United States Patent

Truman

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[54] **GARMENT PRODUCTION APPARATUS WITH AUTOMATIC SLEEVE PLACEMENT**

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[52] **U.S. Cl.**.....**2/243 R**, 156/302, 156/552

[51] **Int. Cl.**.....**A41d**

[58] **Field of Search**...2/243 R, DIG. 7; 156/302, 552

[56] **References Cited**

UNITED STATES PATENTS

2,527,648	10/1950	Pesci	156/302 X
2,596,068	5/1952	Bunch et al	156/552 X
3,500,479	3/1970	Pierron	2/243 R
3,574,238	4/1971	McCurry	2/243 R
3,585,641	6/1971	Pierron	2/243 R X

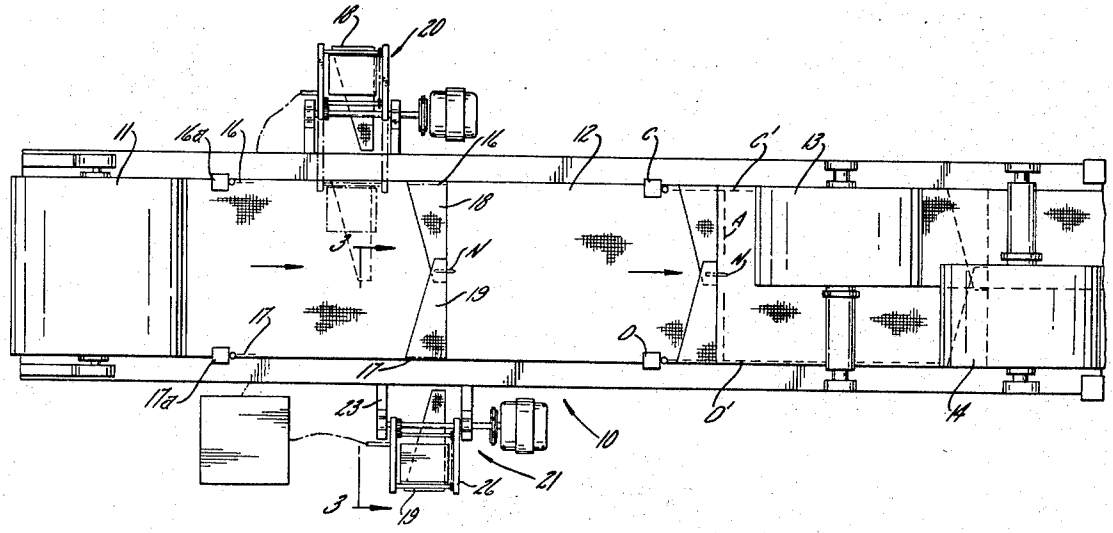
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[57] **ABSTRACT**

Apparatus for an automated garment production line for transferring to a moving web of material a pair of precut garment sleeves from stacks of sleeves on opposite sides of the web. A mechanism serving each stack employs a vacuum manifold, having a series of vacuum cups, located on a frame pivotally mounted to move between a sleeve pick-up position over the vertical stack of pre-cut sleeves to a deposit position over the moving web of garment material. As the frame swings, a drive mechanism causes the vacuum head to rotate, flipping the loose end of the sleeve across the web. The frame stops short of contact with the web holding the shoulder portion of the sleeve slightly off of the web until it registers with a line of adhesive carried by the web. The vacuum is then released and air pressure is introduced to blow the sleeve off the vacuum cups and onto the adhesive area on the moving web.

