Nov. 18, 1969 P. V. SREDL 3,478,940

HOSIERY INSPECTING AND BAGGING APPARATUS

Filed May 20, 1968 3 Sheets-Sheet 1

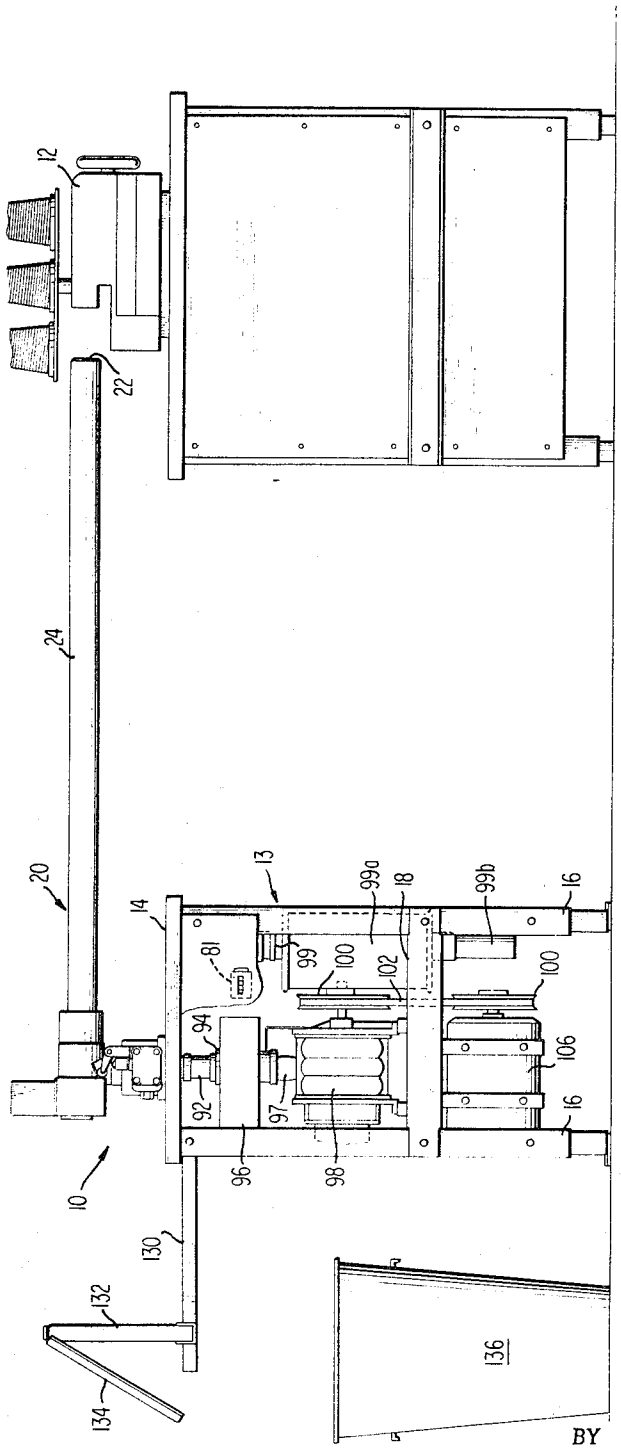


