

Feb. 27, 1968

J. N. RUNGE

3,370,569

AUTOMATIC FLOCKING MACHINE

Filed Nov. 5, 1965

4 Sheets-Sheet 1

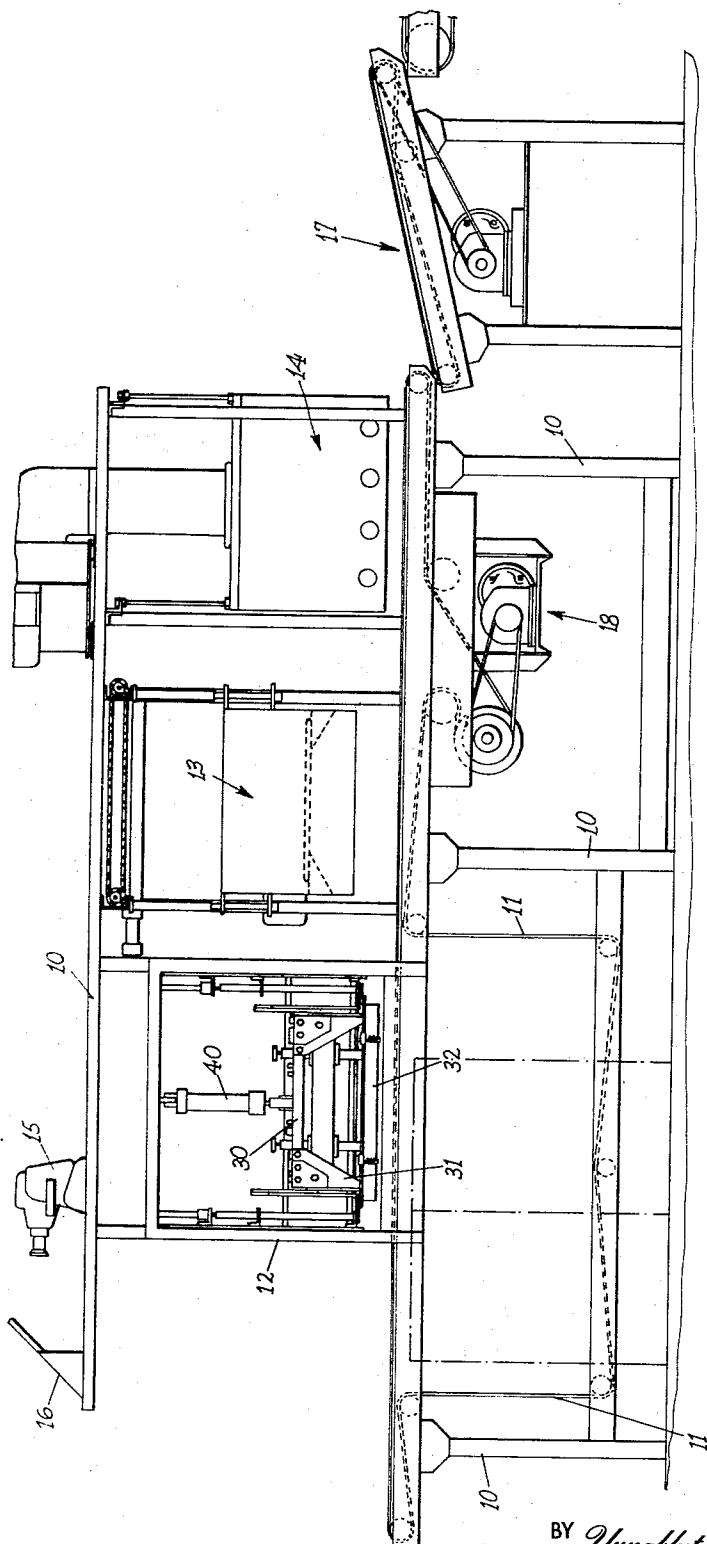


Fig. 1

INVENTOR
JOHN N. RUNGE,

BY *Yungblut, Melville, Shesser and Foster*
ATTORNEYS

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J. N. RUNGE

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4 Sheets-Sheet 2

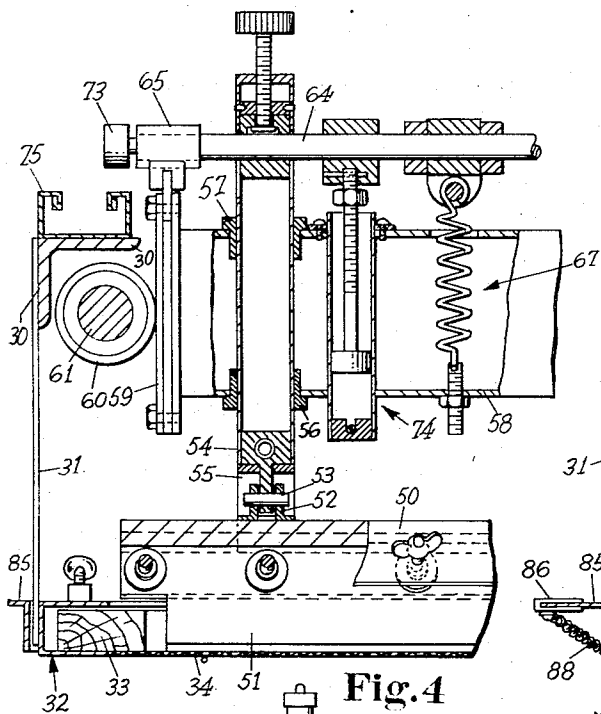


Fig. 4

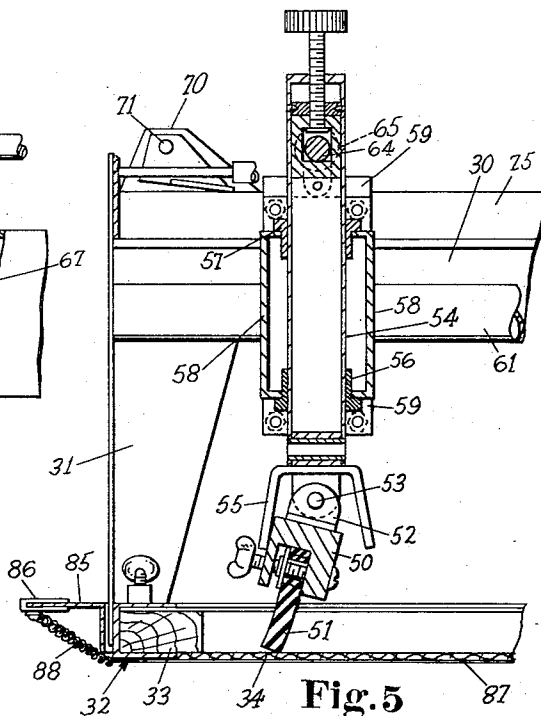


Fig. 5

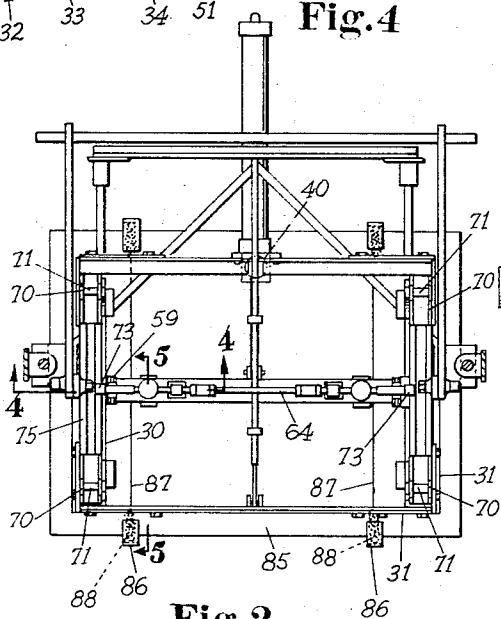


Fig. 2

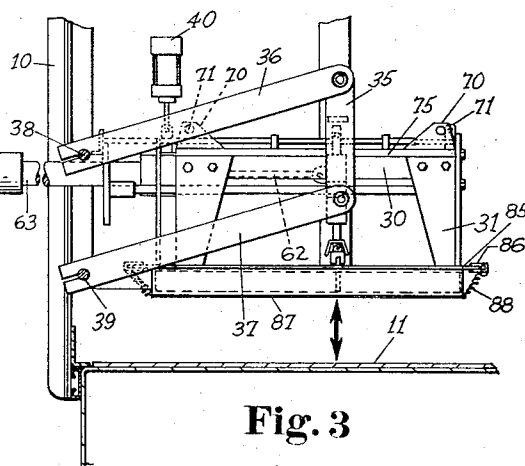


Fig. 3

INVENTOR

JOHN N. RUNGE,

BY *Yungblut, Melville, Shasser and Foster*
ATTORNEYS

BY *Yungblut, Melville, Strasser and Foster*
ATTORNEYS

Feb. 27, 1968

J. N. RUNGE

3,370,569

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4 Sheets-Sheet 4

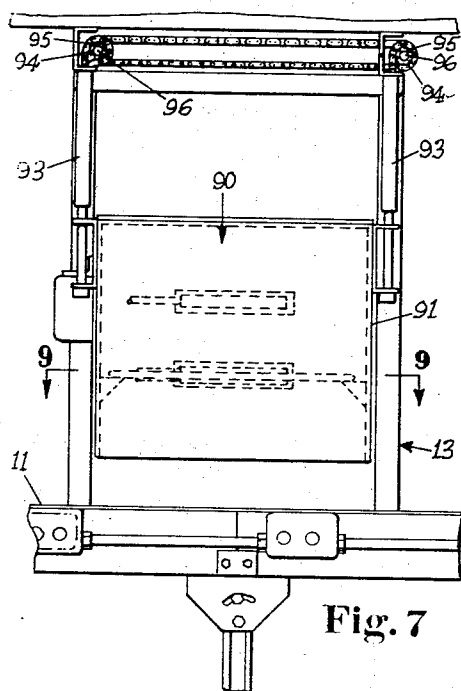


Fig. 7

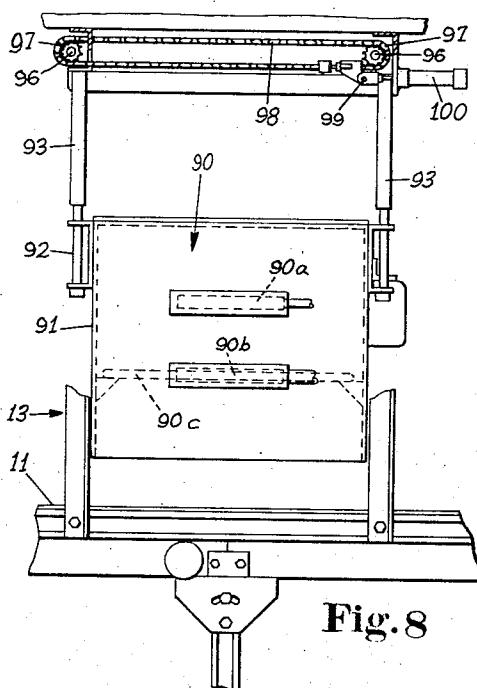


