United States Patent [19]

Lewis et al.

[11] **3,826,062**

[45] **July 30, 1974**

[54] **PNEUMATIC PACKAGE LOADER**

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[73] Assignee: **Bear Brand Hosiery Co.,** Chicago, Ill.

[22] Filed: **May 10, 1973**

[21] Appl. No.: **359,100**

[52] **U.S. Cl.** **53/255,** 52/282

[51] **Int. Cl.** **B65b 1/04,** B65b 1/00

[58] **Field of Search** 53/3, 255, 282, 187, 239, 53/256, 385

[56] **References Cited**

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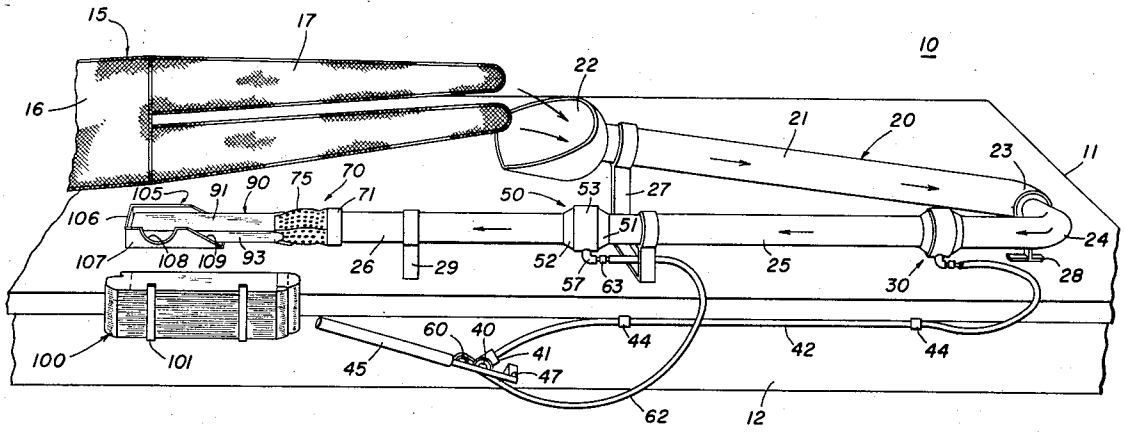
Primary Examiner—Harrison L. Hinson

Attorney, Agent, or Firm—Prangley, Dithmar, Vogel, Sandler & Stotland

[57] **ABSTRACT**

Packaging apparatus for garments such as pantyhose includes a cylindrical conduit having an entry end and an exit end and spaced apart Venturi air chests on the conduit for establishing a stream of air in the conduit to draw the garment into the conduit at the entry end and accelerate the garment through the conduit and eject the garment into a container at the exit end. A nozzle at the exit end of the conduit has a plurality of apertures or orifices extending through the wall to permit air to exit therefrom to allow the garment to be ejected into the container and maintained therein without being discharged therefrom by the stream of air.

