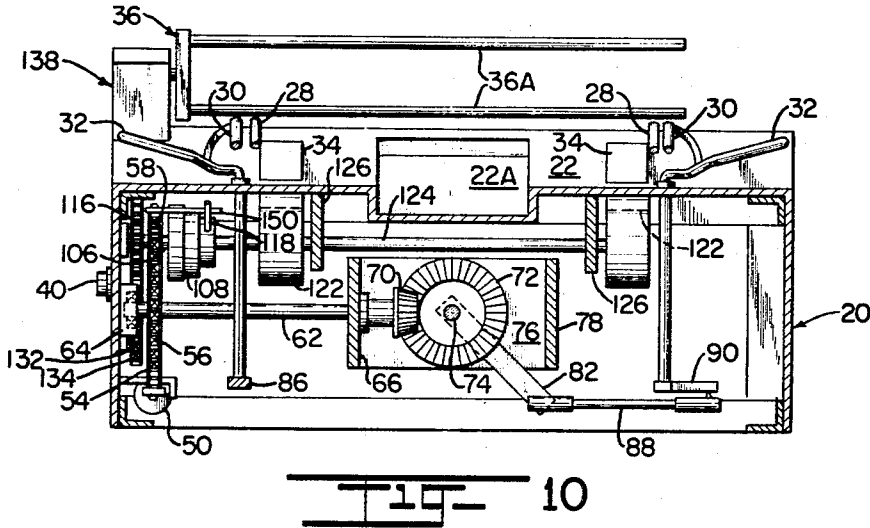
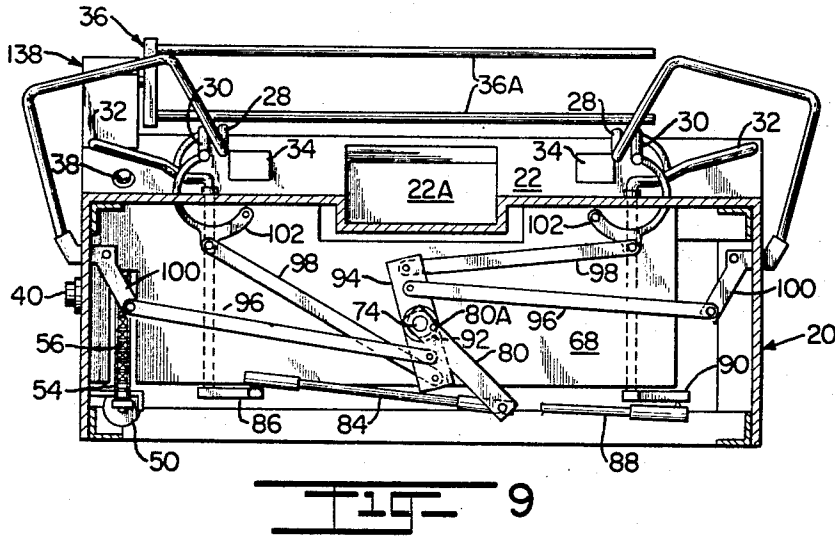
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METHOD AND APPARATUS FOR PACKAGING SHIRTS

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5 Sheets-Sheet 5



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METHOD AND APPARATUS FOR PACKAGING SHIRTS

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20 Claims. (Cl. 223—37)

ABSTRACT OF THE DISCLOSURE

The subject invention relates to a machine for folding a sleeve containing garment, including shirts, comprising a surface upon which at least a portion of garment may be disposed, means for positioning the sleeves of a garment to be disposed upon said surface whereby at least a part of each sleeve is disposed generally longitudinally of the garment, and means for simultaneously drawing the garment to be disposed upon said surface in a direction toward the tail of the garment and folding the garment about an axis disposed transverse to the longitudinal axis of the garment. The surface is inclined from a vertical position and has a longitudinally-disposed slot formed therein. The overfolding and sleeve positioning means includes a first pair of elongated members mounted for translatable movement toward and away from said surface, a second pair of elongated members each of which is mounted for movement about at least a portion of a corresponding member of said first pair of members, and a pair of pivotally mounted members. The means for drawing and folding the garment includes a rotatably mounted mandrel and may also include a pair of endless belts, each of which has portions thereof disposed substantially in the same plane in which lies said surface.

This invention relates generally to a method and apparatus for packaging sleeve containing garments and more particularly to a method and apparatus for rolling a shirt into a neat, compact and uniquely-formed package having a minimum of longitudinal folds and in which the tendency to wrinkle or crease has been greatly minimized.

Heretofore, methods and apparatuses for packaging shirts have involved extensive folding operations. Moreover, such folding operations have required considerable manual assistance from the operator in placing, adjusting and smoothing the shirt upon the machine preceding each of the various folding operations involved and, thus, have increased the amount of time required to effect a packaged shirt. Additionally, any folding of a shirt not only increased its chances of but also normally resulted in creases or wrinkles being formed in the shirt. It has been found, however, that the time required for packaging a shirt and the tendency of wrinkles or creases to be formed in a packaged shirt, particularly a freshly ironed shirt, can be greatly decreased or minimized through the use of a method and apparatus for packaging shirts in which the shirt is packaged through a rolling rather than a folding operation.