FIG. 1

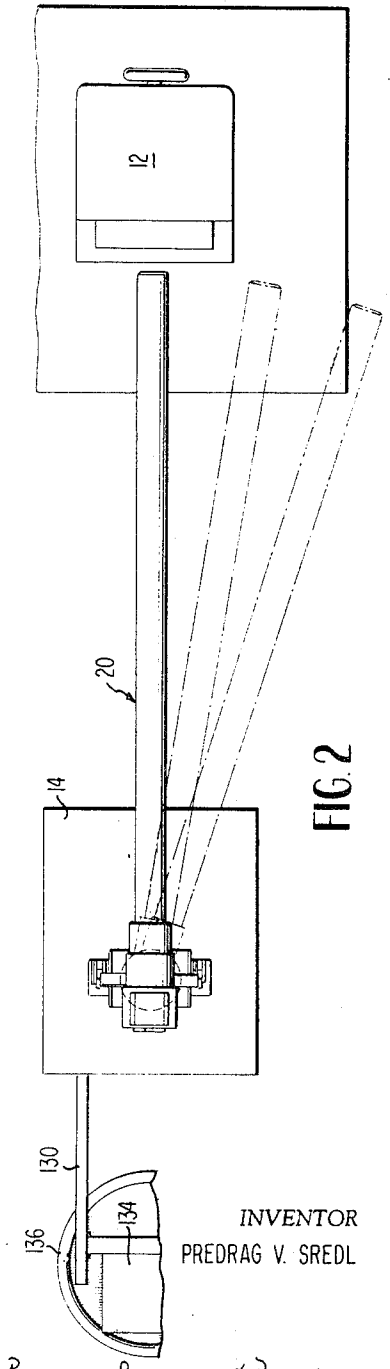


FIG. 2

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Nov. 18, 1969 P. V. SREDL 3,478,940