15 Claims, 6 Drawing Figures



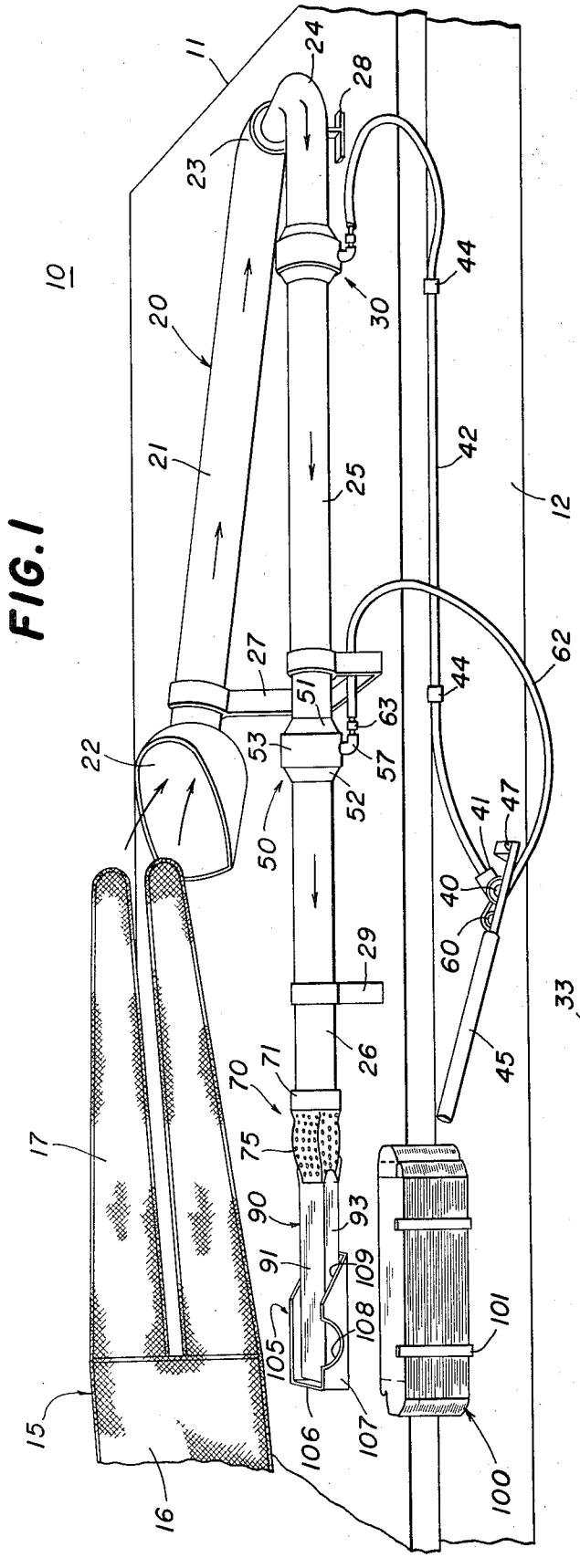


FIG. 1

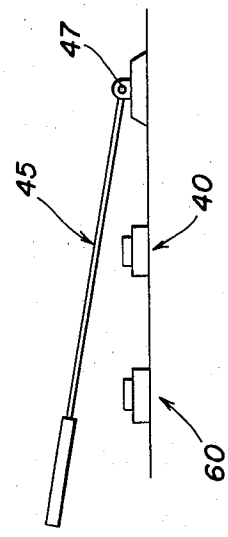


FIG. 6

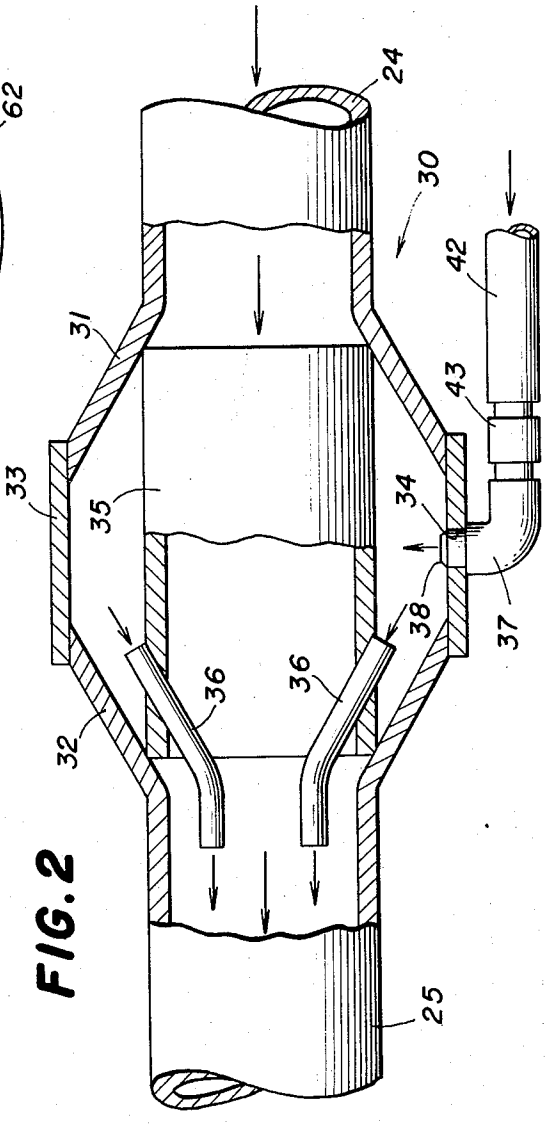