Accordingly, one of the principal objects of this invention is to provide a neat and compact packaged sleeve containing garment having a minimum of wrinkles or creases formed therein.

Another object of this invention is to provide a method and apparatus of rolling a sleeve containing garment into a neat and compact package.

Another object of this invention is to provide a method and apparatus for efficiently and quickly rolling a shirt into a concise, pouch-type package.

Another object of this invention is to provide a method and apparatus for rolling a shirt into a neat and compact

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package with less time and operator assistance and with less resultant wrinkling of the packaged shirt than has been heretofore possible.

Another object of this invention is to provide an apparatus for receiving and holding a shirt in a suspended manner to permit a portion of the shirt to be overfolded against the backside of the shirt and to roll said shirt into a neat and compact package.

Another object of this invention is to provide a novel and improved shirt packaging apparatus which rolls a shirt into a compact package by a transverse rolling action commencing at the bottom of the shirt to reduce objectionable creases in the body of the shirt and especially at the front, bib portion of the shirt.

Another object of this invention is to provide a novel shirt packaging apparatus which automatically aligns and wraps a shirt suspended therein in a minimum of time and with a minimum of supplementary movements by the operator.

Another object of this invention is to provide a method and apparatus for rolling a suspended shirt into a neat package which may be quickly and easily secured against inadvertent unrolling thereof.

Another object of this invention is to provide a novel and improved shirt packaging apparatus which is inexpensive to construct and which, after a minimum of instruction and practice, may be operated by individuals having the minimum of skills.

The foregoing and other objects and advantages will become apparent from the specifications and drawings in which:

FIGURE 1 is a perspective view of one preferred embodiment of an apparatus constructed in accordance with this invention;

FIGURE 2 is a perspective view of the upper portion of the apparatus depicted in FIGURE 1 showing a shirt as initially suspended;

FIGURE 3 is a perspective view of the apparatus shown in FIGURE 1 showing the position of a suspended shirt and certain parts of the apparatus following the overfolding of the side portions of the shirt and positioning of the sleeves;

FIGURE 4 is a perspective view of the upper portion of the apparatus shown in FIGURE 1 showing the position of the shirt and certain parts of the apparatus after the initiation but prior to the completion of the rolling operation;

FIGURE 5 is a perspective view of a part of the upper portion of the apparatus shown in FIGURE 1 showing a packaged shirt following the completion of the rolling operation and prior to the removal of same from the apparatus;

FIGURE 6 is a perspective view of a packaged shirt showing one method of securing same against inadvertent unrolling thereof;

FIGURE 7 is a perspective view of a packaged shirt, similar to the illustration at FIGURE 6, and showing the further use of a body-reinforcing member which may be used to prevent the shirt body from being crushed and creased when packed in a suitcase or the like, a portion of the reinforced member being shown as protruding from the shirt to illustrate better the construction thereof;

FIGURE 8 is a rear elevational view of the upper portion of the apparatus shown in FIGURE 1 with the rear panel removed showing the arrangement of the drive mechanism and the various inner connecting linkages;

FIGURE 9 is a cross-sectional view taken along line 9—9 of FIGURE 8;

FIGURE 10 is a cross-sectional view taken along line 10—10 of FIGURE 8;

FIGURE 11 is a side elevational view taken along line 11—11 of FIGURE 8, and

FIGURE 12 is a plan view of the securement means used in FIGURES 6 and 7 to secure the shirt against inadvertent unrolling.

The present invention was conceived and developed to meet a demand for an improved shirt package which would materially reduce the number of creases that appear in a packaged shirt. Common types of shirt packaging apparatuses used in laundries and factories usually involve extensive folding of the shirt by a sequence of longitudinal overlaps, that is, with the creases extending from the top to the bottom of the shirt body. In making such folds, the sleeves are placed in a transversely-outstanding, arm-extended manner and may be folded and creased three or four times as they are folded into the package. When the shirt is worn, the creases resulting from these folds extend longitudinally of the shirt across the bib portion at the approximate pocket points and the sleeve creases are located at the shoulder, elbow and cuff portions. These creases are especially objectionable in a shirt which has been starched.

The present invention contemplates a shirt package which has a comparatively wide uncreased bib area and a minimum of longitudinal creases only at the side portions of the shirt. All transverse creases across the sides of the shirt and creases in the sleeves are eliminated by a rolling, rather than a folding, of the body of the shirt from the bottom portion and upwardly, with the sleeves being longitudinally aligned behind the shirt body. The rolling of a shirt will ordinarily protect it from transverse wrinkling and, if necessary or desired, a piece of flexible material such as cardboard may be placed in the rolled shirt to protect it from crushing.