HOSIERY INSPECTING AND BAGGING APPARATUS

iled May 20, 1968 3 Sheets-Sheet 2

FIG 4

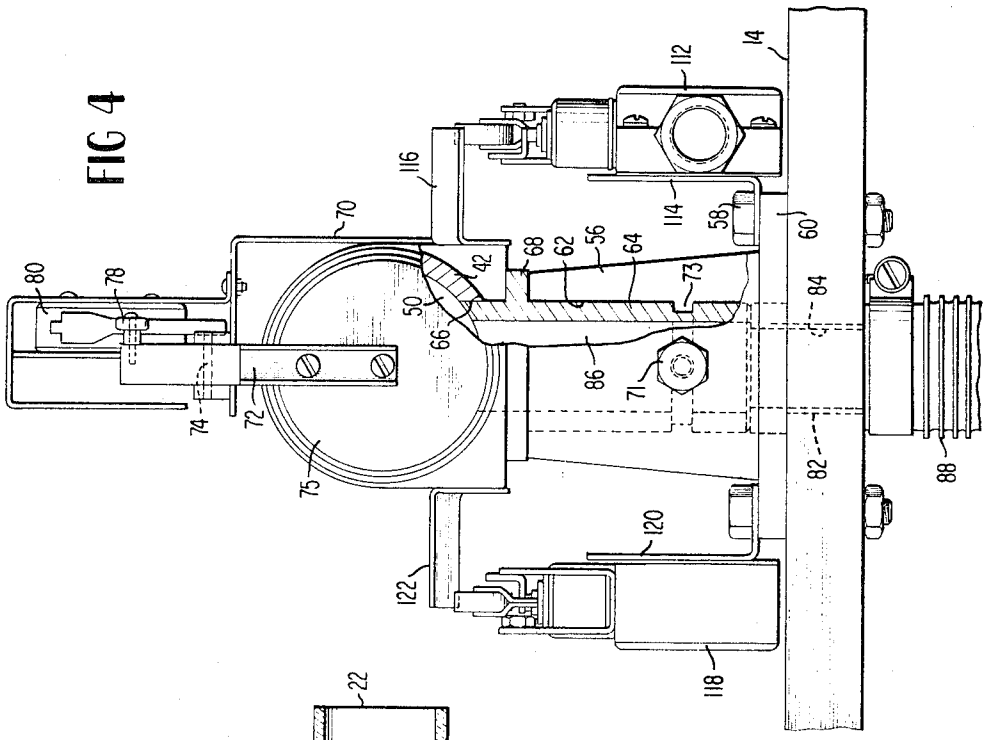
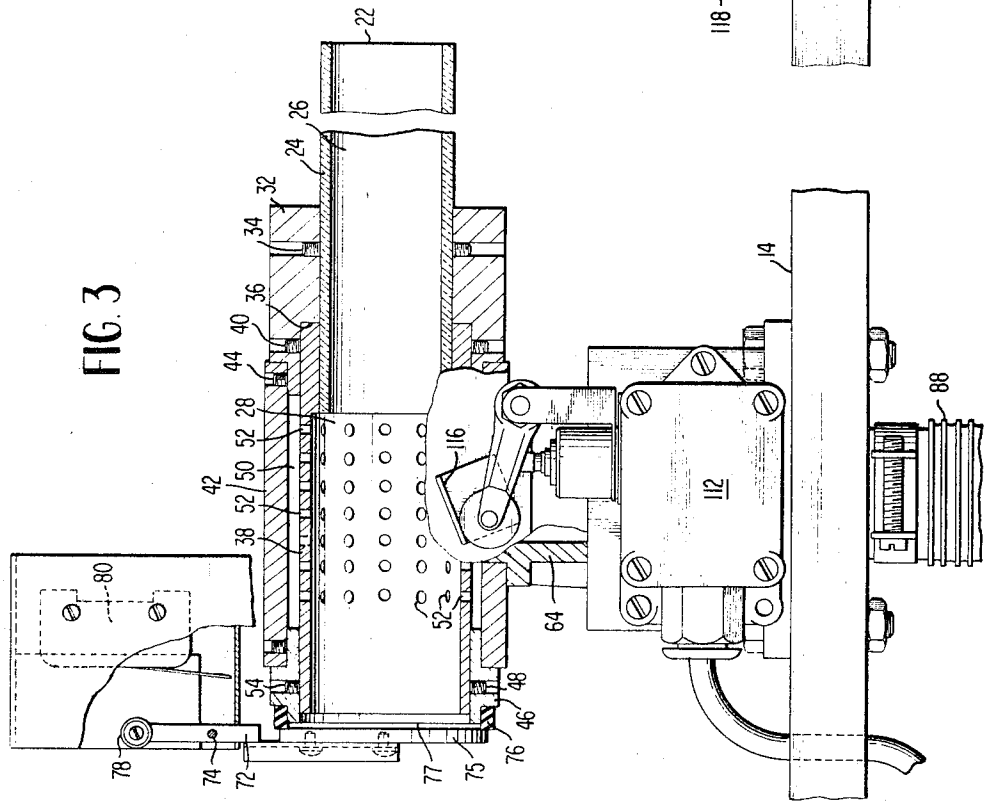


