Aug. 1, 1961 H. L. KELLEY 2,994,561

ARTICLE COLLECTION MEANS AND METHOD

Filed Dec. 23, 1960 4 Sheets-Sheet 1

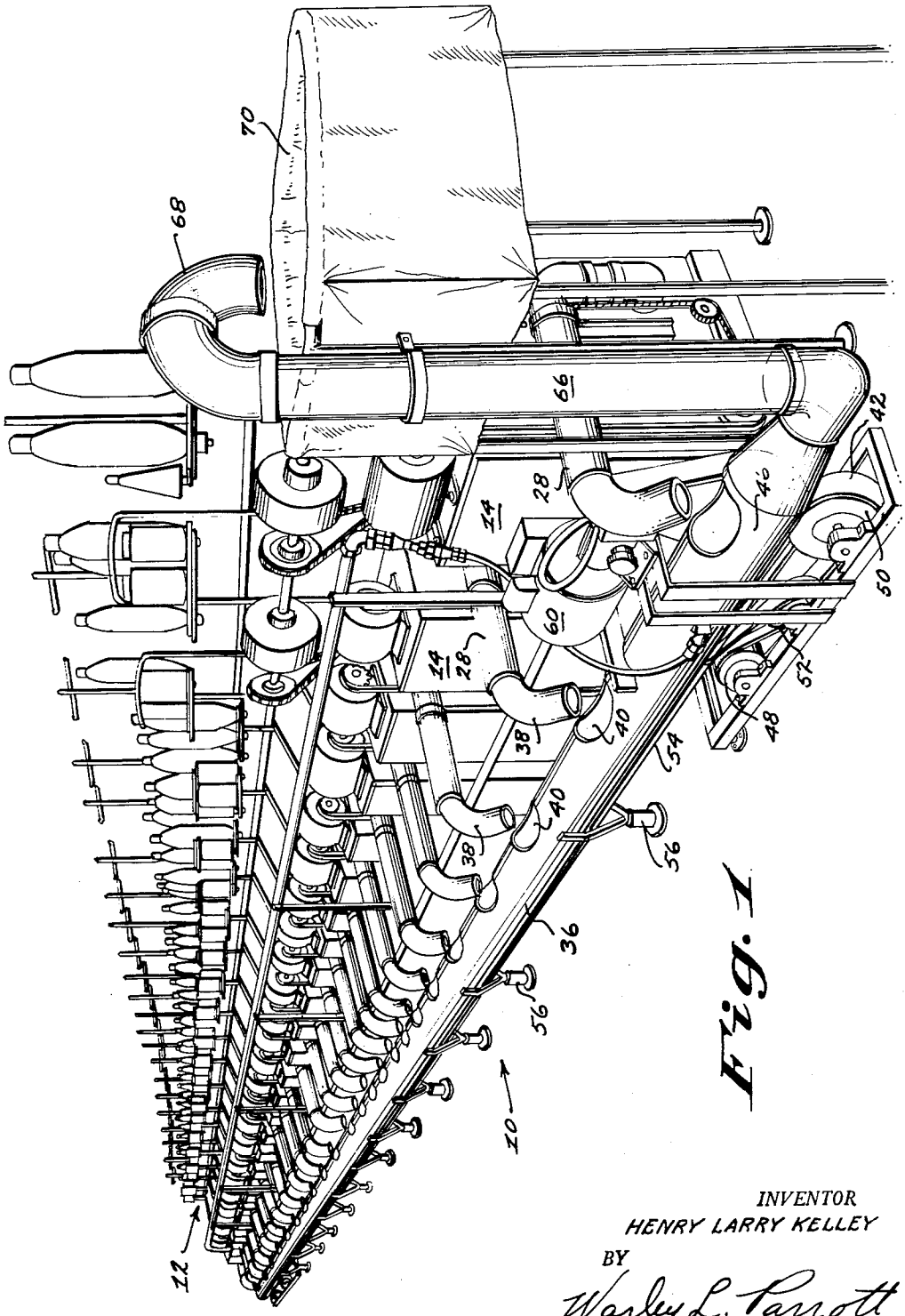