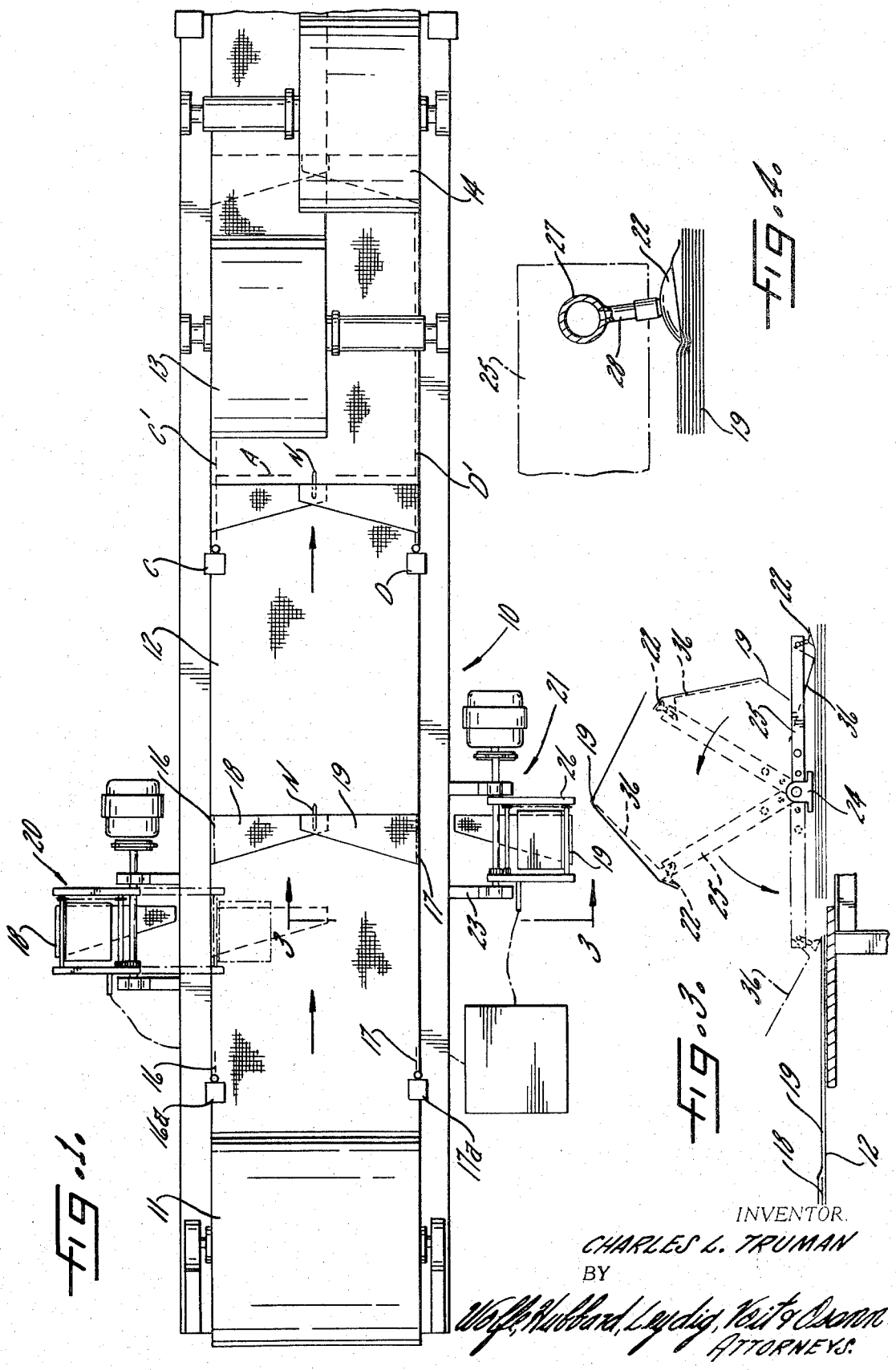
10 Claims, 4 Drawing Figures



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SHEET 1 OF 2



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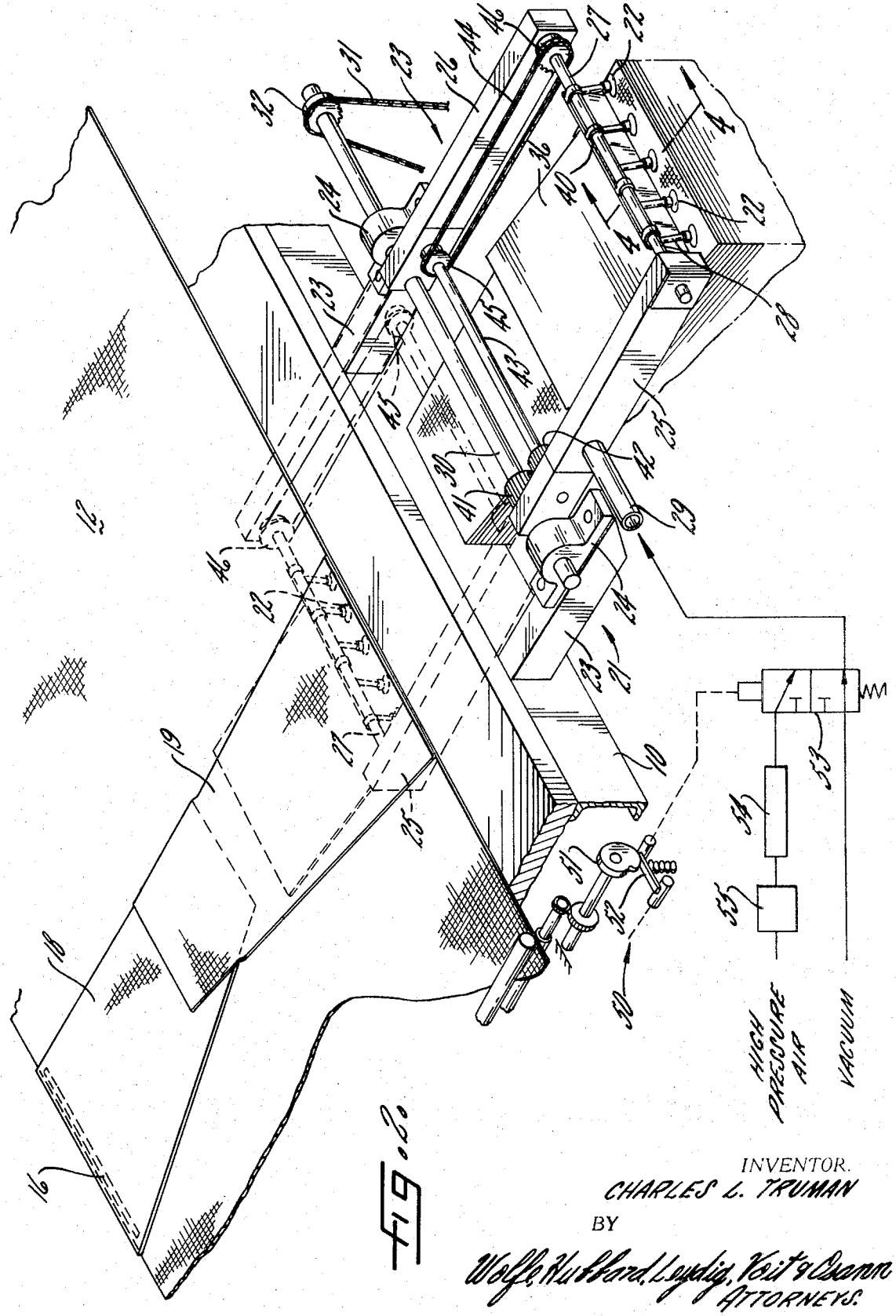


FIG. 2

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GARMENT PRODUCTION APPARATUS WITH AUTOMATIC SLEEVE PLACEMENT

DESCRIPTION OF THE INVENTION

The present invention relates generally to automated garment manufacturing apparatus and, more particularly, to automated apparatus for use in a production line for manufacturing garments from continuous webs of material for placing pre-cut garment sleeves transversely on a moving web.

Accordingly, it is a primary object of the present invention to provide automated sleeve placement apparatus which is capable of placing successive pairs of sleeves transversely at preselected intervals on a moving web.

It is another object of the present invention to provide automated sleeve placement apparatus of the foregoing type which is capable of picking-up the top sleeve from a verticle stack of pre-cut sleeves on either side of a moving web for placement on the web without disturbing the other sleeves in the stack.

It is a further object of the present invention to provide automated sleeve placement apparatus of the foregoing type which is capable of placing successive pairs of sleeves on a continuously moving web at high speeds, so that the web on which the sleeves are placed can also be advanced at correspondingly high speeds.

Still another object of the invention is to provide automated sleeve placement apparatus of the foregoing type which while requiring only a few moving parts and of simple construction is capable of separating the top sleeve from a stack without disturbing the other sleeves, holding the sleeve while it is transferred laterally, and depositing it in exact register on a high speed web.

