

# United States Patent

Hrubecky

[15] 3,639,915

[45] Feb. 8, 1972

[54] **DISPOSABLE GARMENT AND METHOD AND APPARATUS FOR MAKING SAME**

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[52] U.S. Cl. ....2/114

[51] Int. Cl. ....A41b 9/00

[58] Field of Search .....2/DIG. 7, 114; D2/12, 17, 183, D2/92

[56] **References Cited**

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[57]

**ABSTRACT**

A disposable garment is composed of a rectangular torso section having its quarter sections folded inward to define front and back panels, and a rectangular yoke and sleeve section folded longitudinally, with the torso section secured between the edges of the folds of the yoke and sleeve section. Method and apparatus are provided for making the garment from two continuous fabric webs.

2 Claims, 7 Drawing Figures

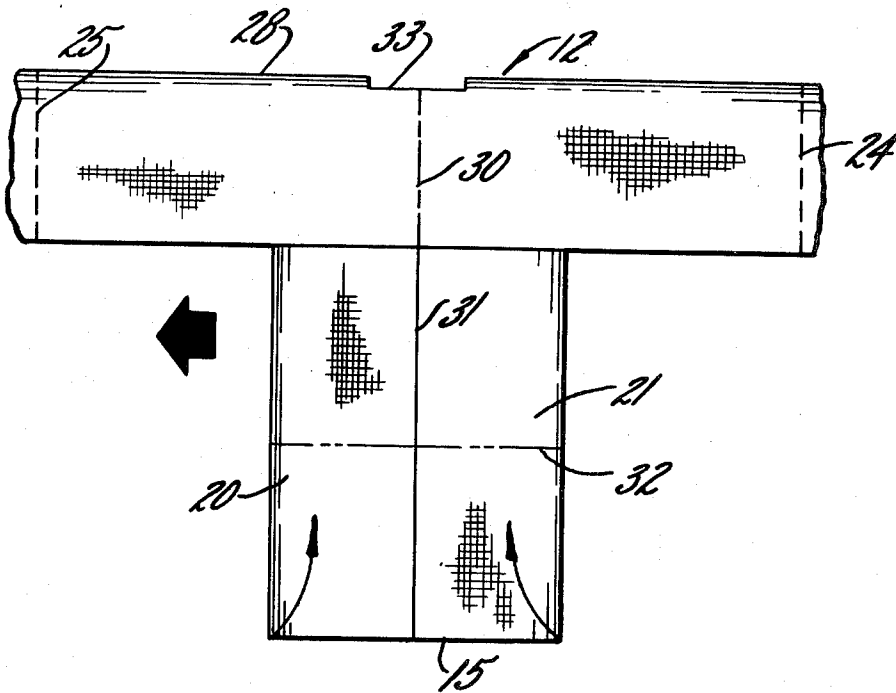


FIG. 1

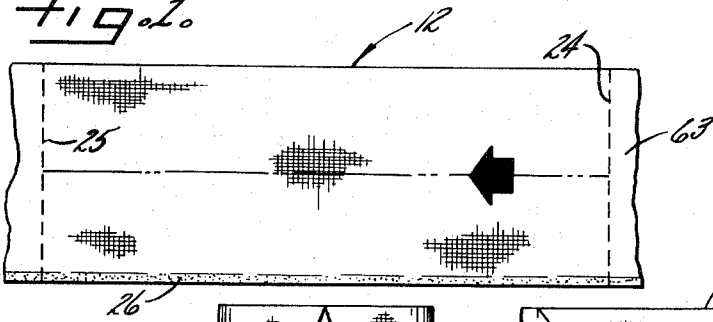


FIG. 2

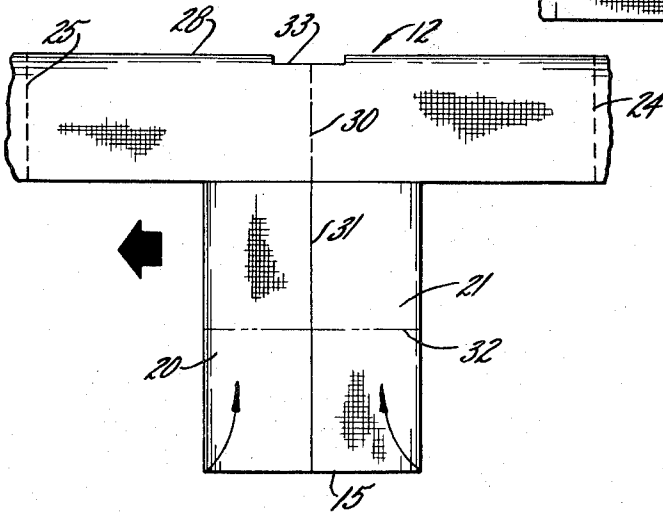
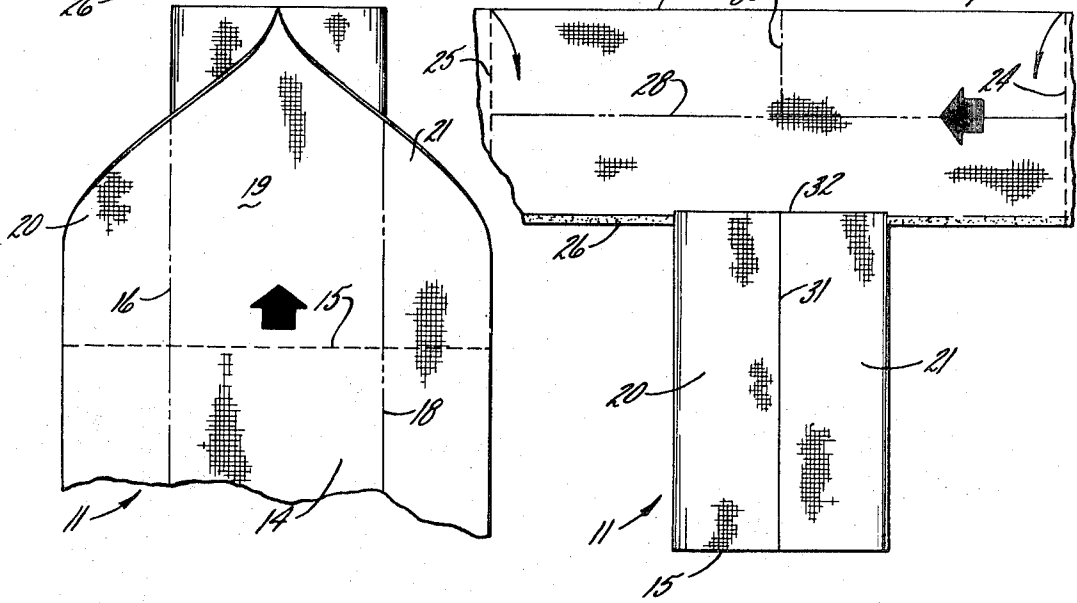


FIG. 3

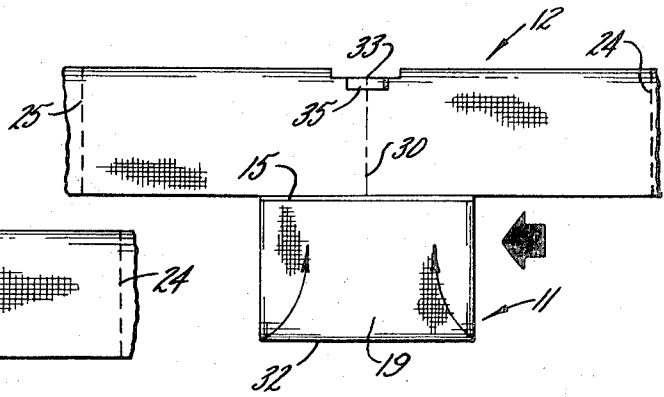


FIG. 4

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ATTORNEYS.