Fig. 8

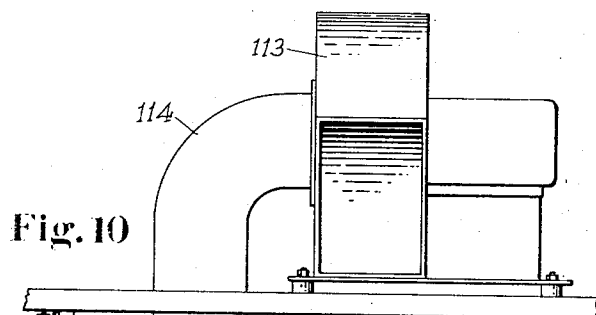


Fig. 10

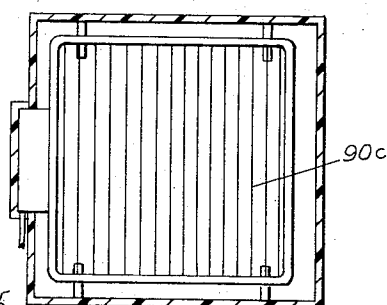


Fig. 9

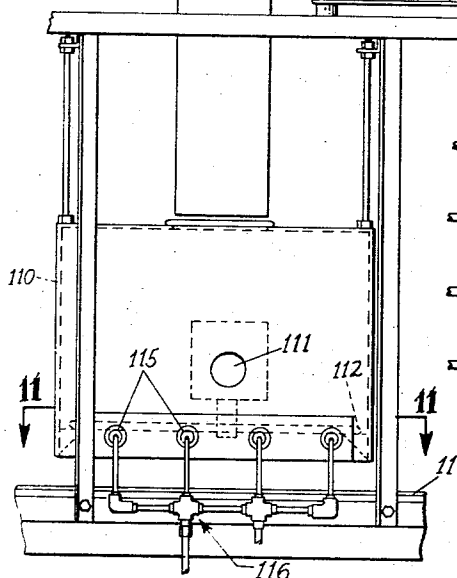


Fig. 11

INVENTOR

JOHN N. RUNGE,

BY *Yungblut, Melville, Shasser and Foster*
ATTORNEYS

1

3,370,569

AUTOMATIC FLOCKING MACHINE

John N. Runge, % R-K Electric Co., 1883 Reading Road,
Cincinnati, Ohio 45215

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10 Claims. (Cl. 118-639)

ABSTRACT OF THE DISCLOSURE

Automatic flocking machine having apparatus for applying adhesive to a work piece, apparatus for depositing flock on said adhesive coated work piece, apparatus for removing excess flock from said work piece, and in intermittently movable conveyor for transporting a work piece in sequence to said adhesive applying apparatus, said electrostatic flocking apparatus, and said deflocking apparatus.