Other objects and advantages of the invention will be apparent from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a top plan view of an automated garment production line with garment sleeve placement apparatus constructed in accordance with the invention;

FIG. 2 is a perspective view of one of the sleeve placement mechanisms shown in FIG. 1;

FIG. 3 is an enlarged fragmentary elevational view, partially in section, taken substantially in the plane of line 3—3 in FIG. 1 and schematically illustrating the mechanism movement and sleeve transferring operation;

FIG. 4 is an enlarged fragmentary sectional view taken substantially in the plane of line 4—4 in FIG. 2 and schematically illustrating the sleeve placement mechanism picking-up the top sleeve on a stack of precut sleeves.

While the invention is susceptible of various modifications and alternative forms, a preferred embodiment thereof has been shown in the drawings which will be described in detail herein.

It should be understood, however, that it is not intended to limit the invention to the particular form disclosed but, to the contrary, the intention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the invention as defined in the claims.

Turning now to the drawings, there is shown in FIG. 1 an automated garment production line including

sleeve placement apparatus embodying the invention. It will be understood however, that while this invention is particularly useful in the illustrative application, it can be used in a wide variety of different applications for pick-up, transferring and delivering flexible sheets of material of other like members.

In the garment manufacturing apparatus, referring to FIGS. 1–3, pairs of pre-cut sleeves are transferred to a continuously moving web **12** of garment material unwound from a roll **11** in timed sequence with the high speed movement of the web and adhesively adhered to the web. This web **12** forms the back panel of the garments. After the sleeves are adhesively secured to the back panel web **12**, webs which form the front panels of the garments are unwound from rolls **13, 14** adhesively secured to the back panel web **12** and the sleeves. The webs are subsequently cut to produce the finished garments.

After the web **12** is withdrawn from the roll **11**, it is passed under a guide roll (not shown) and through an adhesive application stage. More particularly, longitudinal strips of adhesive **16** and **17** are applied to the two longitudinal edges of the web **12** by a pair of adhesive dispensers **16***a* and **17***a*; these discrete longitudinal adhesive strips are spaced at predetermined intervals along the length of the web **12** for the purpose of bonding a pair of sleeve members **18** and **19** to the top surface of the web **12**. After the adhesive strips **16** and **17** are applied, the web **12** is passed through a slitting stage to form successive neck opening slits N at regular intervals along the length thereof. The sleeve members **18** and **19** are then positioned on the web **12**. Following the positioning of the sleeves, the web **12** is then passed through a transverse adhesive application stage. The transverse adhesive applicator (not shown) deposits an adhesive strip A extending fully across the web **12** (except for a narrow center section which form a neck opening) for the purpose of forming shoulder seams between the back panel web **12** and the front panel webs unwound from the rolls **13, 14** and deposited on top of the web **12**. A pair of stationary adhesive dispensers C and D deposit continuous strips of adhesive C′ and D′ on the longitudinal edges of the back panel web **12** and the overlying sleeves **18** and **19** so that the front panel webs are bonded to the sleeves and to the back panel web **12** along the longitudinal edges thereof as well as along the shoulder seams defined by the transverse strips A. The continuous webs are subsequently cut transversely at regular intervals to form garments which, in effect, are manufactured inside-out.

In accordance with the invention, means are provided for transferring pairs of sleeve members **18** and **19** laterally from respective sleeve pick-up positions adjacent to the web on opposite sides thereof and placing them transversely on the web in exact register with the adhesive strips **16, 17** which adhere the sleeves to the web. As herein shown, the means for transferring and placing the sleeves comprises a pair of sleeve placement mechanisms **20** and **21** located respectively on either side of the garment production line, and operable to lift the uppermost sleeve from a stack arranged adjacent the web and transfer it laterally to a placement position on the web. The sleeves in each stack are arranged, as shown in FIG. 1, with the wrist portion adjacent the web and the shoulder portion at

the far end of the stack, and are transferred by the placement apparatus by a method that involves flipping the sleeve up and over through 360° so that it is placed on the web with the shoulder portion along the longitudinal edge of the web and the wrist portion approximately at the center of the web, and thus in the proper position on the web to form a garment.

How this is achieved is shown in FIGS. **2** and **3** which illustrate a sleeve placement mechanism **21** having sleeve supporting means in the form of vacuum cups **22** carried by a frame assembly **23** pivotally supported by stationary bearing blocks **24** fastened to the side of the garment machine. The frame assembly includes parallel arms **25** and **26** rigidly connected at one end to a pivot shaft **30** which is journaled in the stationary bearing blocks **24**.