One preferred embodiment of an apparatus constructed in accordance with this invention contemplates the suspending of the shirt body in a manner which permits the entire operation to proceed automatically in a surprisingly short time interval and with a minimum of attention on the part of the operator once the shirt is placed on the apparatus.

Briefly, this invention relates to a novel method including the suspending of at least a portion of a sleeve containing garment upon or against a surface, then overfolding a part of said garment to overlie the upwardly disposed surface of said garment which part may include either or both the sleeves or a longitudinally extending portion along each side of the garment, and then rolling the garment into a transverse roll. Where desired or required, the rolled garment may be secured against inadvertent unrolling thereof in any suitable manner such as by encompassing or partially encompassing or overwrapping same with a flexible material. One embodiment of an apparatus constructed in accordance with this invention includes a surface upon or against which at least a portion of a sleeve containing garment may be disposed, means for overfolding at least a part of said garment to overlie the upwardly disposed surface of said garment which overfolding may include either or both the sleeves or a longitudinally extending portion along each side of the garment, and means for rolling the garment into a transverse roll.

Referring now to the drawings and more particularly to FIGURES 1 and 8-11, one preferred embodiment of the apparatus constructed in accordance with this invention is shown comprising a housing or box like container 20 including a plurality of removable panels and having an inclined surface or working face 22. Said surface 22 has a central, longitudinally-disposed collar receiving slot or recess 22a formed therein. The inclined surface 22 is preferably tilted rearwardly from the vertical at an angle of approximately 15 degrees to permit a shirt suspended thereon to lie smoothly and essentially wrinkle free against the face thereof to facilitate and enhance the overfolding and rolling of the shirt as will be hereinafter explained. It is to be understood that the angle of inclination may be varied as required or desired by the operator. The height and width of the inclined surface 22 is sufficient to accom-

date a freshly ironed shirt as in the manner illustrated in FIGURE 2, and the bottom portion of the inclined surface is preferably located at the approximate waist height of the operator to permit the operator to easily lift the shirt into position on the inclined surface 22 for overfolding and rolling, as in the manner hereinafter described. The housing 20 is supported by a vertically disposed post 24 which is securely attached to a base plate or platform 26, although it will be understood that the housing may be supported in any other suitable manner.

The apparatus includes a pair of longitudinally extending arms 28 mounted for movement toward and away from the outer surface of working face 22, a second pair of longitudinally extending arms 30 mounted for arcuate movement about a corresponding one of said pair of arms 28 both toward and away from said collar receiving slot 22a, a third pair of arms or sleeve positioning members 32 each being mounted for pivotal movement about one of a pair of corresponding points disposed in juxtaposition with the upper portion 22b of said inclined surface 22, shirt conveying means comprising a pair of endless belts 34, each belt 34 having a portion thereof adapted for movement downward along and lying substantially in said inclined surface 22 and preferably being disposed beneath a corresponding one of said arms 28, and means for rolling a shirt into a transverse roll, said means comprising a rotatably mounted mandrel 36 having a pair of parallel spaced tines 36a. A switch 38 is conveniently mounted along the upper portion 22b of the inclined surface 22. A second switch 40, see FIGURES 8-10, is conveniently mounted on the left side of the apparatus according to these views but which would be on the right side of the apparatus according to the view in FIGURE 1. The function of these switches will hereinafter be described in greater detail.

Referring now to FIGURES 8-10, a 4-way, double solenoid valve 42 is shown securely mounted upon post 24 and connected to a source of fluid pressure (not shown) by conduit 44. The solenoid valve 42 is also connected by conduit 46 and 48 to a cylinder 50. The solenoid valve 42 is momentary in action, i.e., the electrical impulse need not be continuously supplied since the pressurized fluid will complete the operation thereof once an initial electrical impulse has been supplied thereto. Within cylinder 50 is mounted a piston (not shown) which is connected to a piston rod 52 a portion 52a of which extends upwardly from and outwardly of said cylinder 50. Admission of pressurized fluid such as compressed air through conduit 46 into cylinder 50 results in the piston and piston rod 52 being moved downwardly until the piston seats against a stop (not shown) formed within cylinder 50. Admission of pressurized fluid to conduit 48 into cylinder 50 causes the piston and piston rod 52 to move upwardly until the piston seats against a second stop (not shown) also formed within cylinder 50. The portion 52a of the piston rod is suitably connected to a chain 54 which is mounted in driving engagement about sprockets 56, 58 and 60, see FIGURE 11. As a result of this arrangement, each of the sprockets 56, 58 and 60 will rotate first in one direction and then in the other direction.