FIG. 3



Nov. 18, 1969 P. V. SREDL 3,478,940

HOSIERY INSPECTING AND BAGGING APPARATUS

Filed May 20, 1968 3 Sheets-Sheet 3

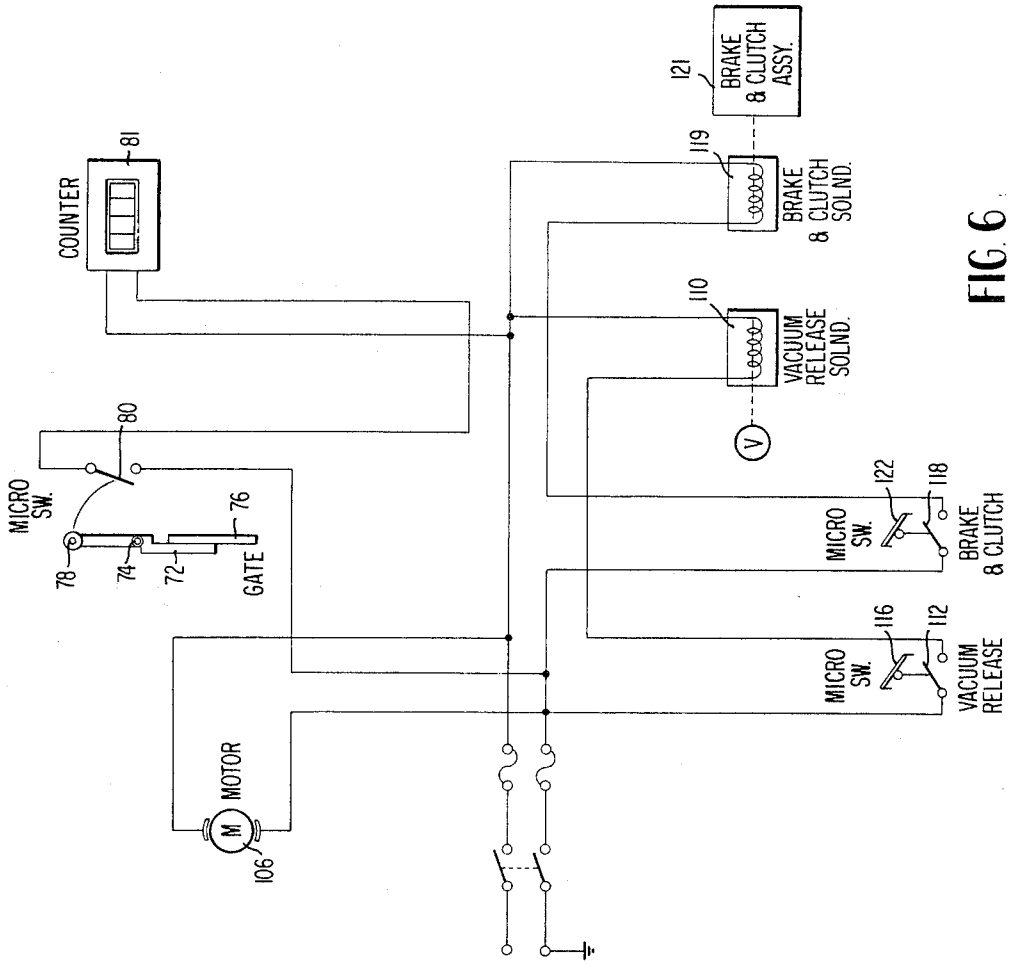
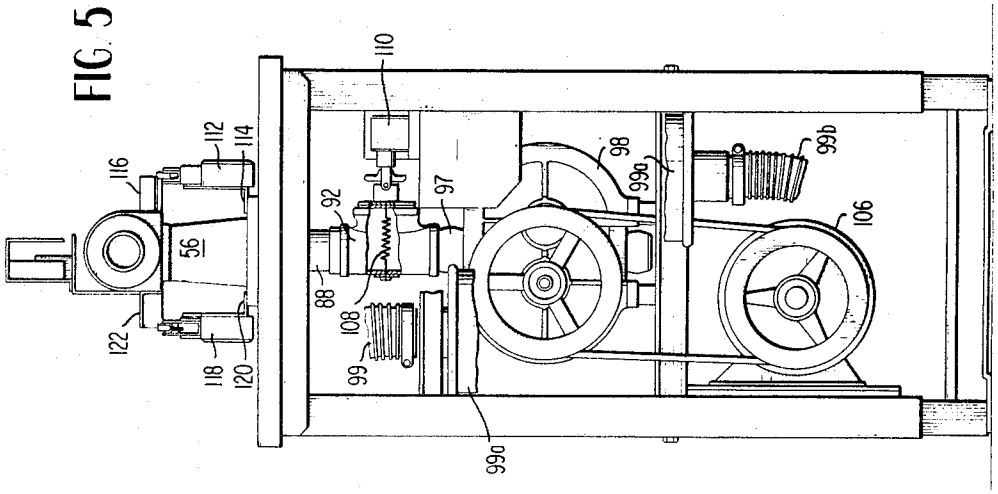


FIG. 6

FIG. 5



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HOSIERY INSPECTING AND BAGGING APPARATUS

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Int. Cl. A41h *43/00*
U.S. Cl. 223—43 11 Claims

ABSTRACT OF THE DISCLOSURE

A hosiery inspecting and bagging apparatus of the type in which hosiery inspected on an elongated form is everted through an inlet into a passage extending longitudinally through the form and discharged therefrom through an outlet by inducing a flow of air through the form from the inlet. Sufficient velocity is imparted to the hosiery moving through the passage to impel the hosiery out of the opening through influence of its own inertia.