FIG. 2

FIG. 4

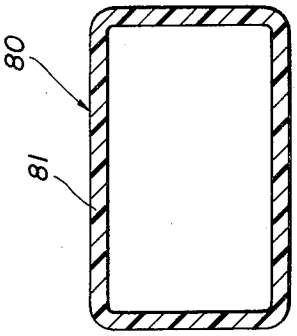


FIG. 3

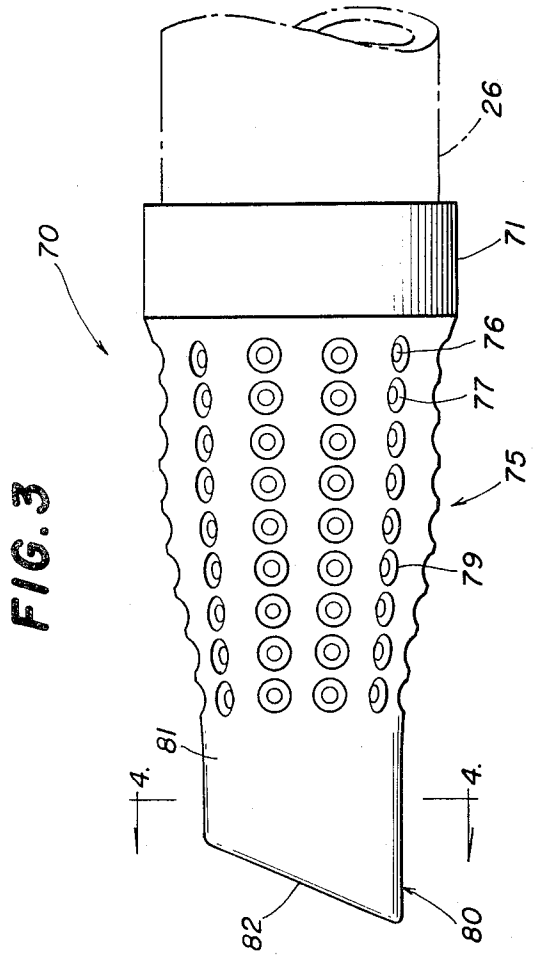
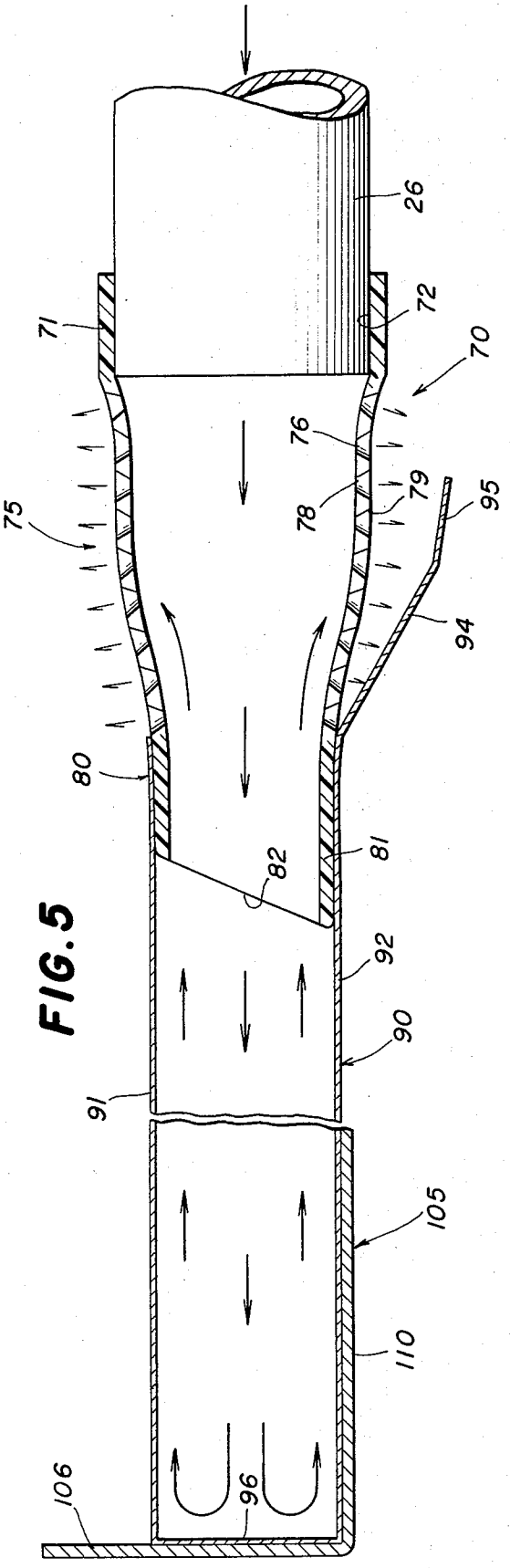


