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HOSIERY TAKE-UP AND DELIVERY APPARATUS

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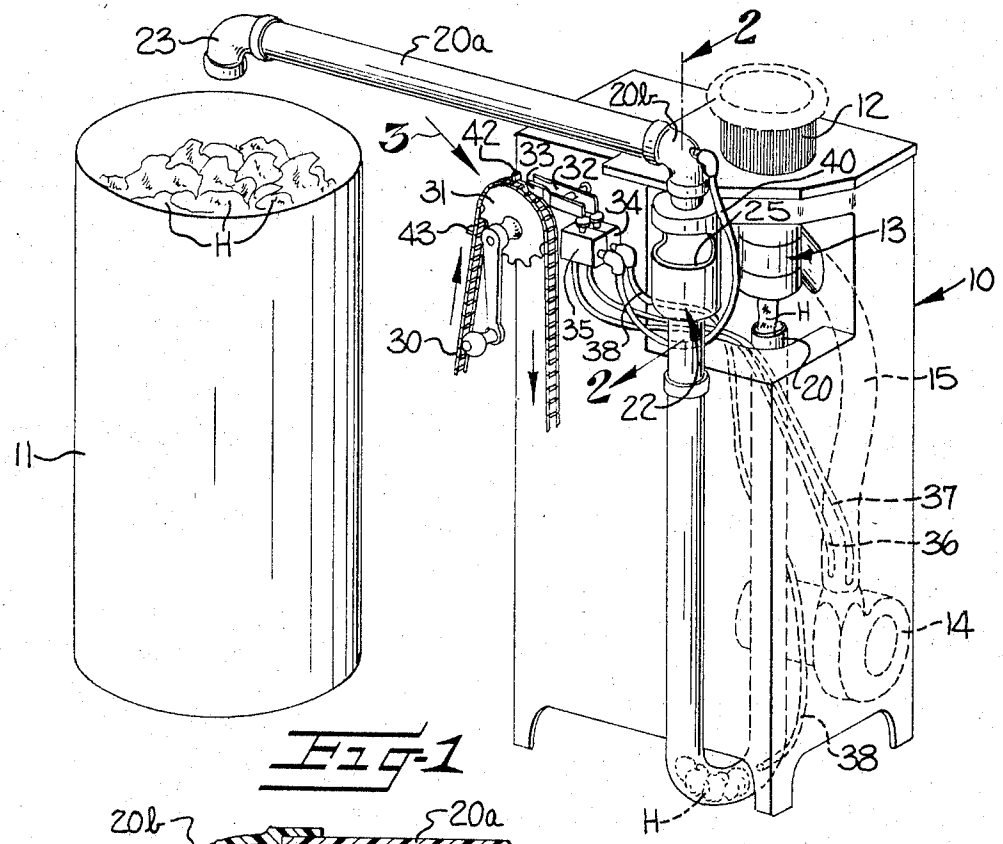