This invention relates in general to stocking inspecting apparatus, and more particularly to an improved apparatus for use in inspecting, toe closing, everting and bagging socks.

It is well-known to inspect hosiery on the open end of an elongated, hollow inspection form, and to evert the hosiery through the form and discharging it from an outlet spaced from the open end. This is accomplished by causing a flow of air through the form from the open end to draw the stocking into and evert the stocking through the form. Such an apparatus is disclosed, for example, in U.S. Patent No. 2,869,765. It is also known to support the elongated hosiery inspection form for pivotal movement about a vertical axis and to mount a sewing machine adjacent the open end of the form so that stockings knitted with open toes may be inspected on the form, with the form then being pivoted past the sewing machine to close the toe of the stocking, and to subsequently evert the sewn stocking through the inspection form. Such an apparatus is disclosed in U.S. patent application Ser. No. 584,455, filed Oct. 5, 1966, now Patent No. 3,327,664, assigned to the assignee of the present invention. While the apparatus disclosed in this co-pending application has many advantages over the devices of the prior art, it has not been entirely satisfactory for inspecting, sewing, everting and bagging relatively heavy hosiery such, for example, as men's work socks. Accordingly, it is an object of the present invention to provide an improved apparatus for inspecting and bagging socks.

Another object of the invention is to provide an improved apparatus for inspecting and bagging socks in which the socks are inspected on the open end of a form, and everted through the form and discharged into a receptacle.

In the attainment of the foregoing and other objects, an important feature of the invention resides in inducing a flow of air through a hollow inspection form to evert the stockings therethrough by applying a suction to the hollow form intermediate its inlet and outlet. Sufficient velocity is imparted to the socks while moving through the form so that their own inertia carries them past the point where the suction is applied to impel them from the open end of the form.

Other objects and advantages of the invention will become apparent from the following specification, taken with the drawings, in which:

FIG. 1 is an elevation view of a hosiery inspecting, seaming, everting and bagging apparatus according to the present invention;

FIG. 2 is a top plan view of the apparatus shown in FIG. 1;

FIG. 3 is an enlarged elevation view of a portion of the mechanism shown in FIG. 1, with certain parts broken away to more clearly show other parts;

FIG. 4 is an end elevation view of the apparatus shown in FIG. 3;

FIG. 5 is an end view of the apparatus shown in FIG. 1; and

FIG. 6 is a schematic wiring diagram illustrating the controls for the apparatus.

Referring now to the drawings in detail, the inspecting, turning and bagging apparatus of the present invention is indicated generally by the reference numeral **10** and is illustrated in position adjacent a conventional overedge sewing machine **12** to permit knitted socks to be inspected on the apparatus, then have their open toe sewn closed on the machine while the socks remain on the inspecting apparatus. The inspecting apparatus **10** comprises a frame indicated generally by the reference numeral **13** and including a table top **14** supported by vertically adjustable legs **16**, with horizontal rails **18** supported on the legs **16** below the table top. An elongated horizontally disposed inspection form **20** has one end pivotally supported on table top **14** for limited pivotal movement about a vertical axis to permit the open end **22** of form **20** to be pivoted from a sewing position disposed adjacent the sewing machine **12** to inspecting and everting positions spaced from the machine as indicated in FIG. 2.

Inspection form **20** preferably includes an elongated cylindrical inspection body **24** of transparent material having a hollow passage **26** extending longitudinally therethrough from the open inlet **22** and opening into an enlarged cylindrical chamber **28** at its opposite end.