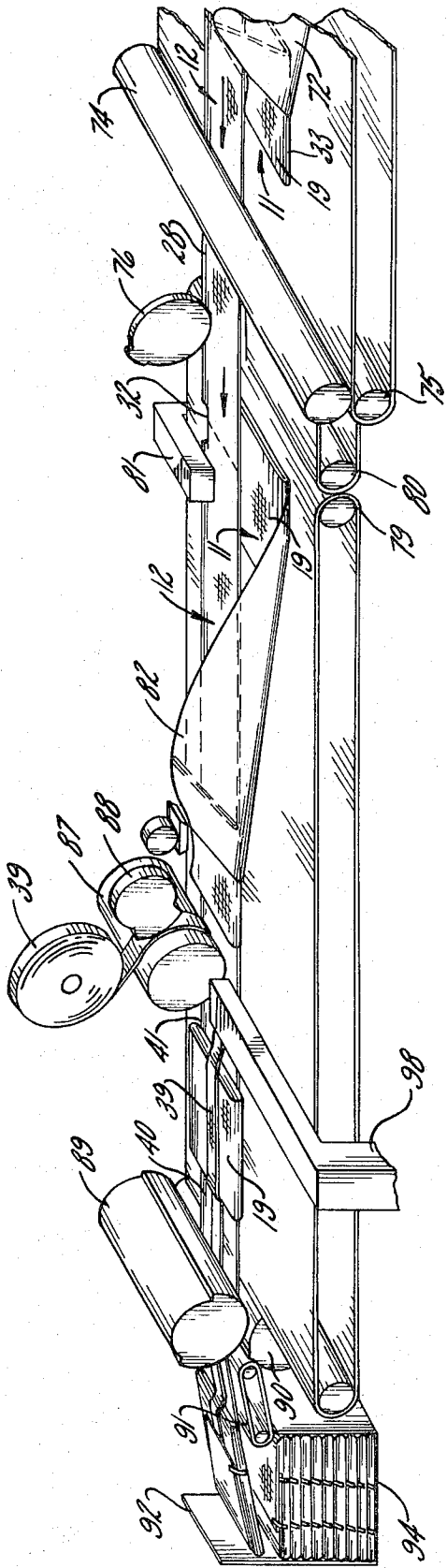
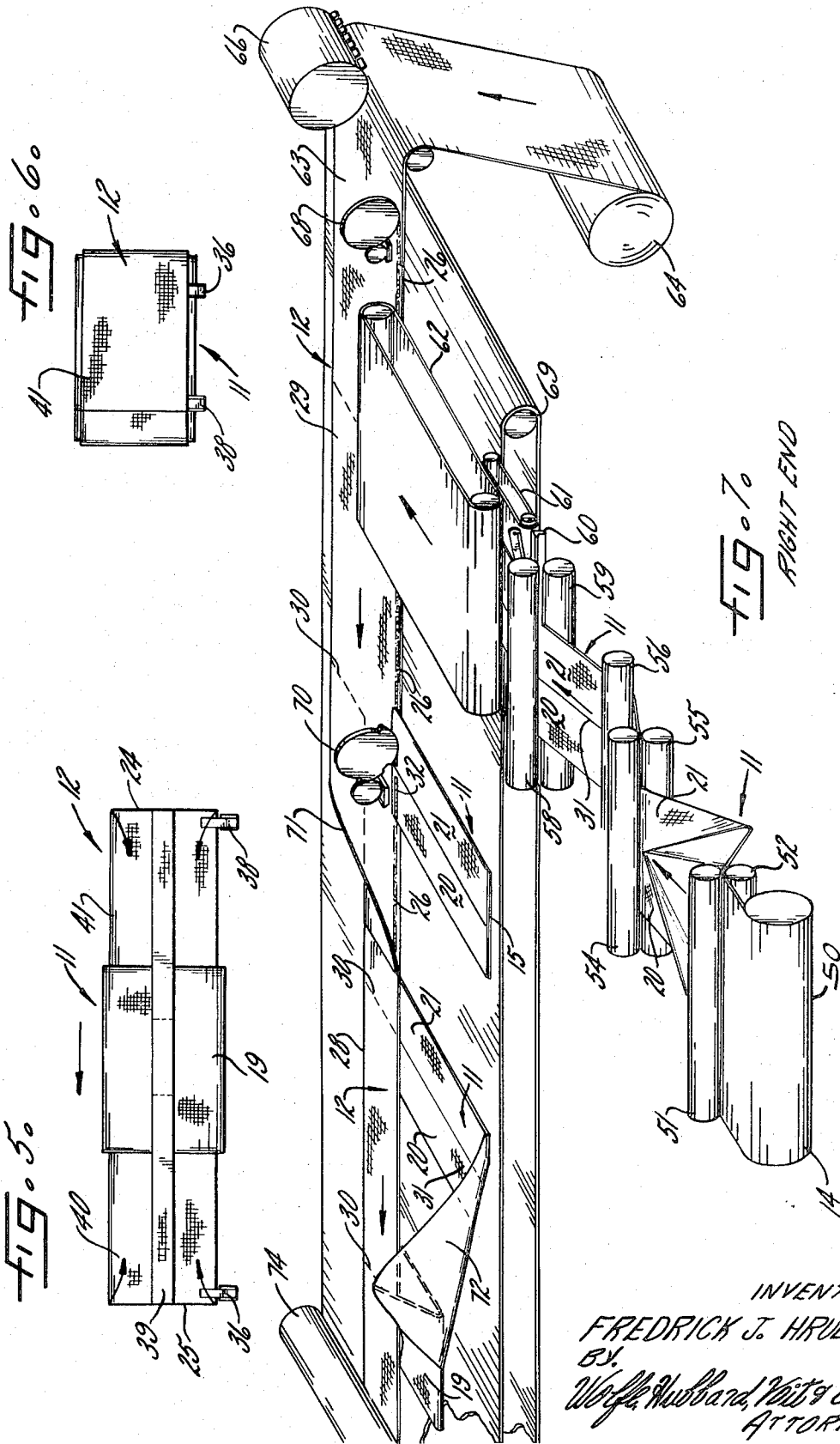


FIG. 70  
LEFT END

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## DISPOSABLE GARMENT AND METHOD AND APPARATUS FOR MAKING SAME

### CROSS-REFERENCE TO RELATED APPLICATIONS

David L. Middleton, Ser. No. 827,493 filed May 21, 1969.