For picking-up individual sleeves from the top of the stack and holding them while the frame assembly of the sleeve placement mechanism **21** travels through its pivotal delivery movement, vacuum is supplied to the vacuum cups **22** of the supporting means by a manifold **27** which has a plurality of radial vacuum tubes **28** arranged in a parallel line along the length thereof, and which is rotatably mounted between the free ends of the pivot arms **25** and **26**. The vacuum cups **22** are made of a resilient material and are carried at the ends of the vacuum tubes **28** vacuum is supplied from a suitable source to the manifold **27** via the pivot arm **25** and an air hose **29** connected thereto.

To pivot the frame assembly of the sleeve placement mechanism **21** between the sleeve pick-up and the sleeve placement position, a conventional reciprocating drive, either pneumatic or mechanical, (not shown) is linked via a drive chain **31** to a sprocket **32** which is secured to one end of the pivot shaft **30**. Since it is important that each successive sleeve properly register with each successively corresponding adhesive strip **17** as it is placed on the moving web **12**, it is necessary to adjust the speed of the reciprocating drive source in order to synchronize it with the speed of the moving web **12**.

In accordance with the invention, the sleeve placement mechanism **21** is operative to flip the sleeve up and over through a path approximating a circle in order to throw the wrist portion of the sleeve outwardly over and onto the moving web **12**, during the delivery cycle of the frame assembly. This is accomplished by rotating the sleeve about the axis of the manifold **27** as it is being carried through a delivery movement of the frame assembly.

In order to impart increased centrifugal force to the sleeve as it is rotated about the axis of the manifold **27**, and to positively support and manipulate the sleeve so that it moves in the prescribed circular path as shown in FIG. **3**, a support plate **36** is employed which is rigidly attached to the vacuum manifold **27** by means of a plurality of clamps **40**. Thus, when the frame assembly is in its pick-up position, the sleeve plate **36** extends inwardly towards the web **12** and is positioned in a substantially horizontal plane. As the frame assembly pivots back and forth between a sleeve pick-up and a sleeve delivery position, the vacuum manifold **27** and attached sleeve plate **36** are rotated in the direction of the frame assembly movement to engage the sleeve and flip it over a full 360° during the delivery stroke and to return to the pick-up position during the return stroke. To this end, a fixed stationary gear **41** is engaged with a driven gear **42** rigidly positioned on an intermediate, manifold drive shaft **43**, extending between the parallel arms **25** and **26** of the frame assembly. As the frame assembly is driven between sleeve pick-up and a sleeve placement positions, the stationary gear **41** drives gear **42** causing the manifold drive shaft **43** to rotate. This rotational motion is transmitted to the vacuum manifold **27** and the sleeve plate **36** through a roller chain **44** connected between a pair of sprockets **45** and **46** secured respectively on the drive shaft **43** and the vacuum manifold **27**.

The operation of the sleeve placement mechanisms constructed in accordance with the invention can more clearly be understood by referring to FIG. **3** which shows the frame assembly of one of the sleeve placement mechanisms at various stages in the delivery cycle. It will be appreciated that the pair of mechanisms serving the stacks of sleeves on opposite sides of the web **12** are constructed similarly and operate in cooperating timed sequence with each other and with the high speed movement of the web **12** to place pairs of sleeves in register with the previously applied strips of adhesive **16**, **17** on the webs. The detailed description of the construction and operation of one of the placement mechanisms **21** is thus equally applicable to the other mechanism. Referring to FIG. **3**, the pre-cut sleeves are supplied to the sleeve placement mechanism **21** in vertical stack with the wrist portion of each sleeve positioned near the longitudinal edge of the web **21** and the shoulder portion spaced outwardly therefrom. As the vacuum cups **22** contact the shoulder portion of the top sleeve on the vertical stack the top sleeve is picked-up by its shoulder portion for delivery to the moving web **12**. As the frame assembly pivots about the pivotal shaft **30**, the sleeve plate **36** and manifold **27** rotate about the manifold axis. This combined action imparts sufficient momentum to the wrist portion of the sleeve member **19** to cast it outwardly over the sleeve plate **36** and to maintain it fully extended transversely over the web so that it may be deposited onto the moving web **12**. At the end of the delivery motion of the frame assembly, the flanged tips **22** of the vacuum manifold **27** are held slightly above the moving web **12** in order to prevent the shoulder portion of the sleeve from prematurely contacting the adhesive strips **17** carried by the moving web **12**.