Fig-1

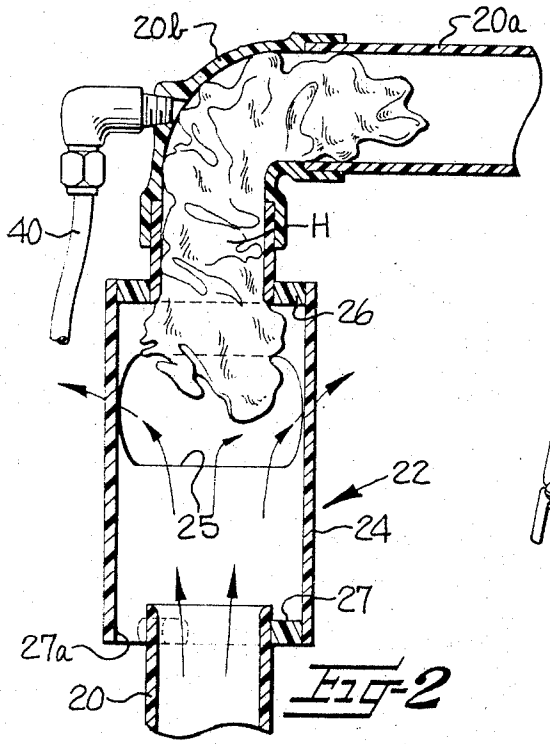


Fig-2

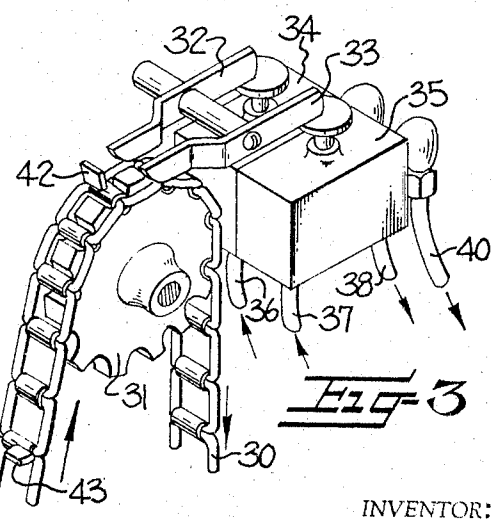


Fig-3

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HOSIERY TAKE-UP AND DELIVERY APPARATUS

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Int. Cl. D04b 27/34; B65g 53/06

ABSTRACT OF THE DISCLOSURE

An apparatus for temporarily retaining textile articles at a convenient location in a pneumatic conveying system to permit selective removal of the articles for inspection. This apparatus is particularly adapted for use with circular hosiery knitting machines and retains the last-knit hose in a convenient position for a period of time where it may be removed and inspected before it continues on to the collection point.

This invention relates generally to a pneumatic take-up and delivery apparatus and more particularly to means for pneumatically conveying hosiery from circular knitting machines and to collection points.

It is well known to pneumatically convey hosiery from knitting machines to collection points or receptacles and to utilize pneumatic means for applying a downward take-up tension on the hose while it is being knit. In some of these pneumatic systems, the hosiery is conveyed from the individual machines and deposited in a main conveyor tube which transports the hosiery to a central collection point. The hosiery is usually inspected at the central collection point and when a defect is found, the corresponding machine is stopped for repair.

In other systems, the hosiery is withdrawn and deposited in an individual container or collector at each machine, from which the operator manually removes the same for inspection. With this individual collector system, the operator must move from machine to machine and collect the hosiery as fast as they are knit.

In either of these systems, a certain amount of mixing of the hosiery from different machines occurs. Since hosiery of various types, styles and sizes is usually knit by a group of machines, this mixing causes an increased work load during the further procesing and handling of the hosiery, such as sorting, sizing, pairing and packaging.

It has been found that this pairing and sorting problem can be substantially eliminated by collecting a large quantity (80–100 dozen pairs) of hosiery from a single machine and maintaining them together during the further processing and handling operations. To this end, a large collection container is provided at each machine and the hosiery is deposited therein as it is knit. However, the large collection container makes the inspection task more difficult. For example, the knitter cannot easily determine which hose in the container was the last knit by the machine. Also, it is difficult for the knitter to reach down into the lower portion of the large container to remove a hose, soon after an empty container has been placed at the machine.

With the foregoing in mind, it is an object of the present invention to provide a take-up and delivery apparatus for circular hosiery knitting machines and which includes means for temporarily retaining the last-knit hose in a convenient location so that it may be easily removed by the operator for inspection, and if not removed by the operator before the next hose is knit, the hose will be carried on to the collection point.

It is another object of the present invention to provide a device for temporarily detaining the last-knit hose at a convenient location for removal, and which device can be

economically manufactured and easily applied to existing hosiery take-up and delivery systems without requiring extensive modification of the existing pneumatic conveying system.

In the preferred embodiment of the present invention, the hosiery detaining means includes an enlarged detaining chamber which is interposed in a main transmission tube connected at one end to the knitting machine and terminating at a collection point where large groups of hosiery from the same knitting machine are collected together. First air pressure means is provided for moving a hose from the machine and into the detaining chamber, second air pressure means is provided for moving the hose from the detaining chamber and to the collection point, and control means is operated by the knitting machine to sequentially operate these air pressure means so that the hose remains in the detaining chamber for a predetermined length of time.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds when taken in connection with the accompanying drawings, in which—

FIGURE 1 is an isometric view of a conventional type circular knitting machine and illustrating the hosiery detaining means of the present invention interposed in the pneumatic take-up and delivery tube which extends from the knitting machine to the collection container;

FIGURE 2 is an enlarged vertical sectional view through a fragmentary portion of the take-up and delivery tube to illustrate the configuration of the detaining chamber, being taken substantially along the line **2—2** in FIGURE 1; and

FIGURE 3 is an enlarged isometric view of the air pressure control valves, looking in the direction of the arrow **3** in FIGURE 1, and illustrating the manner in which they are operated by the pattern chain of the knitting machine.