FIG. 5



PNEUMATIC PACKAGE LOADER

The present invention relates to pneumatic packaging apparatus for loading light-weight garments such as pantyhose and the like into packaging containers and is an improvement of copending patent application Ser. No. 327,002, filed Jan. 26, 1973 for PNEUMATIC PACKAGE LOADER. More particularly, this invention relates to a pneumatic conveyor system for delivering a garment from an inspection form to a container by means of an air stream flowing through the conduit.

In prior systems of this type, it has been found that it was necessary to maintain the bottom end of the container open during loading of the garment thereinto in order to permit full uninterrupted air flow and to facilitate easy entry of the garment into the container. It is a general object of the present invention to provide an air-operated container loading apparatus by which a garment may be transported rapidly and continuously and be loaded into a container open only at the top end thereof while at the same time maintaining free flow of the airstream.

It is an important object of the present invention to provide pneumatic packaging apparatus for loading an article to be packaged into an associated container open only at one end, the apparatus comprising a conduit accommodating passage of the article therethrough and having an entry end and an exit end, first means coupled to the conduit for establishing therein a stream of air flowing from the entry end to the exit end to create an area of reduced pressure at the entry end, second means coupled to the conduit and spaced from the first means for adding to the stream of air established by the first means and to enhance the reduced pressure at the entry end, the area of reduced pressure and the stream of air serving to draw the article into the conduit at the entry end and to eject the article from the conduit at the exit end, and mechanism at the exit end for cooperation with the associated container to permit air to escape from the mechanism thereby preventing introduction of the entire stream of air into the container, whereby the article is moved swiftly and continuously through the conduit and into the container and maintained therein after introduction thereinto.

In connection with the foregoing object, another object of the present invention is to provide a pneumatic packaging apparatus having a control mechanism for sequentially or simultaneously actuating the means to establish the stream of air into the conduit.

Still another object of the present invention is to provide a pneumatic packaging apparatus of the type set forth having a nozzle connected to the exit end of the conduit for cooperation with the associated container, the nozzle having a discharge end for introduction into the container and a plurality of apertures extending through the side walls of the nozzle intermediate the exit end of the conduit and the discharge end of the nozzle to permit air to escape through the apertures thereby preventing introduction of the entire stream of air into the container.

Further features of the invention pertain to the particular arrangement of the parts of the packaging apparatus whereby the above-outlined and additional operating features thereof are attained.

This invention, both as to its organization and method of operation, together with further objects and advantages thereof, will best be understood by reference to the following specification taken in connection with the accompanying drawings, in which:

FIG. 1 is a front perspective view of the packaging apparatus constructed in accordance with and embodying the features of the present invention, showing the orientation of the apparatus with respect to associated equipment;

FIG. 2 is an enlarged fragmentary view in partial vertical section of the Venturi air chest for establishing the air stream in the conduit of the present invention;

FIG. 3 is an enlarged elevational view of the nozzle at the exit end of the conduit shown in FIG. 1;

FIG. 4 is a sectional view of the discharging end of the nozzle shown in FIG. 3 taken along lines 4—4 thereof;

FIG. 5 is an enlarged sectional view partly in elevation of the nozzle and exit end of the conduit shown with the associated container; and

FIG. 6 is an enlarged view of the air control and actuating mechanism of the present invention.

There is illustrated in the drawings a packaging apparatus, generally designated by the numeral **10**, constructed in accordance with and embodying the features of the present invention and adapted for conveying material to be packaged, such as pantyhose or other garments or the like, from an inspection form **15** or other apparatus into a container **90**. For simplicity of illustration, the packaging apparatus **10** has been illustrated in FIG. 1 as being mounted on walls **11** and **12** adjacent to the corner of a room, but it will be appreciated that in actual use any suitable arrangement of the packaging apparatus may be utilized.