Fig. 1

INVENTOR
HENRY LARRY KELLEY
BY
Warley L. Parrott
ATTORNEY

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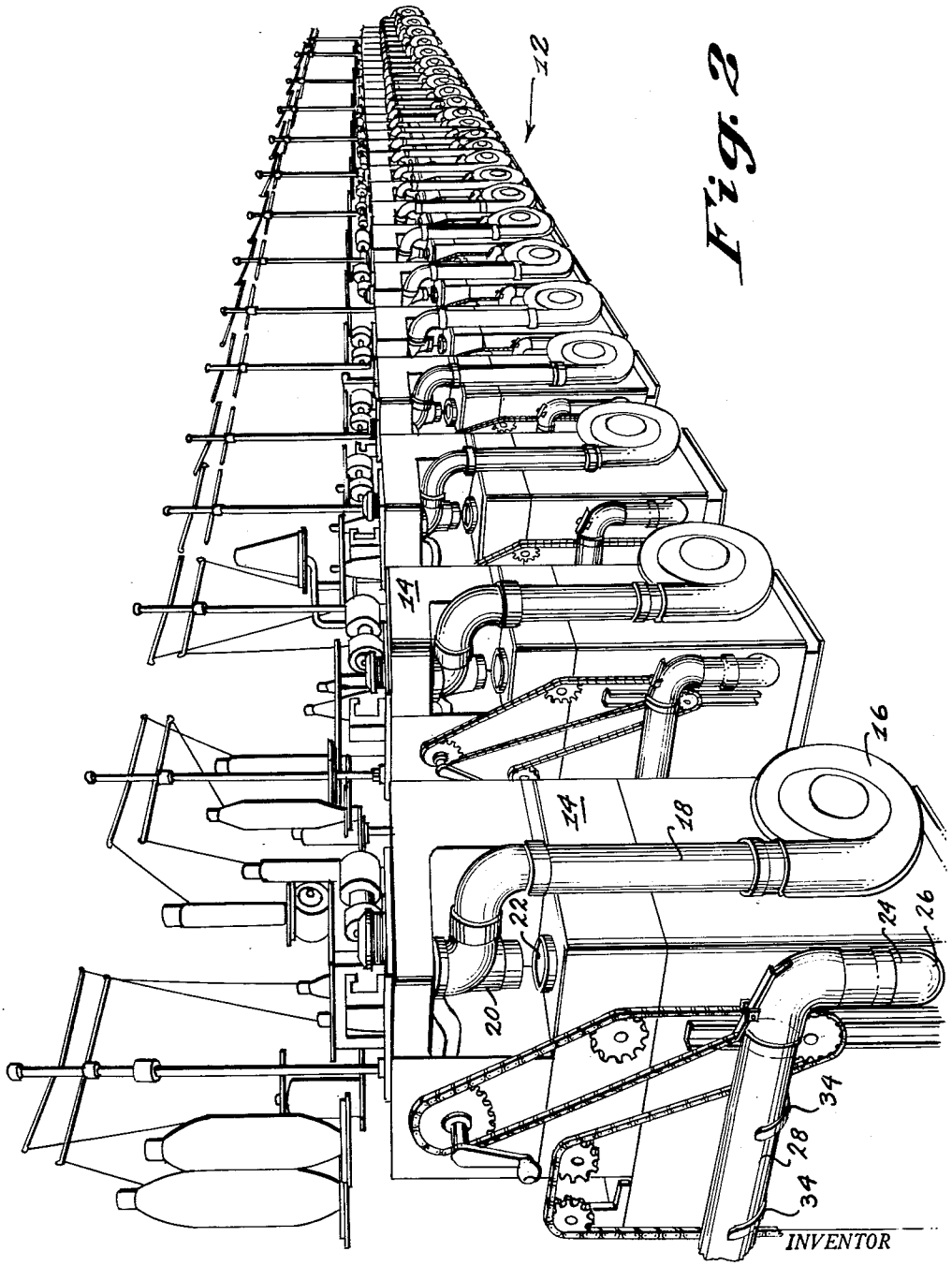