Sprocket 56 is securely mounted upon shaft 62 for rotation therewith. Shaft 62 is journaled for rotation within the member 64 which is securely mounted to one side of the housing 20 and member 66 which is mounted in depending relation from plate 68. Shaft 62 extends through member 66 and has a bevel gear 70 mounted on the end thereof. Bevel gear 70 is mounted in driving relationship with a bevel gear 72. Bevel gear 72 is securely mounted upon the vertically disposed shaft 74 for rotation therewith. Shaft 74 is journaled for rotation within member 76 and plate 68. Member 76 is securely mounted upon post 24 and firmly attached to depending member 66 and a corresponding depending member 78. A pair of radially extending members 80 and 82 are firmly secured to shaft 74 adjacent the opposite ends thereof. An elon-

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gated member 84 pivotally interconnects the free end of radially extending member 80 and gimbally interconnects one end of member 86. The other end of member 86 is securely attached to one end of one of the sleeve positioning arms or members 32. In a like manner, radially extending member 82 is similarly connected to one end of the other sleeve positioning member 32, i.e., one end of radially extending member 82 is pivotally connected to elongated member 88 which in turn is gimbally connected to one end of member 90, the other end of member 90 being securely attached to one end of said other member 32. A helical coil or Bendix spring 92 is mounted about the upper portion of shaft 74 and has one end thereof positioned within an opening 80a, see FIGURE 9, formed in radially extending member 80. A bushing (not shown) is preferably interposed between the shaft 74 and the Bendix spring 92. The purpose and function of this spring will hereinafter be described in greater detail.

A member 94 is mounted for free rotation about shaft 74. As shown in FIGURE 9, member 94 extends radially outwardly in opposite directions. Each end of member 94 is pivotally connected to a pair of members 96 and 98. Each of the members 96 has one end thereof pivotally connected to one of a corresponding pair of members 100. Each of said members 100 is mounted for pivotal movement and is securely attached to one of the longitudinally extending arms 28. Each of the members 98 is pivotally connected to one of a pair of pivotally mounted members 102. Each of the members 102 is securely mounted to one end of one of the longitudinally extending arms 30. Each of the longitudinally extending arms 30 is also connected to a pivotally mounted member 104, see FIGURE 8. Bendix spring 92 which, as described, has one end thereof mounted within the opening 80a of radially extending member 80 has the other end thereof mounted within an opening (not shown) formed in member 94.

Sprocket 58 is mounted for free rotation about shaft 106 and preferably has a bushing (not shown) interposed between it and the shaft 106. Rotation of sprocket 58 in one direction results in the transmission of power through a cam clutch 108 to shaft 106 for rotation of said shaft. Rotation of sprocket 58 in the reverse direction does not result in the transmission of any power to or rotation of shaft 106. Thus, it will be readily apparent that shaft 106 as mounted will rotate in one direction only. Shaft 106 is suitably journaled for rotation in members 110, 112 and 114, see FIGURES 8 and 10. Shaft 106 has securely mounted thereon in juxtaposition with member 110 a sprocket 116, see FIGURE 10, and in juxtaposition with the clutch 108 an elongated pin 118 which extends outwardly therefrom in opposite directions. The shaft 106 also has a pair of rollers 120 securely mounted thereon for rotation therewith. Each belt 34 passes about and is driven by a corresponding roller 120. Each belt 34 also passes about a corresponding one of a pair of rollers 122 both of which are securely mounted upon a freely rotatable shaft 124. Shaft 124 is journaled for rotation in members 126 which are mounted in depending relation from plate 68.

Sprocket 116, which is mounted upon and for rotation with shaft 106, is mounted in driving relationship with sprockets 128, 130 and 132 through chain 134, see FIGURE 11. Sprocket 130 is securely mounted upon and for rotation with shaft 136 which is suitably journaled for rotation within the mandrel-drive housing 138. Thus, it will be readily appreciated that sprockets 116 and 130 will rotate in opposite directions. The mandrel 36 is securely mounted upon shaft 136 for rotation therewith.

Operation of the herein described apparatus and the practice of the method covered by this invention is now described. The apparatus is suitable connected to a source of pressurized fluid (not shown) such as pressurized air and a source of electrical power (not shown). The three pairs of elongated arms 28, 30 and 32 and the tines 36a of the rotatably mounted mandrel 36 are positioned

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initially as depicted in FIGURE 1. As shown, arms 28 are disposed above the surface 22 and belts 34 and are positioned inwardly of arms 30, the sleeve positioning arms 32 extend outwardly away from the collar receiving slot 22a and the tines 36a of mandrel 36 are positioned in a generally horizontally disposed plane.

