

SPECIFICATION

Apparatus for folding garments such as shirts

5 *Technical Field of the Invention*

The invention relates to apparatus for folding a garment such as a shirt.

Background Art

- 10 A shirt folding and pressing machine has been proposed which comprises a forming plate, reciprocable side plates, plates for folding a tail of the shirt over the remainder of the shirt and a stapler for securing folded over parts of the shirt together.
- 15 However, using this machine it is only possible to hold the tail of the shirt with staples. Sometimes it is desirable to avoid the use of staples to hold the tail of the shirt in position, and this is not possible with the proposed machine.

20 *Disclosure of the Invention*

It is an object of the invention to provide apparatus for folding garments which seeks to avoid these disadvantages.

- 25 In accordance with the invention there is provided apparatus for folding a garment such as a shirt, comprising a supporting plate to support a garment to be folded, a collar expander, a forming plate movable to a position above the supporting plate
- 30 and around which the garment is folded, reciprocable members beside longitudinal side edges of the forming plate for folding the side parts of a garment around folding lines, in use substantially parallel to the longitudinal axis of the garment, which are defined by each side edge of the forming plate, a supporting bar positionable in use
- 35 to extend above and transversely of the forming plate perpendicularly to the longitudinal direction of a garment, means for folding the tail part of the garment over the supporting bar, and a tuck-in device for tucking in the free tail of a pre-folded garment between the supporting bar and the
- 40 forming plate, the tuck-in device comprising a plate member, with a free front edge, connected to a reciprocable actuating drive via a pivot joint, the plate member cooperating with abutment means, the arrangement being such that in use on operation of the drive the plate member tilts and rolls around the abutment means from a first, upwardly inclined,
- 45 position, wherein it does not contact the garment, and advances to a second position in which the free front edge has passed below the supporting bar and has engaged and tucked-in the tail of the garment.

Apparatus for folding garments is hereinafter described, by way of example, with reference to the

55 accompanying drawings.

Brief Description of the Drawings

Figure 1 shows a side elevational view of the

60 apparatus, with part broken away for clarity, in accordance with the present invention;

Figure 2 shows a perspective view of the apparatus of Figure 1;

Figure 3 is a plan view, to an enlarged scale, of the

65 part of the apparatus indicated by the arrow 'A' in

Figures 1 and 2;

Figure 4 is a side view, to the same scale, of the part of the apparatus shown in Figure 3; and

70 Figures 5 and 6 show, to an enlarged scale, plan and end elevational views of a forming plate of the apparatus.

Referring to the drawings, there is shown apparatus 1 for folding a garment such as a shirt (not shown). The apparatus 1 comprises a forming plate 2 shown in position above a supporting and heating plate (not shown) which is generally horizontal. A first reciprocable plate 3 is situated at the right hand end (as viewed in the drawings) of the forming plate 2. The plate 3 is pivotable about a horizontal axis 4. A shirt tail folding plate 5 is pivoted to the plate 3 about the horizontal axis 4 so that it is movable through the arc shown in chain dotted lines in Figure 1. At each side of the apparatus 1 there is a respective pair of plates 6 and 7. At the left hand end (as viewed in the drawings) there is a tiltable plate 8 for tucking in the tail of a shirt. There is a device mounted on one side of the apparatus and which is reciprocable transversely of the apparatus for providing a supporting bar 9 for the tail of the shirt so that tail is folded about a straight line. Finally the apparatus includes a collar expander 10 of known construction and operation.

The forming plate 2 is secured to a bracket 11 as by bolts 12 which pass through slots 13 (Figure 5) so that the position of the plate 2 can be adjusted to left or right when those bolts 12 are slackened off. The forming plate 2 has two lateral edge portions 14 inclined at 8° to the horizontal with a flat part 15 in between, which flat part 15 acts as a button retainer.

100 Two opposed lugs 17 each with a raised and inwardly directed forward part 18 are secured to the forming plate 2 to form a 'V'-guide of 30° opening for the tiltable plate 8 and to raise the shirt.

The heating plate has guide means in the form of butts or strips (not shown) at the side for positioning a template.

The bracket 11 is pivoted to a frame of the apparatus 1 for movement about a horizontal axis 19 and is itself secured to a plate 20 which carries two spaced cylindrical bosses 21 mounted with the plane surfaces vertical. The plate 20 in turn carries an upright yoke 22 from the upper (as viewed) part of which projects a member 23 which acts both as a counterbalance arm and as a lifting handle. (The member 23 is omitted from Figure 3 for clarity). To the yoke 22 there is secured a cylinder 24 which has a piston 25 carrying a knuckle 26 in which is pivoted a lug 27 secured to the tiltable plate 8 which rests on the lugs 21 as shown in Figures 1 and 4. The forming plate 2, tiltable plate 8, cylinder 24 and arm 23 thus form one unit pivotable about the horizontal axis 19.