Fig. 2

INVENTOR
HENRY LARRY KELLEY
BY
Warley L. Parrott
ATTORNEY

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Fig. 3

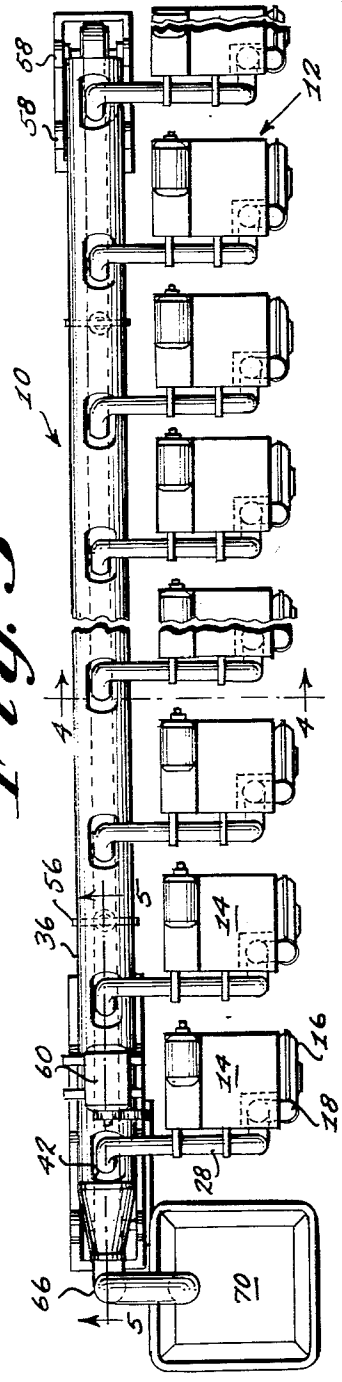
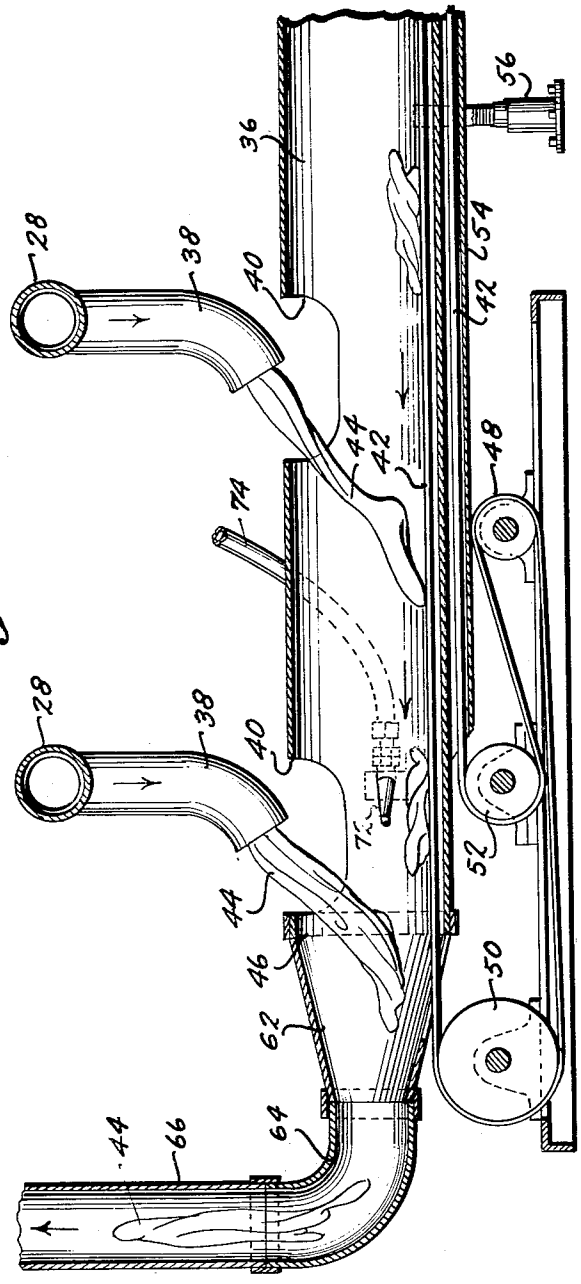