This invention relates to a machine for applying flock in a desired pattern to any selected material, and specifically to such a machine in which, after manual loading of the articles to be flocked, all operations are carried out completely automatically.

As is well known in the art, the article to be flocked is first given a coat of adhesive in the desired pattern. This is generally accomplished by means of a silk screen apparatus. The flock is then caused to adhere to the adhesive coated portions of the article, giving the "fuzzy" texture and appearance.

It will be apparent that the above described flocking operation requires an adhesive applying station, and a flocking station; in a conventional apparatus, only one of these stations will be in use at a given time, the other being completely idle.

Furthermore, the conventional apparatus requires the operator to arrange an article to be flocked at the adhesive applying station, move it to the flocking station, remove excess flock, and then discharge the flocked article. This of course requires an inordinate amount of manual labor.

It is therefore a primary object of this invention to provide a fully automatic flocking machine; that is, a machine which, after being manually loaded will automatically apply adhesive, flock, remove excess flock, and discharge the flocked article, without further effort on the part of the operator.

It is a further object of the invention to provide a flocking machine which will eliminate all unnecessary handling operations.

Ancillary to the above objects, it is a specific object of this invention to provide an improved apparatus by means of which adhesive in a pre-selected design is automatically applied to the article being flocked.

A further specific object of the invention is to provide a novel apparatus wherein "de-flocking" or picking up of excess flock is carried out.