The apparatus of the present invention is shown associated with a circular ladies' hosiery knitting machine of the well known "Singer-Fidelity" four-feed type, broadly indicated at **10** in FIGURE 1. As shown in FIGURE 1, the hosiery knit by the machine **10** is successively conveyed to a relatively large collection can **11** which is adapted to hold a large quantity of hosiery, such as 80–100 dozen. The knitting machine **10** is of a conventional construction and includes a needle cylinder **12** and a pneumatic take-up, broadly indicated at **13**, which extends up into the needle cylinder **12** and applies downward tension on the hose as it is being knit. This take-up **13** is of conventional construction and is disclosed in detail in U.S. Patent No. 2,873,596.

A blower **14** supplies air under pressure to the take-up **13** through a main air pressure supply conduit **15**. As knitting of the hose proceeds, the lower end is blown down into the upper end of a first section of a transmission tube **20** which is positioned directly beneath and spaced from the take-up device **13**. This first section of the transmission tube **20** extends down inside the housing of the machine **10** and then up one side thereof. The upper end of the transmission tube **20** is normally provided with a relatively small receptacle into which the hose are blown. This receptacle is normally large enough to receive only a few hose and it is the usual practice for the operator to remove each hose from the receiver soon after it is received therein.

In accordance with the present invention, hosiery detaining means in the form of an enlarged chamber, broadly indicated at **22**, is connected to the first section of the transmission tube and operates to temporarily detain successive hose therein as they are knit on the machine.

One end of a second section **20***a* of the transmission

tube is connected to the exit end of the detaining chamber **22** and its other end terminates above the container **11** so that hosiery passing through the section **20***a* will be deposited therein. The chamber **22** is preferably formed of a cylindrical body **24** which is illustrated as being of the same diameter throughout and as being larger in cross-sectional area than the cross-sectional area of the adjacent portions of the transmission tube sections **20**, **20***a* entering and leaving the chamber. However, the chamber body **24** may be other than cylindrical and the cross-sectional area may vary throughout its length, as long as the portion at the exit end is larger than the adjacent portion of the transmission tube.

The first and second sections **20**, **20***a* of the transmission tube illustrated are 2½ inches in diameter. With this size tube it has been found that good results are obtained by using a detaining chamber having a cylindrical body diameter of 3¾ inches. Of course the invention is not limited to these dimensions, although best results are obtained when the diameter of the detaining chamber is at least 1½ times as large as the diameter of the transmission tube.

An access opening **25** is provided in the cylindrical body **24** and is spaced from the exit end **26** of the chamber. The exit end of the first section **20** of the transmission tube extends into the entrance end of the chamber **22** and through a spacer ring **27** having suitable air entrance openings **27***a* therein. The hose, indicated at H, is blown through the first section **20** of the transmission tube (by means to be presently described) and expands as it passes into the larger cross-sectional area of the chamber **22** so that it is blown against the exit end **26** and partially into the entrance end of the second section **20***a* of the transmission tube.

As the hose H passes the access opening **25**, the air pressure which has been used to blow the hose into the chamber **22** will escape through the opening **25** so that the hose will remain in substantially the position shown in FIGURE 2, partially in the second section **20***a* of the transmission tube and partially within the chamber **22**. In this detained position, the hose is easily accessible to the operator and it may be removed through the opening **25** and inspected, if desired. The hose H will remain in the position shown in FIGURE 2 for a predetermined period of time before it is blown through the second section **20***a* of the transmission tube and deposited in the container **11**, if not removed by the operator.