Fig. 5



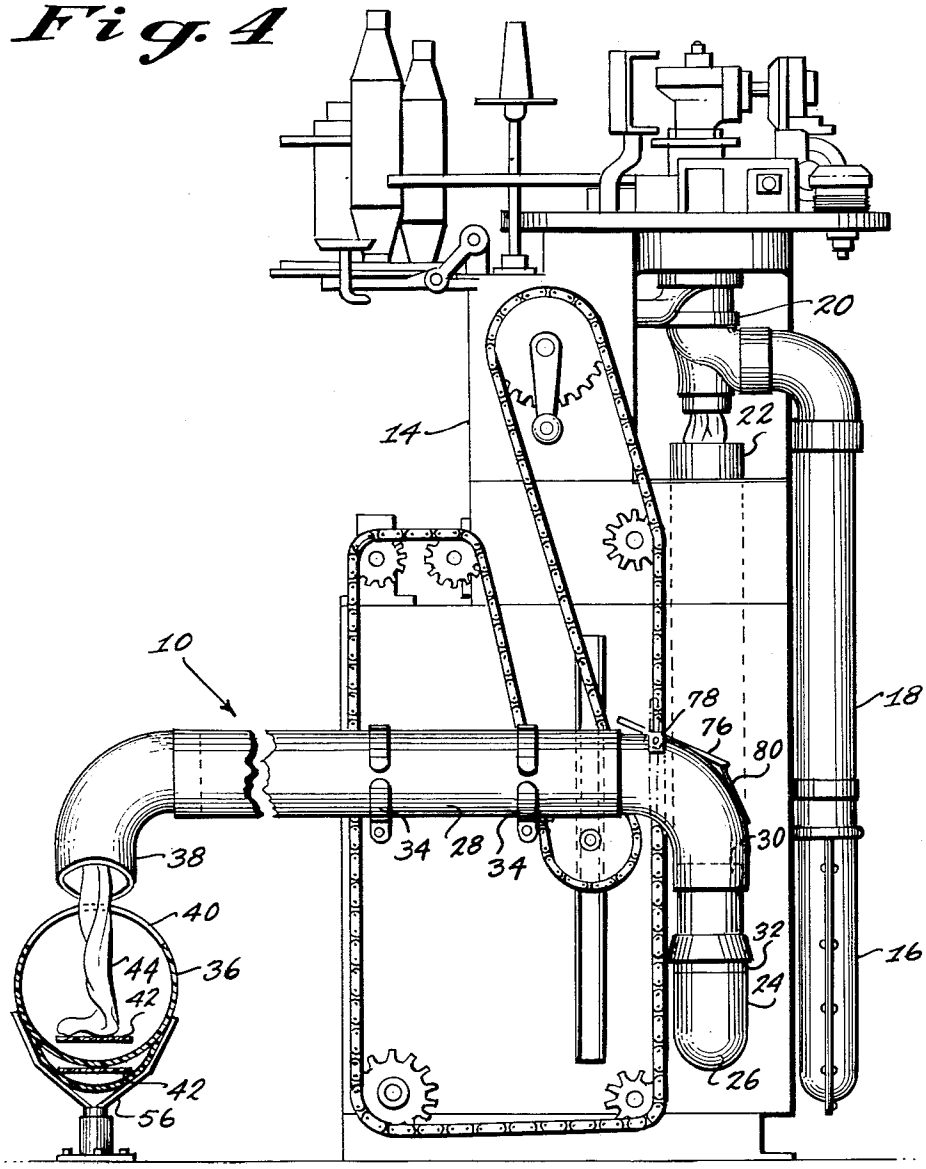
INVENTOR
HENRY LARRY KELLEY
BY
Warley L. Parrott
ATTORNEY

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ARTICLE COLLECTION MEANS AND METHOD

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Fig. 4



INVENTOR
HENRY LARRY KELLEY
BY
Warley L. Parrott
ATTORNEY

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ARTICLE COLLECTION MEANS AND METHOD

Henry Larry Kelley, Chattanooga, Tenn., assignor to Chadbourn Gotham, Inc., a corporation of North Carolina

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11 Claims. (Cl. 302—12)

The present invention relates to an article collection means and method, and more particularly to a method and means for collecting articles from a plurality of stations to a central collection position by means that deposit the articles from the individual stations onto a main conveyor from which the articles are collected at the central collection position.