An enlarged bearing sleeve **32** is mounted on the discharge end of body **24** by suitable means such as set screws **34**. A counterbore **36** is formed in the end of ring **32** and an elongated cylindrical sleeve **38** is telescopingly received in the counterbore and retained therein by set screws **40**. An annular collar **42** is mounted on the ring **32** in concentric, outwardly spaced relation to the sleeve **38** by suitable means such as set screws **44**. An annular ring **46**, mounted on the discharge end of sleeve **38** and attached thereto by set screws **48**, acts as a spacer between the outer cylindrical surface of sleeve **38** and the inner cylindrical surface of collar **42** to define an annular hollow manifold chamber **50** extending around the outer periphery of sleeve **38** along a substantial portion of its length. A plurality of openings **52** spaced both axially and circumferentially along the length of sleeve **38** provides an air passage from the enlarged interior portion **28** of the inspection form to the manifold area **50**. Collar **42** is rigidly attached to ring **46** by set screws **54**. If desired, the body **24** may be supported for free rotation about its longitudinal axis by bearing sleeve **32**.

A journal block **56** is rigidly mounted on table top **14** by bolts **58**, extending through flange **60**. Journal block **56** has a vertical bore **62** formed therein for rotatably supporting a vertically extending hollow shaft **64** having its upper end fixed, as by welding, within an opening **66** in collar **42**. Shaft **64** is rotatably supported on the end of journal block **56** by a radially extending flange **68**, with the shaft **64** being retained against removal from the bore **62** by a set screw **71** extending through the journal block **56** and projecting into an annular recess **73** formed in the outer surface of the hollow shaft **64**. Thus, bearing block **56** provides vertical support for the inspection form while permitting pivotal movement of the form in a horizontal plane about the vertical axis of shaft **64**.

A bracket **70** is mounted on the outer surface of collar **42** and extends horizontally thereabove. An arm **72** is pivotally supported on bracket **70**, as by pin **74**, and a butterfly valve element **75** is mounted on the lower end of arm **72** in position to engage an annular sealing ring **76** mounted on ring **46** to close the outlet opening **77** of the inspection form. Arm **72** carries an actuator **78** positioned to engage and actuate a micro switch **80** upon pivotal movement of the arm **72** about pin **74** to open the form outlet. Switch **80** is electrically connected to a counter mechanism **81** which is advanced each time the switch **80** is actuated to provide an accurate count of the number of times that the butterfly valve **75** is opened. Actuator element **78** also acts as a counterweight for the butterfly valve element **75** to assist in movement of the valve element to open the interior of the inspection form.

As is most clearly seen in FIGS. 1 and 4, the table top **14** has an opening **82** extending downwardly therethrough, with an adapter sleeve **84** fixed therein in fluid communication with the axial bore **86** of the vertical shaft **64**. Conduit **88** is releasably attached to the adapter **84** beneath table **14**, and is connected to the inlet end of a normally closed vacuum release valve **92**, through a sealing ring **94**, to an air filter **96** which, in turn, is connected to the inlet **97** of a vacuum pump **98**. The vacuum pump **98** exhausts through a flexible conduit **99**, muffler **99***a*, and outlet **99***b*. Pump **98** is driven, through pulley **100**, a belt **102** and pulley **104**, by a suitable electric motor **106** mounted on frame **13** beneath rails **18**. Vacuum release valve **92** is normally held in the closed position by a spring **108**, and moved to an open, or vacuum release position by a solenoid **110** to provide a bypass permitting air to flow into the inlet of the vacuum pump without passing through the inspection form. However, with the vacuum release valve in the closed, or de-energized position, and the vacuum pump operating, air will be drawn from the inspection form through the openings **52** into the manifold area **50** and thence downward through the hollow bore **86** of shaft **64** into the vacuum pump. The reduced pressure causing this flow of air will tend to urge the butterfly valve **75** to the closed position illustrated in the drawing so that a flow of air will be induced through the inspection form from the open inlet **22**.

To control actuation of the vacuum release valve solenoid **110**, a micro switch **112** is mounted on journal block **56** by a suitable bracket **114**, and an actuator arm **116** mounted on sleeve **42** projects laterally outward from the inspection form in position to engage and actuate the switch **112** upon pivotal movement of the form about the vertical axis of shaft **64**. Switch **112** is connected in the control circuit, as illustrated in FIGS. 3 and 6, to actuate the switch **112** to energize solenoid **110** to release the vacuum within the inspection form when the form is in the inspecting position illustrated as the intermediate dotted line position in FIG. 2 or the sewing position in which the open end **22** is disposed adjacent the sewing machine **12**, as illustrated in full line in FIG. 2. Pivotal movement of the form past the intermediate dotted line (inspection) position to the extreme dotted line (turning or everting) position shown in FIG. 2 actuates switch **112** to de-energize solenoid **110**, thereby permitting spring **108** to close valve **92** to apply a vacuum within the manifold **50** to cause a flow of air through inspection form **20**.