### BACKGROUND AND OBJECTS

This invention relates to disposable garments, and more particularly provides a disposable garment and method and apparatus for making the same.

An object of the invention is to provide a disposable garment which is simple to fabricate, which utilizes the entire web or webs of material without scrap or waste, and which can be worn by users of different sizes.

Another object is to provide a garment construction which is suitable as a hospital gown for hospital staff, patients, and visitors to isolation wards; which in slightly modified form is useful as a beauty shop or barber shop gown, and particularly useful as a disposable shop or technician's coat especially for work near radioactive materials. A related object is to provide a disposable garment wherein the seam lines are so arranged as to avoid catching particulate matter, whether it be hair clippings or toxic substances.

An additional object is to provide a garment construction accommodating a varied selection of belts or other auxiliaries for securing the waist, neck, and/or cuff areas. A more particular object is to provide a garment construction readily adjustable to different sleeve lengths and/or torso lengths.

An overall object is to provide a method and apparatus for making disposable garments, which method and apparatus feature a relatively few fabricating steps capable of being carried out rapidly and efficiently; which permit the fabrication of a disposable garment without wastage or other scrap; which can utilize adhesives rather than more expensive sewing operations; and which may readily be adjusted to provide a varied selection of garment sizes and sleeve and torso lengths.

Other and more particular objects will become apparent as the description of this invention proceeds.

### BRIEF DESCRIPTION OF DRAWINGS

In the drawings,

FIGS. 1 through 6, in general sequence, depict an illustrative series of operations in fabricating a garment of the invention, commencing from two unfolded uncut webs in FIG. 1 to a folded garment in FIG. 6 as it is supplied to the consumer; and

FIG. 7 is a frontal semiperspective view, largely schematic, showing an illustrative apparatus of the invention.

While the invention will be described in conjunction with illustrative embodiments as depicted in the drawings, it is apparent that these are only for illustrative purposes. Accordingly, various alternatives, modifications, and variations will be evident to those skilled in the art in light of the illustrations, and accordingly it is intended to embrace all such alternatives, modifications, and variations as fall within the spirit and broad scope of the invention.

### DETAILED DESCRIPTION

Disposable garments used by the staff, by patients, and by visitors in hospitals are customarily worn once and then discarded to avoid the possibility of contamination by inadequate laundering. In beauty shops and barber shops, it is desirable for aesthetic reasons that each customer be provided with a fresh gown. In industry, especially in chemical laboratories and shops where hazardous substances are present, disposable garments are used to avoid or minimize the likelihood of toxic or other harmful substances remaining in contact with the wearer. Disposable raincoats have also become popular.

In all of the foregoing applications there exist a number of common denominators that are uniquely satisfied by the present garments. Low cost; ease of fabrication; versatile con-

struction; avoidance or minimization of seams; ability to be manufactured simply and at high speed; and a cost sufficiently low that disposal after one or, at most, a few wearings is justified.

In keeping with the invention, and inviting attention to the sequence of FIGS. 1 through 6, the garment of the invention is manufactured essentially from two rectangular sections of a fabric material, the torso section or web 11 and the yoke and sleeve section (yoke-sleeve web) 12. These are folded and adhesively secured to provide a simple yet functional garment, shown almost completed in FIG. 3, that answers to the varied requirements set forth above.

The fabric may be any woven or nonwoven material suitable for the particular purpose for which the garment is to be used. For low cost and disposability, the fabric is normally a nonwoven cellulosic material such as the nonwoven paperlike materials, either by themselves or with reinforcing scrim or threads. Where desired, the fabric may be impregnated with fire-resisting phosphorus or chlorine-containing compounds, or may be rendered water repellent by treatment with a metal soap. When used as a disposable raincoat, the fabric may be plastic coated or impregnated, as for example polyethylene coated paper, or may be entirely of plastic, such as polyvinyl chloride or polyethylene sheet material.

Turning to FIG. 1, the torso section or web 11 is derived from a continuous web 14, typically 52 inches wide. This is cut perpendicularly along phantom line 15 to a length of 32 inches for a full-length hospital gown which fits the average male patient. The dimensions of the torso section 11 and of the yoke and sleeve section (yoke-sleeve web) 12 are derived from the best fit for the 50 percentile man, as described in "The Measure of Man," by Henry Drefuss, Whitney Library of Design, New York.