The heating plate is flat and has a longitudinally extending recessed channel in it to act as a button guide. The plate 3 also has a channel 28 in it aligned with the channel of the heating plate and also acting as a button guide.

The tiltable plate 8 is generally rectangular and has a rounded free end 29 for facilitating "rolling" of the shirt over plate 8 during tucking in so that the material of the shirt is not rucked or snagged.

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The plates 2, 3, 5, 6, 7 and 8 are moved by pneumatic cylinders. Thus the cylinder 24 is a pneumatic cylinder of 20 cm stroke. However, it will be understood that any means may be employed for movement of the different plates.

In order to fold a shirt a buttoned shirt is laid with its front side facing downward on the heating plate and on the plate 3, and in doing so the collar comes to lie around the collar expander 10, which extends up into the collar which is open downward. The buttons of the shirt are laid in the channels of the heating plate and of the plate 3, an operator of the apparatus ensuring that the buttons are correctly positioned in these channels. A template (not shown) e.g. of cardboard or other stiff card is then laid on the rear or upper side of the shirt. The sheet has a protrusion which is inserted into the collar for holding it in place. The collar expander 10 is then actuated to hold fast the shirt in this area, whereby the collar is expanded to its full size. One can however also proceed in an opposite manner, so that the collar expander is first actuated and the template is laid on afterward. One can proceed in various ways depending on how the shirt is to be folded. One way consists in folding one sleeve across the template, so that one cuff lies outwards and later forwards, i.e. at the front of the folded shirt. Another procedure consists in placing one sleeve upon the other sleeve that is folded inward that the folded shirt does not show any visible cuff. After the sleeves are folded in one of these ways, about 10 centimetres of the lower end or tail of the shirt is folded onto the remaining part of the shirt. The handle 23 is then pulled to pivot the pivotable unit 2, 8, 23 and 24 about the axis 19 so that the forming plate 2 lies on the template. Now plate 5 is swung down to firmly clamp the lower area of the shirt with the shirt that is folded upward. Plates 6 and 7 are now automatically simultaneously pushed in, that is to say they are pushed inwardly over plates 2 and 3, in order to enclose the sides of the shirt between themselves and the plates 2 and 3 and a pin or clip is then manually placed, by an operator of the apparatus, in the material of the shirt where the folded together shoulders meet, to keep the shirt in the desired arrangement.

The control of the apparatus is preferably such that the swinging down of the plate 5 actuates a micro-switch which thereafter passes impulses to cylinders which automatically push in the side plates 6 and 7.

The control is further such, that after the inward movement, all of the side plates 6 and 7 slide outwards to their outermost positions (the Figure 2 positions) which outwards sliding of the side plates preferably occurs simultaneously. Thereafter plates 3 and 5 are raised a few centimetres. The shirt accordingly now lies with its lower part upon plate 3 and folded around the forming plate 2 and the plate 5. The plates 3 and 5 are then, as a continuous operation after the raising, pushed further forward (to the left) over the forming plate 2, whereby the part of the shirt surrounding plate 5 slides off from this plate and finally slides off from the foremost edge of plate 3, which is provided with a bulge, lip or

the like extending across it. As the plates 3 and 5 move to the left as viewed, they operate a microswitch which in turn actuates the cylinder to extend the supporting bar 9. The movement of the plate 5 causes the tail of the shirt to lie over the supporting bar 9 and to come to rest under the tilting plate 8. After attaining their leftmost position, plates 3 and 5 move back. During this movement a cam actuates a one-way switch which actuates the cylinder 24 to extend the piston 25 to the right. This in turn moves the tilting plate 8 to the right. This movement causes the tilting plate 8 to "roll round" the lugs 21, freely pivoting at the knuckle joint 26, 27 to do so, to attain a horizontal position so that its rounded end 29 engages the tail of the shirt, held up by the bar and by the raised ends of the guides, and tucks the tail in between the raised back of the shirt and the plate 2. The guides 17 ensure an accurate and true entry of the tucking in plate 8 with no wobble, while the supporting bar 9 ensures a clean fold of the tail with no "rucking" of the material.

At the end of travel of the cam the switch is switched off and thus retracts the supporting bar 9, and the tiltable plate 8 to the position shown in Figure 1. The plate 5 resumes its inclined angle, about 120° with respect to plate 3, and this plate with outward movement to the level of the heating plate.

Then the handle 23 is manually swung up and in doing so it lifts the forming plate 2 from which the completed folded shirt is lifted.

Figure 1 shows in greater detail the construction of an apparatus. A frame work 31 of the apparatus comprises, within end panels, vertical struts which are interconnected at their upper ends by e.g. tubular bearing elements 32 extending longitudinally of the apparatus.