In most processing and handling operations the transporting of the articles from one station to another is an important element and it is often required that the articles be transported from individual stations to a central location. The present invention is directed to a method and means that greatly facilitate this transportation and eliminate intermediate handling of the articles, thus reducing the cost of production and providing a continuous flow of articles without interruption.

The present invention is particularly adaptable to the collection of hosiery from individual circular knitting machines to a central collection area which has not heretofore been accomplished in a satisfactory and commercially suitable system without intermediate handling. Hosiery are usually accumulated at the individual knitting machines and an operator must move from machine to machine to pick up the hosiery for further handling or processing. This is time consuming and expensive and expensive and therefore undesirable from a commercial standpoint.

By the present invention means are provided to deliver the articles, such as hose, from individual stations onto a main conveyor means that transports the articles toward a central collection point and includes means for removing the articles from the conveyor to the collection point.

In the preferred embodiment of the present invention the collection system is connected to a bank of knitting machines from which knit hose are directed by an air blast through delivery tubes that open into a main conveyor tube running along the length of the bank of knitting machines. A conveyor belt runs along the bottom of the main conveyor tube and carries the hose as they are deposited in the main tube from the delivery tubes toward the collection end of the main tube. At the collection end of the main conveyor tube an air blast is directed to carry the hose from the conveyor belt through a depositing tube into a collection net or other container from which they are removed periodically by a worker.

The present collection system can collect hosiery or other articles in any desired number of individual machines and convey the articles in any desired direction to a preferred collection location for expeditious handling and resulting minimization of labor necessary to collect the articles.

The numerous features and advantages of the present invention are apparent from the following description and drawings in which:

FIG. 1 is a front perspective view of a bank of knitting machines with the preferred embodiment of the article collection means of the present invention;

FIG. 2 is a rear perspective view of the bank of knitting machines of FIG. 1;

FIG. 3 is a top plan view of the bank knitting machines of FIG. 1;

FIG. 4 is a vertical sectional view taken along line 4—4 of FIG. 3; and

FIG. 5 is a vertical sectional view taken along line 4—4 of FIG. 3.

The preferred embodiment of the collection means **10** of the present invention is illustrated in the drawings attached to a bank **12** of knitting machines that knit ladies' seamless hosiery or men's, women's and children's socks or similar articles. The particular knitting machines **14** illustrated are circular knitting machines made by Singer-Fidelity, Inc., of Philadelphia, Pa., and referred to by the manufacturer as model LBMD. These knitting machines **14** are of conventional construction and include an air pump **16** from which air is forced through the vertical tube **18** to the knitting head **20** where the stockings are knit. The air from the vertical tube **18** blows the stockings downwardly through the interior tube **22** to an exterior tube **24** at the bottom of the machine **14**. These machines are conventionally constructed with a collection box (not shown) at the upper end of the exterior tube **24** and the operator must move from machine to machine to remove the stockings accumulated in the collection box of each machine.

In the present invention the individual knitting machines **14** are modified by removing the collection box and cutting off the exterior tube **24** above the bottom elbow **26** that connects the exterior tube **24** with the interior tube **22**.

A delivery tube **28** is mounted adjacent each machine **14** and has an elbow **30** with a flared opening **32** positioned slightly above the end of the exterior tube **24**. The delivery tube **28** extends horizontally from the elbow to carry stockings blown by the air pump **16** from the knitting machines **14**. The flared opening **32** of the elbow **30** of the delivery tube **28** facilitates transfer of the stockings from the exterior tube **24** to the delivery tube **28** and the spacing of the elbow **30** above the exterior tube **24** permits excess air to escape.

The delivery tubes **28** are mounted in brackets **34** on the sides of the knitting machines **14** and extend therefrom to a position above a main conveyor tube **36**. An inclined elbow **38** is attached to the main tube end of the delivery tube **28** to direct the stockings downwardly and forwardly through an opening **40** in the top of the main conveyor tube **36**.