The torso section 11 is folded along longitudinal fold lines 16, 18 located substantially at the quarter sections; that is, when a cut torso section 11 is folded along the fold lines 16, 18, the folded portions each constitute about one fourth of the original torso section width of about 52 inches.

Normally a disposable garment of the general type described herein is used with the opening at the rear. Thus, after folding the torso section 11 along the fold lines 16, 18, the central or integral panel 19 will usually be worn to the front, while the divided or bifurcated quarter sections 20, 21 are to the rear. However, a similar or identical garment when used as a raincoat is usually worn with the integral torso panel 19 to the rear and with the bifurcated torso panels 20, 21 at the front. To avoid arbitrarily classifying the present garment as one having at its opening to the front or to the rear, the terms "front" and "rear" will hereafter be avoided.

As further shown in FIG. 1, the yoke and sleeve section continuous 12 is a rectangular portion of a second fabric web, of the same or of a different fabric from that used in making the torso section 11. Again employing the example of a hospital gown with long sleeves, designed to fit the 50 percentile man, the yoke and sleeve section 12 is cut from a web of about 26 inches in width. The web will ultimately be cut perpendicularly along phantom lines 24, 25 located 72 inches apart. In the FIGS. 1 through 6, the lines 24, 25 are shown in phantom to indicate that, in keeping with the optimum practice of the invention, these lines are cut only near the end of the garment manufacturing sequence.

After folding the torso section 11 along the fold lines 16, 18, the next operation is to assemble the folded torso section 11, after cutting along phantom line 15, to the yoke and sleeve section 12. To accomplish this, an adhesive is applied along one edge 26 of the yoke and sleeve section 12, and the integral torso panel 19 of the torso section 11 is adhesively secured to the adhesive-bearing edge 26 of the rectangular yoke and sleeve section 12. The partly assembled garment at this stage is shown in FIG. 2.

After assembly of the torso section 11 to the yoke and sleeve section 12, the latter section 12 is then folded longitudinally along the fold line 28, which is the center line of the

yoke-sleeve section over the secured end of the torso section 11. The edge or end 29 of the yoke and sleeve section 12 is thus placed over the opposite or adhesive-containing edge 26 of the yoke and sleeve section 12 to overlap the section 12, and these opposite edges or ends 26, 29 are secured together along their continuation to define the sleeves 40, 41 (FIG. 5). Additionally, the edge 29 is secured to the bifurcated torso panels 20, 21 of the torso section 11.

Just prior to, or during, the folding of the yoke and sleeve section 12 along the fold line 28, perforations 30 are cut into the fabric of the yoke and sleeve section 12 along a line registering or aligned with the bifurcation line 31 formed by the adjacent longitudinal edges of the torso panels 20, 21, that is, along the intersection between the two bifurcated torso panels 20, 21 which defines a straight garment torso opening. The perforations 30 which provide a neck aperture when opened extend from the edge 29 of the yoke and sleeve section 12 remote from the torso section 11 down to the fold line 28, which is located approximately half way across the web constituting the yoke and sleeve section 12. Thus, after the yoke and sleeve section 12 is folded longitudinally along the fold line 28, the perforations 30 are aligned with the bifurcation line 31, as best shown in FIG. 3.

At this point little discussion has been directed to the manner and sequence of applying adhesives. This primarily is for the reason that techniques for applying adhesives depend primarily on the nature of the adhesive material, together with the fabric substrate and the conditions of drying or otherwise hardening the adhesive. Where the adhesive is a water resistant air drying adhesive, such as one of the organic polymers in a volatile organic solvent, the adhesive solution of polymer in solvent is applied to one of the fabric surfaces shortly before the contacting surface is placed on top of it. It is then desirable to maintain the surfaces immobile, and preferably under slight pressure, while the solvent is removed by volatilization.

In the sequence of FIGS. 1, 2, and 3, the adhesive layer is applied along one edge 26 of the yoke and sleeve section 12 shortly before the torso section 11 is placed atop the adhesive 26, as shown in FIG. 2. Then, a second layer of adhesive 32 is applied along the top of the bifurcated torso panels 20, 21. Finally, the opposite edge 29 of the yoke and sleeve section 12 is folded along the fold line 28, and the edge 29 is adhesively secured along the exposed adhesive 26 on the yoke and sleeve section 12 and on the freshly applied adhesive 32 on the torso section 11. It will be apparent, therefore, that the simple application of two bands or strips of adhesive 26, 32 secures the defined body yoke and sleeves 12 to the torso section 11, thereby forming a pair of sleeves and a substantially complete garment, as shown in FIG. 3. It should also be noted that the adhesive 26 and the adhesive 32 form a substantially continuous strip securing the torso section 11 to the yoke and sleeve section 12 and also securing the seams of the sleeves.