Further in keeping with the invention, the sleeve is delivered from the placement mechanism **21** to the web **12** when the shoulder portion of the sleeve held by the manifold **27** registers with an adhesive strip **17** on the moving web **12**. A timing switch **50** actuated by the garment machine **10** via a cam **51** and a cam follower **52** operates a manifold control valve **53** which shuts off the vacuum and opens the manifold **27** to air chamber **54**. The pressurized air in the chamber expands very rapidly through the manifold system breaking the vacuum and quickly discharging the sleeve dowardly off of the ends of the flanged vacuum cups **22** and onto the adhesive strip **17** carried by the web **12**. A throttle valve **55** restricts further air flow to the manifold **33** so as not to further disturb the sleeve at it moves away tacked to the web **12**.

After the individual sleeve is discharged onto the moving web **12**, the delivery cycle of the sleeve placement mechanism **21** is reversed and the frame assembly begins swinging back to a sleeve pick-up position. This return motion actuates a limit switch (not shown) reversing the position of the manifold control valve **53**. This re-establishes vacuum in the manifold system and closes the air chamber **54** allowing accumulation of another pressure charge for discharging the sleeve on the subsequent cycle. The pivot arms **25** and **26** continue to rotate, returning to the pick-up position for repeating the cycle.

In order to maintain the upper level of the stack at a proper pick-up level as successive sleeves are removed, position sensing means (not shown), in the form of a General Web Dynamics web guiding system coupled with a hydraulic, vertical left cylinder, are provided. Those skilled in the art will appreciate, however, that any other suitable position sensing arrangement could just as well be used.

In the preferred construction in order to insure a positive pick-up of only one sleeve at a time from the vertical stack, the path circumscribed by the pivot arms **25** and **26** is restricted to less than 180° during each half of the delivery cycle because of the 1:1 overall gear ratio in the manifold drive chain. By so restricting the pivotal movement of the frame assembly, the bottoms of the vacuum cups **22** are horizontally positioned over the web for placement, but tipped with their outward edge upward (FIG. **4**) for pick-up. Consequently, as the leading edges of the vacuum cups **22** strike the top of the sleeve stack during pick-up, the outward edge of the top sleeve bends slightly upward and is quickly grasped by the vacuum cups while the second and subsequent sleeves on the stack are unaffected.

The garment manufacturing apparatus constructed in accordance with the invention is fully automated and involves no manual operations. With this apparatus, and utilizing webs of nonwoven low cost material and pre-cut sleeves of such material, garments can be produced at a low manufacturing cost and sold as disposable garments for industry, hospital and household use. While the continuous web feeding and slitting, and adhesive applying operations illustrated are particularly suited to automated garment manufacture, the sleeve placement mechanism has application in other fields where sheet feeding devices are employed.

I claim as my invention:

1. A machine for manufacturing garments from continuous webs of material comprising, means for moving a continuous web of material, means for applying strips of adhesive to the two longitudinal edges of the web at preselected intervals, and means for transferring a pair of pre-cut garment sleeves laterally from respective sleeve pick-up positions adjacent to the web on opposite sides thereof and placing them transversely on the web in correspondence with the adhesive strips so that the respective shoulder ends of said sleeves register with said adhesive strips.

2. A machine as set forth in claim **1** wherein said means for transferring a pair of pre-cut garment sleeves comprises a pair of sleeve transferring mechanisms located on opposite sides of the web, each of said placement mechanisms including sleeve supporting means for picking up the sleeve, holding it while it is transferred laterally, and depositing it at a predetermined location on the moving web, and means for carrying the sleeve supporting means between a sleeve pick-up and a sleeve placement position.