The main conveyor tube **36** is substantially larger in diameter than the delivery tubes **28** and has a narrow conveyor belt traveling forwardly in the direction of the arrows along the bottom of the tube so that stockings **44** deposited in the main conveyor tube **36** from the delivery tubes **28** will be carried by the conveyor belt to the collection end **46** of the tube. The conveyor belt is made of a material such as canvass and frictionally engages the stockings to pull them along the bottom of the tube, and, because of this frictional engagement, the conveyor belt **42** may be considerably narrower than the width of the stockings being carried thereon, with the overlapping portions of the stockings sliding along the interior of the tube.

The conveyor belt **42** passes from the collection end **46** of the main tube **36** around a drive pulley **50**, an idler pulley **48**, and around an adjustable idler pulley **52** from which the conveyor belt **42** travels rearwardly through a lower chamber **54** beneath the main conveyor tube **36**. The main conveyor tube **36** is circular in cross-section and the lower chamber **54** constitutes a portion of a circular tube secured to the bottom of the main tube with the main tube and associated lower chamber supported at intervals along the length thereof by Y-shaped supports **56**. This is clearly illustrated in cross-section in FIG. 4.

At the rear of the main conveyor tube **36** the conveyor

belt 42 passes from the lower chamber 54 around a pair of idler pulleys 58 and returns through the bottom of the main conveyor tube 36. Proper tension of the conveyor belt 42 is maintained by adjusting the position of the adjustable idler pulley 52 at the collection end 46 of the main tube 36 and the movement of the conveyor belt 42 is controlled by the drive pulley 50 which is driven by an electric motor 60.

At the collection end 46 the main conveyor tube tapers as at 62 and is connected by an elbow 64 to a vertical depositing tube 66 having a U-shaped upper end 68 that opens above a collection net 70.

The stockings 44 are forced through the tapered portion 62 of the main tube 36 and through the depositing tube 66 into the collection net 70 by means of an air blast from a nozzle 72 in the side of the main conveyor tube 36 spaced a short distance back of the collection end 46 thereof and directed forwardly. The air is delivered to the nozzle 72 by a conduit 74 leading from a pump or other suitable supply (not shown).

The diameter of the depositing tube 66 is substantially less than the diameter of the main conveyor tube 36 as seen from the tapered portion 62 that connects the two pipes. This reduction in diameter affects a relative increase in the speed of the air blast and thereby facilitates the transportation of the stockings 44 upwardly through the vertical depositing tube 66. In the preferred embodiment of the collection means 10 illustrated in the drawings the delivery tubes 28, main conveyor tube 36 and depositing tube 66 are made of plastic material and are transparent to permit inspection during operation. Also, the smoothness of the plastic is advantageous as it does not snag or create a drag on the moving stocking that could prevent movement of the stockings through the tubes. In one particular commercial embodiment the delivery tubes 28 are 3½" in diameter and the main conveyor tube 36 is 6" in diameter. The conveyor belt 42 moving along the bottom of the main tube 36 is driven at approximately 120 feet per minute. The tapered portion 62 reduces the diameter of the main tube 36 to the 3½" diameter which is the diameter of the depositing tube 66. The air blast is obtained using a nozzle 72 having a ⅛" opening through which the air passes from a supply wherein the air is under a pressure of approximately 25 to 35 pounds per square inch. This force of the air blast lifts the stockings 44 from the conveyor belt 42 and upwardly through the depositing tube 66.

The conveyor belt 42 is 2" wide and 1/16" thick and the lower chamber 54 through which the belt returns constitutes half of a 3½" diameter tube.

In operation, the stockings knit in the knitting machines are blown through the delivery tube 28 into the main conveyor tube 36 in which they are carried by the conveyor belt 42 until they are blown by air from the nozzle 72 through the depositing tube 66 and into the collection net 70 where the worker inspects and turns the stockings. When a defect is noted in a stocking the stocking marking indicates the machine and the worker can simply press a switch in a panel of switches or other arrangement located at the collection point to turn off the particular machine until the fixer can make the necessary machine corrections.