As shown in FIG. 3, the bifurcation line 31 of the torso section 11 and the perforated or cut line 30 in the yoke and sleeve section 12 extend to a second perforated or cut region defining a neck collar opening 33 at or near the fold line 28 at the center of the yoke and sleeve section 12. This neck collar opening 33 may, as shown in FIG. 3, be cut out completely or may merely be partially cut or perforated, leaving final cutting to the wearer.

From the partially assembled gown of FIG. 3, the final assembly and folding operations then commence. First, the torso section 11 is folded in half along a fold line 33 (FIG. 0) perpendicular to the length of the torso section 11, thereby halving the length of the torso section, as shown in FIG. 4.

Substantially concurrently with folding the torso section 11 from the position of FIG. 3 to that of FIG. 4, a neck tape 35 is attached near the neck collar opening 33. The tape 35 advantageously is a 6 inch length of woven or nonwoven fabric having a pressure sensitive, normally tacky, adhesive along its entire length, but with half of its length protected by a polyethylene-coated adherent fabric strip. Thus, when the

neck tape 35 is placed along the neck collar opening 33, only that portion of the tape 35 which is not protected by the adherent strip is adhesively secured to the yokes and sleeve section 12, while the protected portion remains free. Then, after the wearer has donned the garment, either he or a colleague merely removes the adherent strip and secures the freshly exposed adhesive half to the opposite side of the neck collar opening 33.

Several operations are performed between view of FIG. 4 and that of FIG. 5. First, the previously folded torso section 11 (FIG. 4) is folded toward the yoke and sleeve section 12. Second, a pair of wrist-securing tapes 36, 38 is affixed near the respective ends of the sleeves along the sleeve seams; these tapes likewise are about 6 inches long, coated on one side with a tacky pressure-sensitive adhesive, and protected through half their length by an adherent coated strip removed when donning the garment.

The next-to-last operation between FIG. 4 and FIG. 5 is the securing of a waist belt or tape 39 longitudinally along the integral torso panel 19 of the torso section 11. This tape or belt 39 extends along the entire length of the yoke and sleeve section 12.

The final operation between the view of FIG. 4 and that of FIG. 5 is the perpendicular cutting of the yoke and sleeve section 12, together with the belt 39 (which by now is adhesively secured to the integral torso panel 19), to the desired length, illustratively of 72 inches, along lines 24, 25. The garment is now fully assembled, and only the sleeves 40, 41 need be folded transversely toward the center to provide a compact package, which is flat and rectangular and which accordingly is conveniently shipped, stored, and handled.

To don the garment, the sleeves 40, 41 are unfolded, the torso section 11 is also unfolded, the perforated line 30 is cut (if not already cut), and the sleeves 40, 41 placed over the wearer's arms. The waist belt or tape 39 is then tied in place, and the adherent strips removed from the wrist tapes 36, 38 and the neck tape 35, and the corresponding aperture then closed. For most purposes the garment is entered from the rear, thus presenting a smooth frontal surface, or integral torso panel 19, to the front, but when used as a raincoat the bifurcation line 31 (FIGS. 1, 2, 3) will commonly be at the front.

While the described embodiment illustrates an absence of overlap or gap between the bifurcated torso panels 20, 21 (FIGS. 1, 2), for some purposes it is desired to provide such an overlap. To this end, either or both of the torso panels 20, 21 is made wider than a fourth of the width of the web 14, and the overlapped portion retained under the opposite torso panel (20 or 21) when these panels 20, 21 are folded into the position shown in FIG. 2.

As indicated previously, a particular feature of the present invention is the provision of a continuous method and apparatus for the high-speed fabrication of the garment described herein.

Accordingly, directing attention to FIG. 7, an apparatus in keeping with the invention is depicted in a schematic perspective view. For orientation, the numbering system employed to describe FIGS. 1 through 6 has been retained, and parenthetical notes on FIG. 7 indicate the approximate correspondence between the assembly stages of FIGS. 1 through 6 and that of FIG. 7. It should be noted that the correspondence is not precise, as indeed it was noted earlier that the particular requirements of a machine will dictate the exact sequence of operations. Accordingly, the elements or steps in fabricating a garment according to the invention need not follow the sequence or order described earlier or to be described now in connection with FIG. 7.