First air pressure means is provided for moving the hose through the first section **20** of the transmission tube and into the detaining chamber **22**. Second air pressure means is provided for withdrawing the hose from the chamber **22** and moving it through the second section **20***a* of the transmission tube so that it is deposited in the container **11**. Suitable control means is provided for sequentially operating the first and second air pressure means in proper timed relationship to produce the desired results.

The air pressure control means is operated in timed relationship to operation of the knitting machine **10** by means of the main pattern chain **30**, only a portion of which is shown in FIGURES 1 and 3. As is well known, the pattern chain **30** moves in a step-by-step manner and normally makes one complete cycle with the knitting of each hose. The chain **30** is shown passing over a drive sprocket **31** which is conventionally racked in a step-by-step manner.

The air pressure control means includes levers **32**, **33** which are pivotally supported intermediate their ends on the frame of the machine **10** and have inclined cam ends that normally ride on opposite side portions of the pattern chain **30** (FIGURE 3). The other ends of the levers **32**, **33** are adapted to engage and operate the valve stem portions of respective air pressure valves **34**, **35**, which are in turn supported on the frame of the machine **10**. Air inlet lines **36**, **37** are connected at one end to the inlet sides of the respective valves **34**, **35** and are connected at the other end to the main air pressure supply conduit **15** (FIGURE 1).

The first air pressure means includes an air pressure line **38** which in connected at one end to the exit side of the valve **34**. The other end of the line **38** is connected to the lower U-shaped portion of the first section **20** of the transmission tube **20** (FIGURE 1) and at a suitable location to blow the hose H up into the chamber **22** at the proper time. The second air pressure means includes an air pressure line **40** which is connected at one end to the exit side of the valve **35**. The other end of the line **40** is connected to an elbow **20***b* in the second portion **20***a* of the transmission tube (FIGURE 2). The air pressure control means also includes spaced pattern lugs **42**, **43** (FIGURE 3) on opposite sides of the pattern chain **30** and in alignment with the respective levers **32**, **33**.

Upon completion of the knitting of a hose, the take-up **13** deposits it down into the bottom of the U-shaped portion of the tube **20**, substantially as shown in FIGURE 1. Soon after the hose reaches the lower portion of the tube **20**, the pattern lug **42** will move beneath and raise the free end of the lever **32** to open the valve **34** so that air pressure will blow the hose H upwardly into the detaining chamber **22** and against the exit end **26**, substantially as shown in FIGURE 2. As the hose H moves to the position shown in FIGURE 2, the air pressure will pass out through the access opening **25**. With continued movement of the pattern chain **30**, the pattern lug **42** will move from beneath the lever **32** and valve **34** will close so that the air pressure to line **38** is cut off.

The hose H will remain in the position shown in FIGURE 2 until withdrawn therefrom. While the hose is in this position, the operator may remove the same by reaching into the opening **25** and withdrawing it therefrom so that it may be inspected for knitting defects. After inspection, the operator may place the hose in the container **11**, if it is in a convenient location, or the hose may be placed back in the chamber **22**. Thus, the last-knit hose is retained in an easily accessible position where it may be removed by the operator for a predetermined length of time. It is preferred that the hose remain in the chamber **22** until the knitting of the next hose is almost completed.

Prior to completion of the knitting of the next hose, the pattern lug **43** (FIGURE 3) on the pattern chain **30** will move beneath the lever **33** to open the valve **35** so that air under pressure will pass into the line **40**. The air pressure in line **40** is discharged into the second portion **20***a* of the transmission tube so that the hose H is withdrawn from the exit end of the chamber **22** and blown through the tube to be deposited in the collection can **11**, if the hose has not been removed by the operator.

The spacing of the lugs **42**, **43** on the pattern chain **30** may be varied as desired, to control the length of time that the hose will remain accessible in the chamber **22**. The transmission tube sections **20**, **20***a* and the detaining chamber **22** are preferably formed of clear plastic so that it may be easily determined if a hose is present therein.

The length and shape of the sections of the transmission tube may be varied as desired to suit the requirements of the particular knitting machine and the arrangement of the machines in the mill. The amount of air pressure transmitted through the lines **38**, **40** may be varied to properly move different types of hosiery through the transmission tube. For example, a greater amount of air pressure will be required to move heavier hosiery, such as support hose, and to move longer hose, such as those to be used in forming panty hose. In most cases, the inlet ends of the air lines **36**, **37** (FIGURE 1) will not be connected to the conduit **15** but will be connected to a separate compressed air system in the mill where a higher air pressure is available (on the order of about 90 pounds per square inch).