If for any reason it is desired to retain stockings at the individual knitting machines, rather than allowing them to be collected, a trigger 76 can be lowered into the delivery tube 28 at the top of the elbow 30. As shown in FIG. 4, this trigger 76 is pivotally mounted on a pin 78 and is normally held outside of the elbow 30 by a resilient stop finger 80 secured to the outside of the elbow 30 and extending into the path of the trigger 76. When it is desired to stop a stocking, the trigger 76 is forced past the resilient stop finger 80 into the elbow 30 and as the trigger 76 is slightly longer than the inner diameter of the delivery tube 28, it will stop against the bottom of the elbow 30 and permit removal of the stocking through the trigger opening in the tube.

Although the preferred embodiment illustrated in the drawings is adapted for use with a Singer-Fidelity machine, it can also be adapted for use with other machines such as a Scott & Williams, Model KN, which includes a grab mechanism and an air jet to deliver the stockings from the machine, or a Bentley Model KL machine, which drops the stockings from the knitting head, or any of numerous other knitting machines which automatically deliver knitted stockings at each machine.

Also it should be understood that the particular shapes and paths of the various elements of the present invention can be varied from that illustrated in the drawings to provide collection at other locations such as in other rooms or on other floors of the building and the present invention is not to be limited to the specific details illustrated in the drawings. The scope of the invention is to be limited only by the scope of the claims attached hereto.

I claim:

1. Means for collecting articles, such as hosiery, from a plurality of circular knitting machines or the like to a central collection station, said means comprising a main conveyor tube extending along said plurality of machines or the like to a central collection station and having openings therein adjacent said knitting machines or the like, delivery tubes extending from said machines to said main conveyor tube and having outer ends aligned with said main conveyor tubes openings for delivery of said hosiery or the like from the machines into the main conveyor tube, means for blowing air through said delivery tubes to transport said hosiery or the like therethrough, the ends of said delivery tubes being spaced from the peripheries of the main delivery tube openings to provide a space for the passage of air to dissipate the excess of air blown from the delivery tubes into the main conveyor tube and minimize turbulence in the main conveyor tube, and means for moving said hosiery or the like through said main conveyor tube.

2. Means for collecting articles, such as hosiery, from a plurality of circular knitting machines or the like to a central collection station, said means comprising a main conveyor tube extending along said plurality of machines or the like to a central collection station and having openings therein adjacent said knitting machines or the like, delivery tubes extending from said machines to the main conveyor tube and having outer ends aligned with said main conveyor tube openings for delivery of said hosiery or the like from the machines into the main conveyor tube, said main conveyor tube openings being larger than the outer ends of the delivery tubes to provide air spaces therebetween, means for blowing air through said delivery tubes to transport said hosiery or the like therethrough, the air space between said main conveyor tube openings and the ends of the delivery tubes permitting passage of air to dissipate the excess of air blown from the delivery tubes into the main conveyor tube and minimize turbulence in the main conveyor tube, and means for moving said hosiery or the like through said main conveyor tube.

3. Means for collecting articles, such as hosiery, from a plurality of circular knitting machines or the like to a central collection station, said means comprising a main conveyor tube extending along said plurality of machines or the like to a central collection station and having openings therein adjacent said knitting machines or the like, delivery tubes extending from said machines to said main conveyor tube and having outer ends aligned with said main conveyor tube openings with end portions inclined in the direction of travel of the hosiery in the main conveyor tube, said main conveyor tube openings being larger than the outer ends of the delivery tubes to provide air spaces therebetween, means for blowing air through said delivery tubes to transport the hosiery or the like from the machines through the delivery tubes and into the main conveyor tube, the air space between said main conveyor

tube openings and the ends of the delivery tubes permitting passage of air to dissipate the excess of air blown from the delivery tubes into the main conveyor tube and minimize turbulence in the main conveyor tube, and means for moving said hosiery or the like through said main conveyor tube.

4. Means for collecting articles, such as hosiery, from a plurality of circular knitting machines or the like to a central collection station, said means comprising a main conveyor tube extending along said plurality of machines or the like to a central collection station and having openings therein adjacent said knitting machines or the like, delivery tubes extending from said machines to the main conveyor tube and having outer ends aligned with said main conveyor tube openings for delivery of said hosiery or the like from the machines to the main conveyor tube, said main conveyor tube openings being larger than the outer ends of the delivery tubes to provide air spaces therebetween, means for blowing air through said delivery tubes to transport the hosiery or the like from the machines through the delivery tubes and into the main conveyor tube, a conveyor belt carried in the bottom of said main conveyor tube, and means for moving said belt in the direction of the collection station to move said hosiery or the like through the main conveyor tube to the collection station.