Referring now to FIGURE 2, an operator positions a shirt 140 upon or against the inclined working face 22 with the collar thereof being disposed within the collar receiving slot 22a adjacent the upper portion 22b of said working face 22. A guide line or marker 22c, see FIGURE 1, formed within the collar receiving slot 22a is preferably used to assist the operator in properly positioning the shirt upon the working face 22. As shown in FIGURE 2, the shirt is inserted beneath each of the arms 28 but over the arms 30 and 32. Additionally, although the guide line or marker 22c is used to assist the operator in properly positioning the shirt against the working face 22, it is important that the shirt be positioned such that the length of the tail or bottom portion extending between the tines exceeds the distance separating the tines in order that the tail of the shirt will not become disengaged from the tines upon rotation of the mandrel. Thus, although the tail of the shirt should extend beyond the tines a minimum length the actual length of the tail extending between the tines may vary considerably in excess of this minimum length. Further, it must be kept in mind that the above two criteria serve as guides only in positioning the shirt and that the controlling criteria is to obtain a packaged shirt in which the rear of the collar is more or less flush with the rear portion of the packaged shirt as shown in FIGURE 7. Positioning of the rear of the collar in this manner is desirable not only because a shirt packaged in this manner is neater in appearance but also because it is much easier to insert or apply any suitable securement means such as a plastic bag or the securement means 142, see FIGURES 6, 7 and 12, to prevent inadvertent unrolling of the packaged shirt. It has been found that both of these objectives are obtained even though the rear of the collar extends from a position slightly beyond the rear of the packaged shirt up to approximately one inch ahead of the rear of the packaged shirt.

After the shirt has been properly positioned upon the apparatus as shown in FIGURE 2, the operator depresses switch 38 thereby actuating the solenoid control valve 42 to effect admission of pressurized fluid into cylinder 50 through conduit 46. As previously described, when pressurized fluid enters cylinder 50 through conduit 48, piston rod 52 moves downwardly, as viewed from FIGURE 8, causing sprocket 56, shaft 62, bevel gears 70 and 72 and shaft 74 to rotate. Downward movement of the piston rod 52 results in clockwise movement of shaft 74 as viewed from FIGURE 9. Upon initial rotation of shaft 74, radially extending members 80 and 82 likewise rotate and the effect of such rotation is transmitted through elongated members 84 and 88 and members 86 and 90 to the sleeve positioning arms 32 thereby causing each of said arms 32 to pivot one toward the other. As shaft 74 and radially extending members 80 and 82 continue to rotate, a force is stored within the Bendix spring 92 and when this force reaches a predetermined amount, member 94 is caused to rotate in the same direction as shaft 74. Rotation of member 94 causes movement of arms 28 toward the surface of working face 22 and arcuate movement of the longitudinally extending arms 30 until said arms 30 are positioned as shown in FIGURE 3 and said arms 28 hold the shirt against the surface of the working face 22 all as shown in FIGURE 3. Further movement of arms 28 and arms 30 is precluded when said arms 28 and 30 reach the position depicted in FIGURE 3, due to the arms 28 coming to rest upon the shirt disposed on surface 22; however, shaft 74 and radially extending members 80 and 82 continue to rotate until the sleeve positioning arms 32 assume the position as shown in FIGURE 3. Such rotation results in energy being stored in Bendix spring 92

which upon the release thereof assists and speeds the movement of sleeve positioning arms 32 from that position as shown in FIGURE 3 toward the original position as shown in FIGURE 1. The purpose of this particular feature will be hereinafter described in greater detail. Movement of the arms 28 and 30 both begins and ends before the piston rod 52 has proceeded very far in its downward movement.

In order for the shirt to become positioned as shown in FIGURE 3, it has been necessary to overfold a longitudinally extending portion of each side of the shirt and to position the sleeves whereby at least a part of the sleeves are disposed longitudinally of the shirt. The overfolding of the side portions of the shirt is accomplished through a coaction of the arms 28 and 30; the positioning of the sleeves is effected through appropriate movement of arms 30. At the same time arms 28 are moving toward the surface of the working face 22, arms 30 are overfolding the side portions of the shirt. Immediately following this step, arms 32 position the sleeves of the shirt such that a part of each sleeve is disposed longitudinally of the shirt. When the shirt has assumed the position shown in FIGURE 3, the operator smooths the shirt to remove such wrinkles, if any, that may have resulted from the overfolding operation. Although such smoothing operation by the operator is an infrequent occurrence, such may be accomplished very easily and in a matter of about a second and, therefore, does not materially delay the packaging of a shirt.

Switch 40 is now actuated which through the appropriate positioning of the solenoid valve 42 causes pressurized fluid to be admitted into the cylinder 50 through conduit 48 and permits the exhausting of the fluid previously admitted through conduit 46. This operation causes the piston rod 52 to move upwardly, as viewed from FIGURE 8, and in addition to reversing the movement of arms 28, 30 and 32 so as to reposition said arms from the disposition thereof as shown in FIGURE 3 to the disposition as shown in FIGURE 1, effects rotation of shaft 106 as the result of power being transmitted through clutch 108 whereby portions of the endless belts 34 which are shown in FIGURE 1 are caused to move downwardly as viewed from FIGURE 1 and the mandrel is caused to rotate in a counterclockwise direction as viewed from the left side of FIGURE 1. Through an appropriate selection of gear ratios, the linear speed of the belts 34 is maintained substantially equal to the peripheral speed of the tines 36a. Thus, the body of the shirt is fed downwardly along the surface of working face 22 at the same rate of speed as said shirt is being rolled upon the mandrel 36. This arrangement maintains the shirt in a smooth, substantially wrinkle-free condition until same is completely rolled upon the mandrel. It has been found that a packaged shirt of convenient size may be obtained through $2\frac{1}{2}$ revolutions of the mandrel having a pair of parallel tines where the distance separating the opposite surfaces thereof approximates 5 inches. This dimension may, of course, be changed in order to accommodate garments of various sizes. Upon the completion of the rolling operation, the shirt is disposed upon the mandrel in the condition as shown in FIGURE 5.