Although the present hosiery detaining device is shown

associated with a single knitting machine, it is to be understood that the device may be used in a pneumatic collection system of the type wherein hosiery is collected from a plurality of circular knitting machines and delivered to a central collection point. The device of this invention is also adaptable to any of the well-known types of knitting machines, other than the particular type of machine disclosed in the drawing. The present device may also be utilized to temporarily detain articles other than hosiery as they are being pneumatically conveyed from locations other than knitting machines.

In the drawings and specification there has been set forth a preferred embodiment of the invention and although specific terms are employed, they are used in a generic and descriptive sense only, and not for purposes of limitation, the scope of the invention being defined in the claims.

I claim:

1. Apparatus for pneumatically conveying light textile articles from one location to a spaced second location, said apparatus comprising:

(a) a conduit extending between said locations and through which the articles may pass;

(b) a detaining and removal chamber interposed in said conduit and being of larger cross-sectional area than said conduit, said chamber including entrance and exit ends with axially aligned entrance and exit openings therein;

(c) means for providing a first conveying air current through said conduit from the first location to said chamber;

(d) means for providing a second conveying air current through said conduit from said chamber to the second location;

(e) means for interrupting the operation of said second conveying air current;

(f) restraining means in said chamber adapted to be engaged by and detain the textile article when the second conveying air current is interrupted;

(g) said restraining means including a restricted opening permitting passage of the textile article therethrough upon operation of the second conveying air current; and

(h) said chamber having an unrestricted coverless access opening therein permitting removal of a textile article temporarily detained in said chamber and permitting escape of the first conveying air current when the textile article engages said restraining means.

2. The combination of a circular knitting machine having pattern means, and an apparatus for pneumatically conveying hosiery from said circular knitting machine to a spaced collection point, said apparatus comprising:

(a) a transmission tube extending from said knitting machine to said collection point and through which hosiery may pass;

(b) hosiery detaining means interposed in said transmission tube for temporarily retaining successive hose therein for a predetermined time interval, said detaining means including:

(1) an enlarged detaining chamber having axially aligned entrance and exit ends, the exit end having a larger cross-sectional area than the adjacent portion of said transmission tube leaving said chamber; and

(2) an unrestricted coverless opening spaced from the exit end of said chamber and being of sufficient size to permit manual removal of a hose therethrough;

(c) first air pressure means for moving a hose through said transmission tube and into said chamber against the exit end thereof, the air pressure moving the hose into said chamber escaping through the opening therein when the hose moves thereby;

(d) second air pressure means for withdrawing the hose from the exit end of said chamber and for moving the same through said transmission tube to said collection point; and

(e) control means for sequentially operating said first and second air pressure means whereby the hose may remain accessible in said detaining chamber a predetermined interval of time before being withdrawn therefrom by said second air pressure means.

3. An apparatus according to claim **2** wherein said detaining chamber is cylindrical and of the same diameter throughout its length.

4. An apparatus according to claim **3** wherein the diameter of said detaining chamber is at least one and one-half times as great as the diameter of the adjacent portions of said transmission tube at the entrance and exit ends thereof.

5. An apparatus according to claim **2** wherein said control means is operable by said pattern means and in timed relation to the operation of said knitting machine.

6. An apparatus according to claim **5** wherein said pattern means of said knitting machine includes a pattern chain continuously moved in a step-by-step manner and wherein said control means includes pattern lugs on said pattern chain, and a pair of air valves supported for operation by said pattern lugs and being operable to control the operation of said first and second air pressure means.

7. An apparatus according to claim **6** wherein said first air pressure means includes a first air line connected at one end to one of said air valves and connected at its other end to said transmission tube and in advance of said detaining chamber for directing air pressure toward said detaining chamber, and a second air line connected at one end to the other of said air valves and connected at its other end to said transmission tube and following said detaining chamber for directing air pressure in a direction away from said detaining chamber.

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