With regard to FIG. 7, the first roll of material 50 is advanced to form the continuous web 14 which ultimately is to become the torso section of the garment. The web 14 is about 52 inches wide, and is a laminate of cross-laid nonwoven cellulose fibers, commercially available as "Kaycel." The web 14 is fed through driven nip rolls 51, 52, and then folded in a fold-

ing unit 54 to the doubled-quarter folded arrangement shown earlier in FIG. 1. The resulting double thickness web, half the original width of the web 14, then is fed through another pair of driven nip rolls 54, 55 and under a dance roll 56.

The nip rolls 51, 52 and 54, 55 are driven at a constant speed, but a third pair of nip rolls 58, 59 stops momentarily during the cutting strokes delivered by a cutter 60. During this cut, the dance roll 56 takes up the festoon between the nip rolls 54, 55 and 58, 59. The cut, as indicated earlier, is about 32 inches long and perpendicular to the length of the web.

After cutting, the torso section 11 is fed onto a cross layer section 61, where it is held to the underside of a transfer belt 62 by suction applied to the top of the belt 62.

While this is occurring, a second continuous web 63 is withdrawn from the feed roll 64. This second web will ultimately be the yoke and sleeve section 12 (FIGS. 1-6) which covers the shoulders, tops, front, and back of the wearer down to the mammillary line.

Just as the web 63 is withdrawn from the roll 64, two operations are performed on the web. First, a perforator 66 applies the perforated line 30 (FIG. 2) perpendicular to the web 63 and extending from the edge 29 to about half the width of the web 63. This provides the back opening to the garment, and will be registered with the bifurcation line 31 (FIG. 2) between the two folded quarter sections 20, 21 of the torso section 11 (FIG. 1 and FIG. 7).

The second operation applied to the web 63 as it leaves the roll 64 is the deposition of an adhesive strip or band 26 along the edge opposite the edge 29 by a rotogravure roll 68.

When the torso section 11 from the web 14 is located over the yoke and sleeve section web 63, the transfer belt 62 is temporarily stopped, and the cross layer section 61 performs an elliptical motion, laying the torso section 11 onto the second transfer belt 69. The position of the two transfer belts 62, 69 is so adjusted that the leading edge 32 of the torso section 11 overlaps the adhesive-bearing edge 26 of the yoke and sleeve web 63. This operation is timed so that the bifurcation line 31 (FIG. 2) of the torso section 11 is aligned with the perforation 30 of the yoke and sleeve web 63 (FIGS. 2, 3), thus forming a partially assembled gown or garment that, when completely assembled, will have a continuous back slit from top to bottom, that is, a straight garment torso opening. The perforation allows folding, but is easily broken to facilitate donning a garment.

A second rotogravure or cameo roll 70 applies an additional adhesive 32 to the bifurcated torso panels 20, 21, with a skip at the butted edges of the folded torso section 11 to assure easy opening of the assembled garment.

A folding iron 71 cooperating with the second transfer belt 69 longitudinally folds the yoke and sleeve web 63 at a central fold line 28. The iron 71 also presses the newly folded half of the yoke and sleeve web 63, or the yoke and sleeve section 12 (in FIGS. 1-6), onto the adhesive 32 on the torso section panels 20, 21, and along the continuation of the adhesive 32, that is, the seam-defining adhesive 26 on the yoke and sleeve web 63.

Between the first folding iron and a second folding iron 72, the partially assembled garment is passed under a series of radiant heating lamps, not shown, to dry the adhesive seams. From these lamps, the partially assembled garment is passed to the second folding iron 72, which folds the torso section 11 in half along a fold line 34 (FIG. 3).

Leaving the second folding iron 72, the partially assembled garment is passed to an additional pair of nip rolls 74, 75 which controls the web 63 i.e., the yoke and sleeve section 12) feed and which creases the first fold 34 of the garments. When, in accordance with the preferred operation of the apparatus of FIG. 7, the web 63 has the machine direction running across the chest of the garment, the higher machine direction strength facilitates in pulling the web 63 through the apparatus and, additionally, provides a deterrent against tearing when the garment is donned.

A neck collar opening 33 is clipped from the folded yoke and sleeve section 12 by a pinch cutter 76 bearing on a mandrel 77 (as clearly shown in FIG. 3).

From the pinch cutter 76 and its mandrel 77, the yoke and sleeve section 12 (web 63) is transferred onto an additional carrier belt 79. The folded torso section 11 is fed to the second carrier belt 79 by an intermediate transfer belt 80.