A second micro switch **118** is mounted, by suitable bracket **120**, on journal block **56** in position to be engaged and actuated by the cam surface of a second actuating arm **122** extending laterally from sleeve **42** on the side of form **20** opposite the actuating arm **116**. Switch **118** is connected in the control circuit for the sewing machine to control energization of a solenoid **119** to actuate the sewing machine brake and clutch mechanism **121** (see FIG. 6). Switch **118** is connected in the circuit so that actuation of the switch by the arm **122** upon pivotal movement of the inspection form **20** to the toe closing position will close a circuit energizing a solenoid to release the brake and simultaneously engage the clutch of the sewing machine so that the machine is automatically operated when the form is in the toe closing position. Movement of the form away from the toe closing position toward the inspecting position releases the drive clutch and engages the brake to stop the sewing machine.

Referring again to FIGS. 1 and 2, a horizontally extending bracket **130** extends outwardly from table top **14** and supports an upwardly-extending arm **132** which, in turn, supports an inclined deflector plate **134** in spaced, substantially aligned position from the outlet end of the inspection form. A container **136** for receiving socks discharged from the inspecting apparatus is positioned beneath the deflector plate **134**. While the container **136** is illustrated in the drawings in the form of a rigid frusto-conical container, depositing of the socks in random relation in such a container is normally referred to in the hosiery industry as "bagging."

In operation of the apparatus according to this invention, an operator will manually draw a sock, welt-end-first, onto the outer surface of the open end of the inspection form by first pivoting the inspection form to the turning and everting position to establish a flow of air therethrough and presenting the open toe end of the sock to the open end of the inspection form and permitting it to be drawn into the interior of the form. The operator then pivots the form toward the sewing machine to the inspection position to stop the flow of air through the form and draws welt end of the sock onto the outer surface of the form. After inspecting the sock in the conventional manner, the operator then pivots the form to the toe closing position, thereby actuating the sewing machine, and the open toe of the sock is presented by the operator to the machine to have the toe closed in the manner described in the above-mentioned co-pending application.

Upon completion of the toe closing operation, the inspection form is then pivoted back to the turning position, thereby stopping the sewing machine and simultaneously closing the vacuum release valve to create a flow of air through the inspection form from the open inlet **22**. This flow of air draws the toe of the sock into the form, thereby automatically everting the sock as it is drawn into the form. The sock tends to restrict the flow of air through the form so that the reduced air pressure within the form accelerates the sock until it has attained a relatively high rate of speed as it enters the enlarged portion of the hollow interior of the inspection form at **28**. At this point, the flow of air through the inspection form behind the sock greatly relieves the partial vacuum within this area of the inspection form, so that the kinetic energy imparted to the sock impels it past the small openings **52** in the sleeve **38** to impact with the closed butterfly valve element **75**. The kinetic energy of the sock is sufficient to permit the sock to be impelled from the interior of the inspection form, under its own inertia, to strike the deflector plate **134** and drop into the container **136**.

Although the above-described apparatus has proven satisfactory for commercial use, it is contemplated that the apparatus may be modified to include suitable means for sensing the movement of a sock through the inspection form and to energize the vacuum release valve when the sock reaches a predetermined point. For example, a photo electric cell could be employed to sense a sock approaching or moving into the enlarged chamber **28**. This arrangement may be desired where the inspector does not evert the hose onto the open end of the form, or to permit use of the apparatus with relatively lightweight stockings. It is also contemplated that a manually activated switch be provided to control activation of

the vacuum control valve, or of the sewing machine, or both, to permit more freedom of movement of the form to suit the convenience of the operator.