The movement of the arms 28, 30 and 32 in returning to their initial position as shown in FIGURE 1 and the relative sequence of such movements are now described. As the piston rod 52 begins its upward movement and shafts 62 and 74 begin their rotational movement, the sleeve positioning arms 32 begin to retract under the combined influence of the energy stored within the Bendix spring 92 and the movement of the radially extending members 80 and 82 which are securely mounted upon shaft 74. Thus, it will be readily apparent that an accelerated retracting motion of the arms 32 is effected through such combined forces and particularly as a result of the release of the energy previously stored within the Bendix spring 92. This feature is particularly advanta-

geous since it enables the arms 32 to be quickly retracted from supporting or positioning engagement with the sleeves of the shirt all without causing any wrinkling or bunching or gathering of either the sleeves or any portions of the shirt during the rolling operation. The sleeve positioning arms 32 continue to move outwardly away after the center portion of the inclined surface 22 and after the energy which was previously stored within the Bendix spring has been dissipated and a sufficient amount of energy is subsequently stored within the Bendix spring, the resistance and inertia of the arms 28 and 30 are overcome and said arms 28 and 30 are caused to move away from the position shown in FIGURE 3 toward that shown in FIGURE 1. Through an appropriate gear ratio and linkage selection, the movement of arms 28 and 30 is delayed toward the latter portion of the cycle in order to permit the top of the shirt to be transported a considerable distance along the inclined surface 22 thereby better insuring that the unrolled portion of the shirt will remain taut and substantially wrinkle free prior to the rolling thereof as a result of the combination of the pulling action of the rotating mandrel and the clamping action of the arms 28 and the belts 34. As the piston rod 52 approaches the end of its upward movement, the longitudinally extending arms 28 and 30 retract from the position as shown in FIGURE 3 and return to that shown in FIGURE 1. As shown in FIGURE 4, the shirt has already proceeded downwardly along the surface of working face 22 and a portion thereof has been rolled upon the mandrel 36.

Positive stopping of the mandrel with the tines disposed in a substantially horizontal plane is insured through the coaction of the elongated pin 118, which is securely mounted on shaft 106, and pin 150 which is mounted to and projects outwardly from chain 54, see FIGURE 11. Since the tines 36a upon mandrel 36 are spaced to roll effectively and completely a shirt thereabout within $2\frac{1}{2}$ revolutions of the mandrel, it is necessary to use an elongated pin 118 which extends outwardly from the shaft 106 in opposite directions. With this arrangement, one end of the pin 118 will contact pin 150 at the end of every second shirt rolling operation while the other end of the pin 118 will contact the pin 150 at the end of every intervening shirt rolling operation.

Upon completion of the shirt rolling operation the shirt may be easily and quickly removed from the mandrel and stored in any suitable container or suitable means or secured against inadvertent unrolling thereof by any suitable securement means such as the securement means 142 shown in FIGURES 6, 7 and 12. Use of the unique and novel securement means shown in FIGURE 12 is particularly advantageous both from a time and cost viewpoint. Not only is the securement means 142 inexpensive, since same may be made from light weight cardboard, but also due to the unique form and structure thereof it may be easily and quickly applied to the shirt in its rolled condition prior to the removal thereof from the mandrel.

Application of the securement means 142 is effected in the following manner. Portions 142a, 142b and 142c are folded as an integral unit over portion 142d about the line of juncture between portions 142c and 142d. Next, portions 142a and 142b are folded back as an integral unit about the line of juncture between portions 142b and 142c. Portion 142a is then positioned behind the outer ends 144 and 142c. The securement means 142 in this folded condition is now ready for installation about the rolled shirt. The collar-hook portion 142e is inserted under the collar of the shirt as shown in FIGURE 7. The remaining portion of the securement means 142 is then passed under and about the rolled shirt, the ends 144 of portions 142c are inserted under the collar portion 140a in much the same manner in which a tie is worn, see FIGURE 6, portion 142a is inserted within recess 148 formed by the collar and the hook portions 146 of portions 142a are positioned between the collar and the back

portion of the shirt thereby effectively securing the shirt against inadvertent unrolling thereof.

In the event a number of shirts are to be stacked on each other such as in a suitcase or the like and it is desired to prevent the shirt body from being crushed and creased as a result of such stacking or packing, a body-reinforcing member may be inserted in the center of a rolled shirt. A portion of such a body-reinforcing member is shown in FIGURE 7 as protruding from the shirt to illustrate better the construction of such a member. This member 152 as shown is channel-shaped in cross section and has arcuately formed sidewalls 152a. It will be understood, of course, that different shapes and forms of body-reinforcing members may be used to achieve the same result.