A neck tape 35 is attached near the neck collar opening 33 by an attaching device 81 of conventional design. This tape 35 was discussed previously in connection with FIG. 4, and a similar pair of wrist tapes 36, 38 was described in relation to FIG. 5. A third folding iron 82 then comes into operation. This folds the already-folded torso section 11 onto the yoke and sleeve section 12 (web 63).

A driven roll 84 meters out a two inch wide belt or tie band 39, while a strip of adhesive is applied to the belt or band 39 by a rotogravure applicator 88. The belt 39 is adhesively secured to the middle of the front of the integral torso panel 19, as depicted in the drawing.

At substantially the same time as the belt 39 is being applied to the torso section 11, a pair of sleeve-closing tapes is adhesively applied to the glued or adhesive-bound seams of the yoke and sleeve section 12 by a reciprocating tape applicator 89. These wrist or cuff tapes 36, 38 have been described previously, and have half of their six inch length covered by a strip of adherent-coated material to prevent the covered portion of the tapes from sticking to the garment until it is desired to secure these respective apertures when the garment is worn.

A pair of driven rolls 89, 90 further advances the now almost completely assembled garment, and also cuts the web 63 (i.e., the yoke and sleeve section 12 of FIGS. 1-6). The cut is advantageously of the flying shear type so as not to disturb the central and longitudinal placement of the belt 39.

The upper roll 39 has suction applied to a foraminated section to permit the roll 89 to carry the incoming sleeve 40 (FIG. 2) and half of the belt 39 over the folded torso section 11 (FIG. 5). Thus, when the folded torso and yoke-sleeve pass on to the take-away belt 91, the leading sleeve 40 (FIG. 5) is released from the vacuum of the cutter roll 89 and falls down on top of the folded torso section 11.

The assembled garments are then conducted via the take-away belt 91 to a collection chute 92, and the take-away belt 91 swings through 180°, thereby folding the trailing sleeve 41 (FIG. 6) over on top of the leading sleeve 40 (FIG. 5), the folded torso section 11, and the remainder of the yoke and sleeve section 12. As the take-away belt 91 completes this swing, it releases a pawl, not shown, which allows the stack of finished garments 94 to descend by the thickness of one folded garment. The take-away belt 91 then flips back to receive the next garment whose leading sleeve is following around the top cutter roll 89.

Thus it is apparent that there has been provided, according to the invention, a uniquely simple—yet simply unique—disposable garment and continuous automatic method and apparatus of making the same, which garment, method, and apparatus fully satisfy the aims, objects, and advantages set forth earlier.

I claim as my invention:

1. A disposable garment comprising:

- a one-piece rectangular yoke-sleeve section with longitudinal half sections folded along the yoke-sleeve section center line providing a yoke and sleeves having bottom edges,
- a rectangular torso web with longitudinal quarter sections folded toward the torso section center line providing torso front and back panels having top edges secured between said longitudinal half sections of said yoke-sleeve section and adjacent longitudinal edges defining a straight garment torso opening,
- said bottom edges of said yoke overlapping the top edges of said back and front panels,
- straight adhesive seams extending along the bottom edges of said yoke and sleeves for securing said bottom edges of

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said sleeves together and the overlapped bottom edges of said yoke and top edges of said back and front panels together,  
 a transverse, at-least perforated line dividing one of said longitudinal half sections of said yoke-sleeve section to provide a neck aperture aligned with the straight garment torso opening,  
 whereby there is provided a disposable garment adapted to be fabricated by severing said rectangular torso and yoke-

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sleeve webs, respectively, from two continuous webs, folding the torso and the yoke-sleeve sections and securing the folded rectangular sections together by means of a straight adhesive seam.  
 2. A disposable garment as in claim 1 further comprising an at-least perforated neck collar opening that meets said neck aperture at the approximate longitudinal center of said yoke-sleeve section.

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UNITED STATES PATENT OFFICE  
CERTIFICATE OF CORRECTION

Patent No. 3,639,915 Dated February 8, 1972

Inventor(s) Frederick J. Hrubicky

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the Claims:

Claim 1, line 6, after "a" insert --one-piece--;

line 6, delete "web" and substitute therefor

--section--.

Signed and sealed this 4th day of July 1972.

(SEAL)  
Attest:

EDWARD M. FLETCHER, JR.  
Attesting Officer

ROBERT GOTTSCHALK  
Commissioner of Patents

UNITED STATES PATENT OFFICE  
CERTIFICATE OF CORRECTION

Patent No. 3,639,915 Dated February 8, 1972

Inventor(s) Frederick J. Hrubecky

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the Claims:

Claim 1, line 25, delete "webs" and  
substitute therefor --sections--.

Signed and sealed this 26th day of September 1972.

(SEAL)  
Attest:

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Commissioner of Patents