While I have disclosed and described a preferred embodiment of my invention, I wish it understood that I do not intend to be solely restricted thereto, but that I do intend to include all embodiments thereof which would be apparent to one skilled in the art and which come within the spirit and scope of my invention.

1. In a hosiery inspecting and bagging apparatus including an elongated form having a passage extending longitudinally therethrough from an inlet at one end to an outlet, and means for inducing a flow of air through the passage from the inlet to evert hosiery through the inlet into the passage and discharge the hosiery from the outlet, the improvement comprising port means in said form communicating with said passage intermediate said inlet and said outlet, and exhaust means operatively connected with said port means, said exhaust means being operable to evacuate air from said passage through said port means to induce a flow of air through said passage from sai dinlet at a rate to impart sufficient velocity to hosiery everted into said passage to impel the hosiery past said port means and out of said passage through said outlet.

2. In a hosiery inspecting and bagging system in which hosiery inspected on an elongated form is everted through an inlet into a passage extending longitudinally through the form and discharged from the passage through an outlet by indducing a flow of air through the passage from said inlet, the improvement comprising the steps of inducing said flow of air by evacuating air from said passage through a port positioned intermediate said inlet and said outlet at a rate to impart sufficient velocity to hosiery everted into said passage to impel the hosiery past the port and out of said passage through said outlet.

3. In a hosiery inspecting and bagging apparatus including an elongated form having a free end and a hosiery passage extending longitudinally therethrough from an inlet opening at said free end to a discharge opening at the end opposite said free end, and means for inducing a flow of air through said form to convey hosiery therethrough from said inlet opening and discharge the hosiery from said discharg opening, the improvement wherein said means for inducing said flow of air comprises port means in said form communicating with said hosiery passage adjacent said discharge opening, duct means connected to said port means, and exhaust means for producing a reduced pressure in said duct means, said exhaust means being effective to produce a flow of air through said hosiery passage to impart sufficient velocity of hosiery everted into said passage to impel the hosiery past said port means and out through said discharge opening.

4. In a hosiery inspecting and bagging apparatus according to claim **3**, the further improvement comprising valve means in said duct means between said port means and said exhaust means, said valve means being movable between a first position permitting said exhaust means to produce a flow of air through said passage and a second position to interrupt said flow of air.

5. In a hosiery inspecting and bagging apparatus according to claim **4**, the further improvement comprising support means at the end of said form opposite said free end mounting said form for limited pivotal movement about a substantially vertical axis between an everting position and a toe closing position.

6. In a hosiery inspecting and bagging apparatus according to claim **5**, the further improvement comprising control means responsive to the pivotal movement of said form for controlling operation of said valve means to provide a flow of air through said passage when said form is in said everting position and to stop the flow of air through said passage when said form is in said toe closing position.

7. In a hosiery inspecting and bagging apparatus according to claim **6**, the further improvement wherein said control means includes means responsive to pivotal movement of said form for activating a sewing machine when said form is in said toe closing position and for deactivating the sewing machine when said form is moved from said toe closing position.

8. In a hosiery inspecting and bagging apparatus according to claim **4**, the further improvement comprising check valve means for closing said discharge opening to restrict the flow of air through said passage from said discharge opening, said check valve means being normally closed and movable to an open position by impact of hosiery moving through said passage.

9. The hosiery inspecting and bagging apparatus defined in claim **8**, wherein said check valve means is urged to a closed position by said exhaust means when said valve means is in said open position.

10. In a hosiery inspecting and bagging apparatus according to claim **4**, the further improvement wherein said port means comprises a plurality of ports spaced longitudinally and circumferentially of said form adjacent said outlet opening, and exhaust manifold means surrounding said openings.

11. In a hosiery inspecting and bagging apparatus according to claim **10**, the further improvement wherein said hosiery passage in said form is of substantially increased diameter adjacent said outlet opening, said plurality of openings extending through said form in the area of said increased diameter.

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U.S. Cl. X.R.

112—121.12