In the preferred embodiment of the invention the apparatus **10** is adapted for loading pantyhose from an inspection form **15** into a box **90**, the inspection form **15** having a waist portion **16** and a pair of leg portions **17** and **18** for receiving the pantyhose thereover to facilitate inspection thereof in a well-known manner. The apparatus **10** is adapted for assisting in removing the pantyhose from the inspection form **15** after completion of the inspection and for transporting the pantyhose to and into the container **90**.

The packaging apparatus **10** includes an elongated cylindrical conduit, generally designated by the numeral **20**, substantially circular in transverse cross section and having an entry end and an exit end. The conduit **20** comprises a plurality of interconnected conduit sections, including a first generally vertically extending section **21** having a funnel **22** secured thereto at the lower or entry end thereof adjacent to the top of the inspection form **15**, the conduit section **21** being provided with a right angle bend or elbow portion **23** at the upper end thereof. Coupled to the upper end of the conduit section **21** by a fluid tight coupling is a right angle elbow section **24**, the free end of which extends substantially vertically downwardly and is coupled through a Venturi air chest, generally designated by the numeral **30**, to the upper end of an elongated substantially vertically-extending straight conduit section **25**, the lower end of which is coupled through a second Venturi air chest **50** to another straight section **26** which is the exit end of the conduit **20**. The conduit **20** is mounted in place on the walls **11** and **12** by means of a main mounting bracket **27** secured to the conduit

sections 21 and 25, and by an upper mounting bracket 28 secured to either the elbow section 24 or to the bend portion 23 of the conduit section 21, and finally by a lower mounting bracket 29 secured to the conduit section 26 adjacent to the exit end thereof, each of the brackets 27, 28 and 29 being fixedly secured to the walls 11 and 12 by bolts or other suitable fasteners.

The Venturi air chest 30 forms a coupling between the conduit sections 24 and 25, the conduit section 24 having a downwardly and outwardly flared generally cone-shaped flange 31 at the lower end thereof and the conduit section 25 having an outwardly and upwardly flared generally cone-shaped flange 32 at the upper end thereof. Interconnecting the flanges 31 and 32 and fixedly secured as by welding to each in surrounding relationship therewith is a cylindrical sleeve 33 having a port or opening 34 therein. The flanges 31 and 32 and the sleeve 33 cooperate to define a chamber 39 therein in which is disposed a cylindrical conduit section 35 substantially identical in transverse cross section to the conduit section 25 and the downwardly extending portion of the elbow section 24 and coaxial with each, the upper and lower ends of the conduit section 35 being respectively engaged along the entire circumferences thereof with the flanges 31 and 32 for forming a fluid-tight seal between the interior and exterior of the conduit section 35. A plurality of port tubes 36 are equiangularly spaced about the conduit section 35 and are fixedly mounted thereon, the port tubes 36 being respectively received in complementary openings through the wall of the conduit section 36 with each port tube 36 having an upper end communicating with the space between the conduit section 35 and the sleeve 33 and a lower end projecting downwardly below the bottom end of the conduit section 35 and into the conduit section 25 and communicating with the interior thereof.

A pneumatic elbow fitting 37 is mounted on the sleeve 33 and has a nozzle end 38 received in the opening 34 in the sleeve 33 for providing communication between the interior of the fitting 37 and the space between the conduit section 35 and the sleeve 33. The fitting 37 is coupled by means of a coupler 43 to one end of a pneumatic conduit 42, the other end of which is coupled by means of a coupler 41 to an air control valve 40. The conduit 42 is connected to the wall 12 by means of spaced apart clamps 44 and an actuating handle 45 is provided to actuate the control valve 40, the actuating handle 45 being mounted for pivotal movement on a support 47.

A second Venturi air chest 50 forms a coupling between the conduit sections 25 and 26 in the same manner as the previously described Venturi air chest 30 interconnects the conduit sections 24 and 25. The Venturi air chest 50 is identical in construction to the Venturi air chest 30 and includes cone shaped flanges 51 and 52 respectively extending from the conduits 25 and 26 interconnected by a side wall 53. An elbow fitting 57 provides communication between the chamber of the air chest 50 and an air control valve 60. The elbow fitting 57 is connected by a pneumatic conduit 62 and a coupler 63 to the air control valve 60 in the same manner as hereinbefore set forth. The air control valve 60 is situated below the air valve 40 so that activation of the air control valve 60 may be sequentially delayed with respect to the air control valve 40, all for a purpose hereinafter set forth.