3. A machine for manufacturing garments from continuous webs of material comprising, means for moving a continuous web of material, means for applying strips of adhesive to the two longitudinal edges of the web at preselected intervals, and a pair of sleeve transfer mechanisms located on opposite sides of the web for transferring a pair of pre-cut garment sleeves laterally from respective sleeve pick-up positions adjacent to the web on opposite sides thereof and placing them transversely on the web in correspondence with the adhesive strips so that the respective shoulder ends of said sleeves register with said adhesive strips; each of said placement mechanisms including a frame assembly pivotally mounted to swing between a sleeve pick-up and a sleeve placement position, and sleeve supporting means movably carried by said frame and operable to flip a sleeve up and over through 360° while transferring it laterally from the stack to the web.

4. In a machine for the manufacture of garments from continuous webs of material, a mechanism for transferring a pre-cut garment sleeve from a vertical stack located adjacent and perpendicular to the side of a moving web and for placing it transversely on the web, each sleeve in the stack being arranged with the wrist portion near the longitudinal edge of the web and the shoulder portion spaced outwardly therefrom, said mechanism comprising a frame assembly pivotally mounted to swing between a sleeve pick-up and a sleeve placement position; sleeve supporting means rotatably attached to the frame assembly for picking-up the sleeve at its shoulder end, holding it during the delivery movement of the frame assembly while the sleeve is transferred laterally, and depositing it at a predetermined location on the moving web; and means for simultaneously pivoting said frame and for rotating the sleeve supporting means in the direction of the pivotal movement of the frame between a sleeve pick-up and a sleeve placement position.

5. In a machine for the manufacture of garments from continuous webs of material, a mechanism as set forth in claim **4**, for transferring a pre-cut garment sleeve from a vertical stack located adjacent and perpendicular to the side of a moving web and for placing it transversely on the web, in combination with a second identical mechanism, said pair of mechanisms being positioned on opposite sides of the web and operable for positioning a pair of sleeves on the moving web.

6. Apparatus as set forth in claim **4**, wherein said sleeve supporting means includes a vacuum manifold having a plurality of radial vacuum tubes arranged in a parallel line along the length thereof for gripping the sleeve element and holding it by suction.

7. Apparatus as set forth in claim **6**, wherein said sleeve supporting means further comprise a sleeve plate rotatably carried by the frame and moved with the manifold for flipping a sleeve up and over through 360° while transferring the sleeve laterally from the stack to the web.

8. In a machine for the manufacture of garments from continuous webs of material, a mechanism for transferring a pre-cut garment sleeve from a vertical stack located adjacent and perpendicular to the side of a moving web, and for placing it transversely on the web, each sleeve in the stack being arranged with the wrist portion near the longitudinal edge of the web and the shoulder portion spaced outwardly therefrom, said mechanism comprising a frame assembly pivotally mounted to swing between a sleeve pick-up position over the stack and a sleeve placement position over the web; and sleeve supporting means movably carried by said frame and operable while the frame assembly swings between said positions for engaging the upper surface of the top sleeve on the stack, for lifting the top sleeve from the stack, and for flipping the sleeve up and over through 360° so as to transfer the sleeve laterally from the stack to the web and to deposit it on the web with its upper surface facing up.

9. A mechanism for transferring a flexible sheet member from a vertical stack located adjacent to the side of a moving web and for placing it on the web, said mechanism comprising a frame assembly movably mounted to shift laterally between a sheet pick-up position over the stack and a sheet placement position over the web; and sheet supporting means movably carried by said frame and operable while the frame assembly shifts between said positions for engaging the upper surface of the top sheet member on the stack, for lifting the top sheet member from the stack, and for flipping the sheet member up and over through 360° so as to transfer the sheet member laterally from the stack to the web and to deposit it on the web with its upper surface facing up.

10. A method for use in the manufacture of garments from continuous webs of material of transferring a pre-cut garment sleeve from a position adjacent a moving web and placing it transversely on the web, comprising the steps of: delivering a pre-cut garment sleeve to a position adjacent to the side of the moving web so that the wrist portion of the sleeve is positioned near the longitudinal edge of the web and the shoulder portion is spaced outwardly therefrom; picking the sleeve up by its shoulder portion; flipping the sleeve up and over through a path approximating a circle while moving it laterally towards the moving web in order to throw the wrist portion of the sleeve outwardly over and transversely onto the web; holding the shoulder portion slightly off of the web until it is aligned with an adhesive strip carried by the web; and discharging the sleeve downwardly onto the web so that the shoulder portion thereof registers with said adhesive strip.

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