Certain other objects and advantages of this invention will become apparent to the skilled worker in the art upon reading this specification and the accompanying drawings which illustrate an exemplary embodiment of the invention, and in which:

FIGURE 1 is a side elevational view of the automatic flocking machine of this invention;

FIGURE 2 is a horizontal plan view of the adhesive applying apparatus;

2

FIGURE 3 is a partial vertical elevation of the adhesive applying apparatus;

FIGURE 4 is a cross sectional view along the line 4-4 of FIGURE 2;

FIGURE 5 is a cross sectional view along the line 5-5 of FIGURE 2;

FIGURE 6 is a perspective view showing a portion of the adhesive applying apparatus;

FIGURE 7 is a side elevational view of the electrostatic flocking apparatus;

FIGURE 8 is a side elevational view of the electrostatic flocking apparatus from the opposite side;

FIGURE 9 is a cross sectional view along the line 9-9 of FIGURE 7;

FIGURE 10 is a side elevational view of the de-flocking apparatus; and

FIGURE 11 is a cross sectional view along the line 11-11 of FIGURE 10.

Considered generally, the automatic flocking machine of this invention includes an adhesive applying apparatus, an electrostatic flocking apparatus, and a de-flocking apparatus. These three apparatuses or stations are equally spaced over a continuous belt which is intermittently driven, so that an article carried by the belt is successively presented to the adhesive applying apparatus, the electrostatic flocking apparatus, and the de-flocking apparatus. The continuous belt also serves to discharge the flocked articles into a bin or other receptacle, for inspection, packaging, or further processing.

Referring now to FIGURE 1, the general layout and arrangement of the automatic flocking machine of this invention will be described. The machine includes a suitable frame 10 which mounts the intermittently driven conveyor belt 11 as will be described hereinafter. Mounted on the frame 10 and disposed at equally spaced positions above the belt 11 are the adhesive applying station and apparatus indicated generally at 12, the electrostatic flocking station and apparatus indicated generally at 13, and the de-flocking station and apparatus indicated generally at 14.

Articles to be flocked are successively placed on the belt 11 and transported through the three stations noted generally above. In order to properly position the article to be flocked on the belt 11 (in order that they will be placed in accurate registry with the adhesive applying apparatus, the flocking apparatus, and the de-flocking apparatus) it is desirable to provide the light source 15 and the angularly disposed mirror 16 by means of which a suitable image is projected on to the belt 11. It will be apparent that by adjusting the position of the light source 15 and the mirror 16, the image can be located at any desired spot on the belt 11. The image can either be a simple rectangular light spot which indicates the maximum limitations of the area to be flocked, or can be arranged in the desired flocked design. When the conveyor belt 11 is stopped, the operator places the article to be flocked on the belt so that the projected image is properly located. Upon the first increment of movement of the belt 11, the article initially placed on the belt will be disposed beneath the adhesive applying apparatus 12. When the belt stops at this position, the operator places a second article to be flocked on the belt 11, the belt moves forward one additional increment, the first article now being disposed at the flocking station 13, while the second article is at the adhesive applying station. The operation continues in this manner, with the articles successively

being presented to the adhesive applying station, the electrostatic flocking station, and the de-flocking station, after which the flocked articles are discharged to the receiving means indicated generally at 17. In the embodiment illustrated, the receiving means is a further belt system, but it will be understood that the precise receiving system utilized does not in and of itself form a part of this invention. In other words, the flocked articles can be discharged on to another conveyor system for inspection or further handling, or could even be discharged directly into a packaging container.

The conveyor belt 11 in the embodiment shown is formed of a heavy cloth material, which has proven satisfactory both from the standpoint of initial cost, as well as from the standpoint of wear and depreciation. Of course, any other suitable material can be utilized. The drive for the belt 11 is indicated generally at 18, and will not be described in detail in this specification. As will be apparent from the foregoing description, the driving system must be of an intermittent type, and must be sufficiently accurate that proper registry is maintained during the cycle of operation. The well known Geneva movement is of course satisfactory.

It will be recalled that a specific object of this invention was the provision of an automatic adhesive applying apparatus. This apparatus is shown in detail in FIGURES 2 through 6, and will now be described.

The apparatus includes the generally rectangular frame 30 which by means of the downwardly extending brackets 31 and the clamp units indicated generally at 32 mounts a conventional silk screen including the wooden frame 33 and the silk screen 34. It will of course be understood that the silk screen is entirely conventional, as is the formation of the desired image on the screen 34.