The exit end 26 of the conduit 20 has connected thereto a nozzle 70, the nozzle 70 being provided with an upper section 71 having a circular cross section of suitable dimension securely to accept the exit end 26 of the conduit 20 therein and to form a fluid tight connection therewith. In use, the inner wall 72 of the upper section 71 abuts the exit end 26 of the conduits 20 and seals with the same to prevent the loss of air therebetween. The upper section 71 of the nozzle 70 is integrally connected to a transition section 75 which is provided with a plurality of orifices 76 extending through the wall of the transition section. Each of the orifices 76 is provided with cone shaped walls 77 which result in a small diameter aperture 78 at the inside surface of the transition section 75 and a large diameter aperture 79 at the outside surface of the transition section. A discharge end 80 is integrally connected to the transition section 75 and is formed to provide, as shown in FIG. 4, a rectangular transverse cross section. The discharge end 80 of the nozzle 70 includes a conduit 81 having the aforementioned rectangular cross section and the distal edge 82 thereof chamfered.

Associated with the packaging apparatus 10 is an assembled container 90 having a front wall 91 and a back wall 92 interconnected by side walls 93 and a bottom 96. A top 94 is integrally connected to the back wall 92 and extends therefrom and is provided with a section 95 which is folded and inserted behind the front wall 91 in the usual manner. The assembled container 90 is supplied from a stack 100 of unassembled containers maintained in a holder 101 fixedly mounted to the side wall 12. Additionally, a holder 105 is provided on the front wall 11 to position the assembled container 90 directly underneath the nozzle 75 as more particularly hereinafter described. The holder 105 includes a bottom 106 and opposed sides 107 with one of the sides 107 having a semi-circular cutout 108 and both sides having chamfered edges 109, the sides being interconnected by a back 110.

The operation of the packaging apparatus 10 will now be described in detail. The operator initially takes a container from the stack 100 and assembles it so that the top end thereof is open, as shown in FIG. 1. The assembled container 90 is thereafter positioned so that the top open end thereof surrounds the discharge end 80 of the nozzle 70, the chamfered edge 82 facilitating introduction of the discharge end into the assembled container. The transition section 75 of the nozzle 70 is maintained above the container 90 so that air can exit through the apertures 76 and not enter the container 90.

After the container 90 has been mounted in place, the pantyhose garment is stretched over the inspection form 15 and inspected in the usual manner, after which the operator starts to pull the feet of the pantyhose off the inspection form leg portions 17 and 18 and operates the control valve lever 45 initially to open air control valve 40 and then to open the air control valve 60, both valves being open for a short time. Upon opening of the air control valve 40, a blast of compressed air from the source thereof (not shown) is admitted to the Venturi air chest 30 through the conduit 42, the compressed air stream then passing via the port tubes 36 downwardly into the conduit section 25 in the direction of the arrows in FIG. 2. The porting of the compressed air in the Venturi air chest 30 causes a stream of air to flow into the conduit 20 in the direction indicated by

the arrows from the entry end 22 thereof through the first section 21, the top elbow 24 and the second section 25, all as shown in FIG. 1. This air flow reduces the air pressure at the funnel or entry end 22, thereby causing a partial vacuum which draws the toes of the pantyhose up to the conduit 20 and to aid in the removal of the pantyhose from the inspection form 15. After the garment has been released from the inspection form 15 it is carried along by the air stream from the Venturi air chest 30 through the conduit sections hereinbefore set forth in the direction of the arrows.

Upon the opening of the air control valve 60 a blast of compressed air is admitted to the Venturi air chest 50 through the conduit 62, the compressed air then passing via port tubes downwardly into the conduit section 26 and then to the nozzle 70 as shown by the directional arrows in FIG. 1. This air flow reduces pressure along the conduit 20 and more particularly enhances the stream of air in the conduit thereby aiding in the continuous and rapid movement of the pantyhose through the elbow 24 and through the conduit sections 25 and 26. Particularly in the case of heavy pantyhose, such as support garments and the like, there is a tendency for the pantyhose to hang-up in portions of the conduit 20 and particularly at the elbow 24. To this end, the addition of the Venturi air chest 50 provides an enhanced air stream in the conduit 20 to ensure continuous and rapid movement of the pantyhose through the conduit.