Through the use of a method and apparatus as described herein, an operator can within a very short time nearly double the performance rate currently being achieved with commercially available apparatuses. For example, an operator may package approximately five shirts per minute where the shirt is secured against inadvertent unrolling thereof, or approximately 10 shirts per minute where the shirts are not secured against inadvertent unrolling thereof. Such an increase in efficiency not only reduces the amount of labor required for packaging shirts but also decreases the capital investment in such apparatuses.

From the foregoing, it will be apparent that the use of the invention described herein will produce a neat and compact packaged shirt substantially free from any transverse wrinkles or creases and having a minimum of longitudinal folds and which may be obtained in considerably less time than has heretofore been possible.

It is to be understood that this invention is not limited to the exact embodiments of the methods and apparatuses shown and described, which are intended to be illustrative only, and that the various features of the invention may be incorporated in other forms without departing from the spirit and scope of the invention as defined in the subjoined claims. For example, it is to be understood that the method and apparatus of this invention may be utilized to package garments or shirts having short sleeves in which each short sleeve may be positioned essentially transversely of the body of the shirt rather than longitudinally thereof, all without adversely affecting the appearance of the package or of the garment or shirt upon being unrolled in preparation for the wearing or use thereof. Additionally, it is to be understood that sleeve containing garments include, by way of example and not of limitation, such items as sweaters, coats, blouses, coveralls, jackets, smocks, dresses, underwear, uniforms and costumes as well as shirts.

What is claimed is:

1. A shirt-folding machine comprising: a surface upon which at least a portion of a shirt may be disposed, said surface having a longitudinal axis and a first portion; means for positioning the sleeves of a shirt to be disposed upon said surface whereby at least a part of each sleeve is disposed generally parallel with the longitudinal axis of said surface and generally longitudinally of the shirt; and rotatably mounted means disposed adjacent the first portion of said surface for engaging the tail of the shirt to be disposed upon said surface and, upon rotation thereof, for simultaneously drawing the shirt along said surface toward said rotatably mounted means and folding the shirt thereabout, said rotatably mounted means having an axis of rotation disposed generally transversely to the longitudinal axis of said surface.

2. A machine for folding a sleeve-containing garment comprising: a surface upon which at least a portion of a garment may be disposed, said surface having a longitudinal axis and a first portion, the garment to be disposed upon the said surface having the tail portion thereof disposed in juxtaposition with the first portion of said surface; means for laterally overfolding longitudinally ex-

tending, side portions of a garment to be disposed upon said surface, whereby said side portions are disposed in a direction generally parallel with the longitudinal axis of said surface, and positioning the sleeves of the garment to be disposed upon said surface whereby at least a part of each sleeve is disposed generally parallel with the longitudinal axis of said surface and generally longitudinally of the garment; elongated means for drawing the garment to be disposed upon the said surface along said surface toward the first portion of said surface and folding the garment about said means, said drawing and folding means having a longitudinal axis disposed generally transverse to the longitudinal axis of said surface; and means for actuating each of the aforesaid means.

3. A machine as described in claim 2 in which said surface is inclined from a vertical position and has a longitudinally disposed slot formed therein.

4. A machine as described in claim 2 in which said over-folding and sleeve positioning means includes: a first pair of elongated members mounted for translatory movement toward and away from said surface, said first pair of members being constructed to secure relative to said surface portions of a garment to be disposed upon said surface; a second pair of elongated members each of which is mounted for movement about at least a portion of a corresponding member of said first pair of members, each of said second pair of members cooperating with a corresponding one of said first pair of members to over-fold a side portion of a garment to be disposed upon said surface; and a pair of elongated, pivotally mounted members, each of which positions a part of one sleeve of a garment to be disposed upon said surface in a direction generally parallel with the longitudinal axis of said surface; said actuating means upon initial actuation thereof providing for actuation of said first and second pairs of members and subsequently for pivotal movement of each of said pivotally mounted members toward each other.

5. A machine as described in claim 2 including means for transporting a garment to be disposed upon said surface along said surface in a direction toward the first portion of said surface, and means for actuating said transporting means, said transporting means including a pair of endless belts.

6. A machine as described in claim 2 in which said folding means includes a rotatably mounted mandrel.

7. A machine as described in claim 6 in which said mandrel includes a pair of times disposed transversely of the longitudinal axis of said surface.