Rigidly secured to opposite sides of the frame 30 are the short vertical arms 35, which are in turn pivotally secured to the parallel arms 36 and 37. These arms 36 and 37 are in turn secured to the shafts 38 and 39 which are pivotally journaled in the upstanding portion of the frame 10. By virtue of this arrangement, it will be seen that the entire adhesive apply unit is movable vertically from a position in contact with the conveyor belt 11 to a position spaced upwardly therefrom as shown in FIGURE 3. This vertical movement of the applying device may be accomplished by a number of expedients. In the embodiment shown, the hydraulic cylinder 40 extends between a portion of the main frame 10 of the machine and one of the cross pieces 30, and accomplishes this vertical reciprocation.

Reciprocal within the silk screen frame 33 is the conventional squeegee including the handle portion 50 and the replaceable rubber blade 51. The handle portion 50 includes the upstanding lugs 52 (best seen in FIGURE 4) which are pivotally secured by means of the pin 53 to the lowermost end of a pair of tubular sleeves 54. The skirt 55 generally in the form of an inverted U is also secured to the lowermost end of the tubular sleeve 54, and serves to limit the pivotal action of the handle portion 50 of the squeegee with respect to the sleeve 54. Therefore, when the squeegee is reciprocated in the direction of the heavy arrow in FIGURE 5, it will be tilted as shown; and when reciprocated in the opposite direction, it will be tilted to the opposite position. It will of course be apparent that by varying the disposition of the skirt 55, the limits of tilt of the squeegee can be adjusted so as to maintain an optimum angle for the squeegee with respect to the silk screen 34.

The tubular sleeve 54 is slidably journaled in the bearings 56 and 57 in the cross bar 58. The cross bar 58 mounts at its opposite ends the brackets 59 which will be described in more detail hereinafter. Fixably secured to the brackets 59 are the rings 60 which in turn are slidable along the tubular guide or ways 61. The ways 61 are of course secured to the generally rectangular shaped frame 30 of the apparatus. Secured to the cross

bar 58 is the piston 62 of the hydraulic cylinder 63. It will now be apparent that the extension and reaction of the piston 62 will bring about reciprocation of the cross bar 58. This in turn, through the tubular sleeve 54 will bring about reciprocation of the squeegee 51.

As is known by the skilled worker in the art, a quantity of adhesive will be placed on the silk screen 34 within the boundaries of the frame 33. As the squeegee 51 is reciprocated, it will push a quantity of this adhesive along in front of it, accumulating into a relatively large mass at the end of each stroke. It is therefore desirable to provide means by which the squeegee is lifted from its normal plane of reciprocation adjacent the end of each stroke, in order that it may be lifted over this accumulated quantity of adhesive, and dropped back into its normal plane of reciprocation at the beginning of the next stroke.

It will be recalled that the handle portion 50 of the squeegee is pivotally secured to the tubular member 54, which in turn is vertically slidable with respect to the cross bar 58. Referring to FIGURES 4 and 5, it will be seen that the upper most ends of the tubular member 54 are secured to the bar 64. At its opposite ends, the bar 64 includes the collar 65, which rest in the position shown in FIGURE 4 in the yoke 66 attached to the upper end of the mounting brackets 59. This arrangement defines a precise and positive lower most position for the bar 64. The bar 64 is normally biased to this position by means of the spring arrangement indicated generally at 67.

Referring now to FIGURES 2 and 6, it will be seen that each end of the transverse frame member 30 are provided with the upstanding brackets 70. Pivotally secured to the bracket 70 as by the pin 71 are the upwardly inclined members 72. It will also be observed in these figures that opposite ends of the bar 64 are provided with the rollers 73.