The air control valves 40 and 60 may be operated substantially simultaneously or sequentially depending on the position of the air control valve 60 with respect to the air control valve 40, it being a mere matter of mechanical skill to arrange the air flow valves for simultaneous or sequential operation. In the preferred embodiment of the present invention, the operator actuates the lever handle 45 by hip action sequentially to operate the valves 40 and 60 thereby freeing both hands for assembling the container 90 and for removing a container from the holder 105 and introducing a new container into position.

As the pantyhose moves through the conduit 20 from the exit end 26 thereof to the nozzle 70, compressed air flows through the orifices 76 in the transition section 75 to prevent introduction of the entire air stream into the container 90. Venting of air through the apertures 76 prevent two problems, one being that the full blast of the air stream moving into the container 90 will be likely to force the container away from the nozzle 70 and the other being that the air would be likely to bounce the pantyhose out of the container. Providing the orifices 76 in the transition section 75 which, as seen in the drawings, is intermediate the exit end 26 of the conduit 20 and the container 90 allows most of the air from the stream of air to exit before the introduction thereof into the container 90. Air stream flow through the conduit 20 and the nozzle 70 into the container 90 as shown in FIG. 5; however, since a great portion of the air stream vents through the orifices 76, the amount of air actually flowing into the container 90 is not sufficient to either force the container 90 away from the nozzle 70 or to bounce the pantyhose out of the container. Providing a nozzle 70 of the present construction wherein the discharge end 80 has a transverse cross section complementary to that of the container 90 as well as providing the orifices 76 to prevent the introduction of the entire air stream into the container ensures rapid packaging of the pantyhose in the container and facilitates efficient operation.

By positioning the air control valves 40 and 60 so that the actuator 45 initially contacts the valve 40 and then contacts the valve 60, sequential operation of the Venturi air chests 30 and 50 will be attained. Sequential operation of the air chests 30 and 50 provides initial suction at the entry end 22 of the conduit 20 due to operation of the air chest 30 and additional suction at the entry 22 and the elbow 24 of the conduit 20 due to operation of the air chest 50, thereby to aid rapid and continuous movement of the pantyhose through the conduit from the entry end to the exit end 26 thereof. Simultaneous operation of the air control valves 40 and 60 provides increased suction at the entry end 22 of the conduit 20 due to the operation of the air chests 30 and 50 and ensures rapid movement of the pantyhose through the conduit. Whether operation of the air chests 30 and 50 sequentially or simultaneously is more beneficial depends upon the type of pantyhose being transported.

From the foregoing it is seen that there has been provided pneumatic packaging apparatus for loading light weight garments such as pantyhose into packaging containers. In addition, there has been provided mechanism for introducing an enhanced air stream into the conduit to ensure rapid and continuous movement of the pantyhose therethrough. An improved nozzle has been shown which prevents the full introduction of the entire air stream into the container thereby insuring that the pantyhose introduced in the container remains therein.

While there has been described what is at present considered to be the preferred embodiment of the present invention, it will be understood that various modifications and alterations may be made herein without departing from the true spirit and scope of the present invention, and it is intended to cover in the appended claims all such mofifications and alterations as fall within the true spirit and scope of the present invention.

What is claimed is:

1. Pneumatic packaging apparatus for loading an article to be packaged into an associated container open only at one end, said apparatus comprising a conduit accommodating passage of the article therethrough and having an entry end and an exit end, first means coupled to said conduit for establishing therein a stream of air flowing from said entry end to said exit end to create an area of reduced pressure at said entry end, second means coupled to said conduit and spaced from said first means for adding to said stream of air established by said first means and to enhance the reduced pressure at said entry end, said area of reduced pressure and said stream of air serving to draw the article into said conduit at said entry end and to eject the article from said conduit at said exit end, and mechanism at said exit end for cooperation with the associated container to permit air to escape from said mechanism thereby preventing introduction of the entire stream of air into the container, whereby the article is moved swiftly and continuously through said conduit and into the container and maintained therein after introduction thereinto.