8. A shirt-folding apparatus comprising: an inclined surface upon which at least a part of a shirt may be disposed, said surface having a longitudinal axis, a first portion and a collar-receiving, longitudinally extending slot formed therein; means for releasably mounting, with respect to said surface, a shirt to be disposed upon said surface; means cooperating with said releasably mounting means for laterally overfolding longitudinally extending side portions of a shirt to be disposed upon said surface whereby said longitudinally extending side portions are disposed in a direction generally parallel with the longitudinal axis of said surface; means for positioning at least a part of each sleeve of a shirt to be disposed upon said surface in a direction generally parallel with the longitudinal axis of said surface and generally longitudinally of the shirt; rotatably mounted means disposed adjacent the first portion of said surface for folding the shirt thereabout, said rotatably mounted means having an axis of rotation disposed generally transversely of the longitudinal axis of said surface; means for transporting a shirt to be disposed upon said surface along said surface in a direction toward said rotatably mounted means; and means for actuating each of the aforesaid means.

9. An apparatus as described in claim 8 in which said transporting means includes a pair of endless belts.

10. An apparatus as described in claim 8 in which said releasably mounting means includes a pair of elongated

members, each of said members being mounted for trans-
latory movement toward and away from said inclined sur-
face.

11. An apparatus as described in claim 10 in which
said transporting means includes a pair of longitudinally
disposed feed belts, each of said belts being disposed oppo-
site a corresponding elongated member of said releasably
mounting means.

12. An apparatus as described in claim 10 in which said
overfolding means includes a pair of elongated members
each of which is mounted for arcuate movement about
a corresponding member of said releasably mounting
means, and said sleeve positioning means includes a pair
of pivotally mounted members.

13. An apparatus as described in claim 8 in which said
rotatably mounted means includes a mandrel.

14. An apparatus as described in claim 12 in which said
rotatably mounted means includes a mandrel having an
axis of rotation disposed in spaced apart relation with
respect to said inclined surface and in juxtaposition with
the lower portion of said inclined surface.

15. A machine for folding a sleeve containing garment
comprising: a surface upon which at least a portion of a
garment may be disposed, said surface having a longitu-
dinal axis and a first portion, the garment to be disposed
upon said surface having the tail portion thereof disposed
in juxtaposition with the first portion of said surface; means
for overfolding a longitudinally extending portion of a
garment to be disposed upon said surface along each side
of the garment and positioning the sleeves of the garment
to be disposed upon said surface whereby at least a part
of each sleeve is disposed generally longitudinally of the
garment; means for moving the garment to be disposed
upon said surface in a direction along said surface toward
the first portion of said surface and folding the garment
about an axis disposed transverse to the longitudinal axis
of said surface, said garment-folding means including a
rotatably mounted mandrel having a pair of tines disposed
transversely to the longitudinal axis of the surface; and
means for actuating each of the aforesaid means.

16. A shirt-folding apparatus comprising: an inclined
surface upon which at least a portion of a shirt may be
disposed, said surface having a longitudinal axis and a
collar-receiving, longitudinally disposed slot formed there-
in; means for releasably mounting with respect to said
surface a shirt to be disposed upon said surface, said re-
leasably mounting means including a pair of elongated
members each of which is mounted for translatory move-
ment toward and away from said inclined surface; means
cooperating with said releasably mounting means for over-
folding a longitudinally extending portion of a shirt to be
disposed about said surface along each side of the shirt;
means for positioning at least a part of each sleeve of a
shirt to be disposed upon said surface generally longi-
tudinally of the shirt; means for folding the shirt about an
axis disposed transverse of the longitudinal axis of the said
surface; means for transporting along said surface a shirt
to be disposed upon said surface toward said shirt-folding

means, said transporting means including a pair of longi-
tudinally disposed feed belts having portions thereof
mounted for movement in substantially the same plane in
which lies said inclined surface, each of said belts being
disposed opposite a corresponding elongated member of
said releasably mounting means; and means for actuating
each of the aforesaid means.

17. A shirt-folding apparatus comprising: an inclined
surface upon which at least a portion of a shirt may be
disposed, said surface having a longitudinal axis and a
collar-receiving, longitudinally-disposed slot formed there-
in; means for releasably mounting a shirt to be disposed
upon said surface; means cooperating with said releasably
mounting means for overfolding a longitudinally extend-
ing portion of a shirt to be disposed upon said surface
along each side of the shirt, means for positioning at least
a part of each sleeve generally longitudinally of the shirt;
means for folding the shirt about an axis disposed trans-
verse to the longitudinal axis of said surface; and means
for transporting a shirt along said surface toward said
shirt-folding means.

18. An apparatus as described in claim 17 in which said
transporting means includes a pair of endless belts, each
of said belts having portions thereof mounted for move-
ment in substantially the same plane in which lies said
inclined surface.

19. An apparatus as described in claim 17 in which said
releasably mounting means includes a pair of elongated
members, each of said members being mounted for trans-
latory movement toward and away from said inclined sur-
face, and said shirt transporting means includes a pair
of longitudinally disposed feed belts having portions there-
of mounted for movement in substantially the same plane
in which lies said inclined surface, each of which is dis-
posed opposite a corresponding member of said releasably
mounting means.

20. An apparatus as described in claim 17 including
means for transporting a shirt toward said shirt-folding
means, and in which said shirt folding means includes a
rotatably mounted mandrel.

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