The rollers 73 and the upwardly inclined member 72 are arranged to coast so that near the end of each stroke, the roller will ride up the inclined surface of the member 72, thereby lifting the bar 64, the sleeve 54 and hence the squeegee 51 above its normal plane of reciprocation. The movement in this direction continues until the roller falls off the end of the inclined member 72, permitting the bar 64 to drop back to its original position. This dropping of the bar 64 is of course encouraged by the spring 67, and is cushioned by the air cylinder 74. When the piston 63 reverses its stroke, moving the squeegee on its next stroke, the roller 73 will contact the back side of the upwardly inclined member 72, pivoting it out of its way.

In the actual embodiment shown, the upstanding brackets 70 are mounted on the channel shaped tracks 75 by means of the bolts 76 and plates 77, so that they can be adjusted to provide the desired length of stroke.

It is also desirable in some cases to vary the length of stroke of the cylinder 63. This may be accomplished by providing the slotted bracket 80 (see FIGURE 6) on the top surface of the cross bar 58. Riding in a slot in the bracket 80 is the sleeve 81 which is slidably supported on the rod 82. The sleeve 81 carries the collars 83 and 84 which are axially adjustable by any known expedient. The rear end of the sleeve 81 as viewed in FIGURE 6 will be connected to a suitable valving structure, so that movement of the sleeve 81 with respect to the rod 82 will act to reverse the reciprocation of the piston. It will be apparent that by adjusting the positions of the collars 83 and 84 with respect to the sleeve 81, the length of stroke of cylinder 63 can be controlled.

Finally, there is often a tendency for the work piece to stick to the screen 34 when it is raised by the cylinder 40 after completing the adhesive applying operation. To prevent this, a stripping apparatus should be provided.

As seen best in FIGURES 2 and 5, the stripper includes the frame 85 which surrounds the silk screen frame 33. Pairs of clips 86 are disposed on opposite sides of the frame 85 with the very fine wires 87 extending

therebetween. In addition, the springs 88 may be utilized to make the clips and wires readily movable. The frame 85 is secured to the piston of a hydraulic cylinder as at 89, so that the stripper may be raised and lowered independently of the silk screen.

In operation, both the stripper and the silk screen will be lowered onto a work piece on the belt 11. After the adhesive applying operation, the silk screen will lift while the stripper remains down, thereby holding the work piece on the belt. Then, the stripper is lifted, and the conveyor advanced.

The electrostatic flocking apparatus indicated generally in FIGURE 1 at 13 is largely conventional, and will not be described in detail. It includes a hopper portion indicated generally at 90 for containing a supply of flock. It also includes the various conventional means for supplying high voltage electricity to electrostatically charge the particles of flock. Preferably, the voltage supply 90a is of constant potential, while voltage supply 90b to the screen or grid 90c is of a varying potential.

All of this apparatus is encased within the housing indicated generally at 91. This housing is provided along opposite sides with the rods 92. These rods are slidable within the sleeves 93 by the mechanism described presently, and provides a means by which the housing 91 is movable from a lowered position (not shown) directly over the conveyor 11 to an upper position shown in FIGURES 7 and 8 spaced above the conveyor 11.

The ends of the rods 92 within the sleeves 93 are secured to a link chain 94 as shown in the drawings. The chain 94 passes over the sprockets 95 which are secured to the shaft 96 which runs transversely of the conveyor 11. As seen in FIGURE 8, the opposite ends of the shaft 96 mount the sprocket 97 about which is placed the link chain 98. Connected to the chain 98 is the piston 99 of the hydraulic cylinder 100. It will be apparent that reciprocation of the piston 99 will rotate the sprockets 97 and shaft 96, thereby in turn rotating the sprocket 95 and chain 94 causing the vertical movement of the electrostatic flocking apparatus.

Turning now to FIGURES 10 and 11, the de-flocking apparatus will be briefly described. The de-flocking apparatus includes the housing 110 which is fixedly secured in a position spaced above the conveyor belt 11. Mounted within the casing 110 is the voltage supply connection 111 and the screen or grid 112. As was the case with the flocking apparatus, the elements 111 and 112 are connected to a high voltage source of electricity, and upon energization serve to charge the particles of flock on the previously flocked article. Those particles of flock which are not embedded in the adhesive will be energized and made to move rapidly about. The suction pump 113 through the conduit 114 serves to remove all flock which is not adhered to the article.