Approximately centrally of the apparatus there is a beam 33 which extends in the longitudinal direction through the apparatus. Within the end panels the struts are interconnected near their lower ends by horizontal transverse elements provided with feet 34, the height of which is adjustable, and which can be made of tubes or the like which are slidable in the vertical direction and are securable by means of lock screws. At one long side of the apparatus the feed can be longer to enable inclination of the apparatus in the working position. For this purpose the foot ends can be somewhat oblique.

Below the bearing elements 32 and in the longitudinal direction of the apparatus 1 there extends for instance a pneumatic cylinder 35, the upper side of which can be provided with a longitudinal slot (not shown), out of which protrudes a carrier 36 connected to the cylinder piston and adjustably, which means by horizontal displacement, supporting a slider 37 which supports the plates 3 and 5. As mentioned before, the guiding of plate 3 and thus slider 37 is such, that starting from the position shown in Figure 1, a movement is obtained which is directed inclined upwards and leftwards in relation to plate 2.

The heating plate has wiring 38 for heating the plate.

The beam 33 supports hydraulic and pneumatic

cylinders 39 actuating supporting bars 40, at the upper ends of each of which the respective plates 6 and 7 are supported adjustably about axles and by means of stop screws. There are altogether four bars 5 40 each supporting a plate 6 or 7. The lower ends of the bars 40 are swingable about lower axles 41 extending in the longitudinal direction of the apparatus and preferably between the ends of the transverse beams.

10 The beam 33 also carries a manometer 42 for controlling incoming pressurised air and carries a receptacle 43 for lubrication, which is fed via passage (not shown) to various points requiring lubrication.

15 Figure 1 also shows a clamp strip 44 for electrical wiring and a control unit 45, which can be located lowermost in the apparatus.

The drawings show that all the sides of the apparatus are covered by protection panels or plates 20 46. The vertical edges of one panel can be secured to the struts on one longitudinal side of the apparatus, together with which pair of struts said plate is removable.

On that long side of the apparatus where an 25 operator works, there can be outside the movable protecting plate 46 a so-called knee control 47 to be actuated by a knee of the operator to e.g. initiate a working operation. To the left of said control, the stationary part of the apparatus 1 can provide a 30 keyboard with an emergency stop, control lamp and thermostatic hand-wheel (all not shown) for adjusting the temperature of the heating plate.

In the drawings 48 designates a support for plate 5 in its upright position.

35 It will be understood that the term "shirts" used herein is intended to cover any similar garment such as a blouse, pyjama top, sweater or similar article of clothing, whether with or without buttons or zips at the front or back, or with or without sleeves.

40 It will be further understood that the invention shown in the drawings and above described may be modified. For example the tiltable plate may be curved. Also, though the supporting and heating plate has been described as being heatable, it may 45 not be so, in which case it merely acts as a base plate or support plate of the apparatus.

CLAIMS

50 1. Apparatus for folding a garment such as a shirt, comprising a supporting plate to support a garment to be folded, a collar expander, a forming plate movable to a position above the supporting plate and around which the garment is folded, 55 reciprocable members beside longitudinal side edges of the forming plate for folding the side parts of a garment around folding lines, in use substantially parallel to the longitudinal axis of the garment, which are defined by each side edge of the 60 forming plate, a supporting bar positionable in use to extend above and transversely of the forming plate perpendicularly to the longitudinal direction of a garment, means for folding the tail part of the garment over the supporting bar, and a tuck-in 65 device for tucking in the free tail of a pre-folded

garment between the supporting bar and the forming plate, the tuck-in device comprising a plate member, with a free front edge, connected to a reciprocable actuating drive *via* a pivot joint, the 70 plate member cooperating with abutment means, the arrangement being such that in use on operation of the drive the plate member tilts and rolls around the abutment means from a first, upwardly inclined, position, wherein it does not contact the garment, 75 and advances to a second position in which the free front edge has passed below the supporting bar and has engaged and tucked-in the tail of the garment.

2. Apparatus according to Claim 1, wherein the pivot joint is provided on the upper (in use) side of 80 the plate member and wherein the abutment means cooperates with the lower (in use) side of the plate member.

3. Apparatus according to Claim 1 or Claim 2, wherein the reciprocable actuating drive comprises 85 a piston rod of a cylinder unit.

4. Apparatus according to any preceding claim, wherein the supporting bar is an extendable bar comprising a piston rod of a reciprocable piston-cylinder arrangement.

90 5. Apparatus according to any preceding claim, wherein on the forming plate guide means for the plate member of the tuck-in device are provided for guiding the plate member during its travel to said second position.

95 6. Apparatus according to any preceding claim, wherein further guide means are provided on the supporting plate for locating a template on the garment to be folded.

7. Apparatus for folding a garment such as a 100 shirt, substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

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3. Apparatus according to Claim 1 or Claim 2, wherein the reciprocable actuating drive comprises a piston rod of a cylinder unit. 85

4. Apparatus according to any preceding claim, wherein the supporting bar is an extendable bar comprising a piston rod of a reciprocable piston-cylinder arrangement.

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