2. The pneumatic packaging apparatus set forth in claim 1, wherein said first and second means includes a port providing communication between the interior

of said conduit intermediate the ends thereof and an associated source of compressed air for introducing a jet of compressed air into said conduit.

3. The pneumatic packaging apparatus set forth in claim 1, wherein each of said first and second means comprises a Venturi air chest adapted to be coupled to an associated source of compressed air, and an actuating valve connected between said air chest and the associated source of compressed air for selectively admitting compressed air into said air chest.

4. The pneumatic packaging apparatus set forth in claim 1, wherein said conduit has an elbow bending therein and said first and second means are positioned intermediate said elbow bend and said exit end.

5. The pneumatic packaging apparatus set forth in claim 1, wherein said conduit is substantially circular in transverse cross section.

6. The pneumatic packaging apparatus set forth in claim 1, wherein said mechanism at said exit end has a transverse cross section complementary to the transverse cross section of the associated container.

7. Pneumatic packaging apparatus for loading an article to be packaged into an associated container open only at one end, said apparatus comprising a conduit accommodating passage of the article therethrough and having an entry end and an exit end, first coupled to said conduit for establishing therein a stream of air flowing from said entry end to said exit end to create an area of reduced pressure at said entry end, second means coupled to said conduit and spaced from said first means for adding to said stream of air established by said first means and to enhance the reduced pressure at said entry end, control mechanism for actuating said first and said second means to establish the stream of air into said conduit, said area of reduced pressure and said stream of air serving to draw the article into said conduit at said entry end and to eject the article from said conduit at said exit end, and mechanism at said exit end for cooperation with the associated container to permit air to escape from said mechanism thereby preventing introduction of the entire stream of air into the container, whereby the article is moved swiftly and continuously through said conduit and into the container and maintained therein after introduction thereinto.

8. The pneumatic packaging apparatus set forth in claim 7, wherein each of said first and second means includes a Venturi air chest adapted to be coupled to an associated source of compressed air and an actuating valve connected between said air chest and the associated source of compressed air, said control mechanism including a lever for operating said actuating valves for selectively admitting compressed air into said air chests.

9. Pneumatic packaging apparatus for loading an article to be packaged into an associated container open only at one end, said apparatus comprising a conduit accommodating passage of the article therethrough and having an entry end and an exit end, first means coupled to said conduit for establishing therein a stream of air flowing from said entry end to said exit end to create an area of reduced pressure at said entry end, second means coupled to said conduit and spaced from said first means for adding to said stream of air established by said first means and to enhance the reduced pressure at said entry end, said area of reduced pressure and said stream of air serving to draw the article into said conduit at said entry end and to eject the article from said conduit at said exit end, and a nozzle connected to said exit end of said conduit for cooperation with the associated container, said nozzle having a discharge end for introduction into the container and a plurality of apertures extending through the side walls of said nozzle intermediate said exit end of said conduit and said discharge end of said nozzle to permit air to escape through said apertures thereby preventing introduction of the entire stream of air into the container, whereby the article is moved swiftly and continuously through said conduit and into the container and maintained therein after introduction thereinto.

10. The pneumatic packaging apparatus set forth in claim 9, wherein the portion of said nozzle connected to said exit end has a circular transverse cross section.

11. The pneumatic packaging apparatus set forth in claim 9, wherein said discharge end of said nozzle has a transverse cross section complementary to the container opening.

12. The pneumatic packaging apparatus set forth in claim 9, wherein said discharge end of said nozzle has a rectangular transverse cross section.

13. The pneumatic packaging apparatus set forth in claim 9, wherein the distal edges of said discharge end are chamfered.

14. The pneumatic packaging apparatus set forth in claim 9, wherein said apertures in said nozzle are shaped to provide a small diameter aperture on the inner surface of said nozzle and a larger diameter aperture at the outer surface of said nozzle.

15. The pneumatic packaging apparatus set forth in claim 9, wherein said apertures are arranged in rows and columns.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,826,062 Dated July 30, 1974

Inventor(s) George E. Lewis; Albert W.Brown; Harris Dean Osborne

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

Column 3, line 31, "36" should be --35--;

Column 6, line 39, "mofification" should be --modification--;

Column 7, line 26, after "first" insert --means--.

Signed and sealed this 8th day of October 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

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