To further assist in de-flocking, the housing or casing 110 is provided adjacent its lower end with the tubes or pipes 115 which are provided with a plurality of transverse slots along their lower surface. Air under pressure is supplied to the pipes 115 through the passages indicated generally at 116, and tend to blow the loose particles of flock away from the article and into position to be exhausted by the vacuum pump 113.

While this invention has been described in terms of a single exemplary embodiment, it is to be understood that this description is simply exemplary. Numerous modifications and changes are contemplated by this application, and may be made by the skilled worker in the art without departing from its scope and spirit. Accordingly, no limitations are intended except insofar as specifically set forth in the following claims.

I claim:

1. An automatic flocking machine comprising:

- (a) an adhesive applying apparatus;
- (b) electrostatic flocking apparatus;
- (c) a deflocking apparatus for removing excess flock;

(d) a traversable work surface;

(e) means for intermittently moving said work surface whereby a work piece thereon is in sequence presented to said adhesive applying apparatus, said electrostatic flocking apparatus, and said deflocking apparatus; and

(f) means for locating a work piece on said work surface, whereby said work piece will be accurately located with respect to said adhesive applying apparatus, said electrostatic flocking apparatus, and said deflocking apparatus.

2. The machine claimed in claim 1 wherein said means for locating a work piece on said work surface comprises a light pattern projected onto said surface.

3. The machine claimed in claim 1 wherein said traversable work surface comprises a continuous belt, rollers supporting said belt, and means for intermittently driving said belt.

4. The machine claimed in claim 1 wherein said adhesive applying arrangement comprises a frame mounting a silk screen; a squeegee; means pivotally mounting said squeegee; means for reciprocating said squeegee mounting means in a plane generally parallel to said frame; and means for lifting said squeegee mounting means above said plane near the end of each stroke and for returning said squeegee mounting means to said plane at the beginning of the next stroke.

5. The machine claimed in claim 4 wherein said means for lifting said squeegee mounting means near the end of each stroke comprises an upwardly inclined member adjacent each end of each said stroke, means pivotally mounting said inclined member, and follower means associated with said squeegee mounting means and arranged to contact one of said upwardly inclined members near the end of each stroke, whereby said follower means rides up said inclined member lifting said squeegee mounting means, and whereby said follower means has passed over said inclined member and begins its next stroke said inclined member is pivoted upwardly out of the way.

6. The machine claimed in claim 5 including means normally tending to maintain said squeegee mounting means in said plane.

7. The machine claimed in claim 6 including means for raising and lowering said frame, said squeegee, and said squeegee mounting means as a unit.

8. The machine claimed in claim 7 including stripper means movable independently of said unit, and means for moving said stripper after said unit has been raised whereby to hold work piece on said work surface when said unit is raised.

9. In a flocking machine, the automatic adhesive applying arrangement comprising:

- (a) a frame mounting a silk screen;
- (b) a squeegee;
- (c) means pivotally mounting said squeegee;
- (d) means for reciprocating said squeegee mounting means in a plane generally parallel to said frame; and

(e) means for lifting said squeegee mounting means above said plane near the end of each stroke and for returning said squeegee mounting means to said plane at the beginning of the next stroke comprising an upwardly inclined member adjacent each end of said stroke, means pivotally mounting said inclined member, and follower means associated with said squeegee mounting means and arranged to contact one of said upwardly inclined members near the end of each stroke, whereby said follower means will ride up said inclined member lifting said squeegee mounting means, and whereby when said follower means has passed over said inclined member and begins its next stroke said inclined member is pivoted upwardly out of the way.

10. The arrangement claimed in claim 9 including means for raising and lowering said frame, said squeegee, and said squeegee mounting means as a unit.

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CHARLES A. WILLMUTH, *Primary Examiner.*

PETER FELDMAN, *Examiner.*