5. Means for collecting articles, such as hosiery, from a plurality of circular knitting machines or the like to a central collection station, said means comprising a main conveyor tube extending along said plurality of machines or the like to a central collection station, said main conveyor tube having a top surface above the level of the locations at which the articles are removed from said machines and said main conveyor tube having openings along the top thereof adjacent said knitting machines or the like, delivery tubes extending from the removal locations of said machines upwardly above said main conveyor tube and having outer ends aligned with said main conveyor tube openings for delivery of said hosiery or the like upwardly from the machines to above the main conveyor tube and into said main conveyor tube, means for blowing air through said delivery tubes to transport said hosiery or the like therethrough, the ends of said delivery tubes being spaced from the peripheries of the main conveyor tube openings to provide a space for the passage of air to dissipate the excess of air blown from the delivery tubes into the main conveyor tube and minimize turbulence in the main conveyor tube, means for moving said hosiery or the like through the main conveyor tube to said collection station.

6. Means for collecting articles, such as hosiery, from a plurality of circular knitting machines or the like to a central collection station, said means comprising a main conveyor tube extending along said machines to the central collection station and having openings therein adjacent said knitting machines, delivery tubes extending from said machines to said main conveyor tube and having outer ends aligned with said main conveyor tube openings for delivery of said hosiery or the like from the machines into the main conveyor tube, means for blowing air through said delivery tubes to transport said hosiery or the like therethrough, the ends of said delivery tubes being spaced from the peripheries of the main delivery tube openings to provide a space for the passage of air to dissipate the excess of air blown from the delivery tubes into the main conveyor tube and minimize turbulence in the main conveyor tube, a conveyor belt carried in the main conveyor tube and on which hosiery or the like are received from said delivery tubes, means for moving said conveyor belt in the direction of the collection station, a deposit tube extending from the main conveyor tube to the collection station, and means adjacent said deposit tube for directing a jet of air against the articles on the belt to remove the articles from the belt and blow them through the deposit tube into the collection station.

7. Means for collecting articles, such as hosiery, from a plurality of circular knitting machines or the like to a central collection station, said means comprising a main conveyor tube extending along said machines to the central collection station, delivery tubes extending from said machines to said main conveyor tube to deliver articles from said machines into said main conveyor tube, a conveyor belt carried in the main conveyor tube, means for moving said conveyor belt in the direction of the collection station to carry articles thereto, a deposit tube extending from the main conveyor tube to the collection station, and means adjacent said deposit tube for directing a jet of air against the articles on the belt to remove the articles from the belt and blow them through the deposit tube into the collection station.

8. Means for collecting articles, such as hosiery, from a plurality of circular knitting machines or the like to a central collection station, said means comprising a main conveyor tube extending along said plurality of machines or the like to a central collection station and having openings therein adjacent said knitting machines or the like, delivery tubes extending from said machines to said main conveyor tube and having outer ends aligned with said main conveyor tube openings for delivery of said hosiery or the like from the machines into the main conveyor tube, means for blowing air through said delivery tubes to transport said hosiery or the like therethrough, the ends of said delivery tubes being spaced from the peripheries of the main delivery tube openings to provide a space for the passage of air to dissipate the excess of air blown from the delivery tubes into the main conveyor tube and minimize turbulence in the main conveyor tube, a smooth flat conveyor belt extending along and supported on the bottom interior surface of said main conveyor tube to receive articles delivered thereto by said delivery tubes, means for moving said belt in the direction of the central collection station to transport said articles on the belt to said collection station.

9. Means for collecting articles, such as hosiery, from a plurality of circular knitting machines or the like to a central collection station, said means comprising a main conveyor tube extending along said machines to the central collection station, delivery tubes extending from said machines to said main conveyor tube to deliver articles from the machines into said main conveyor tube, means for blowing air through said delivery tubes to transport said articles therethrough, a smooth flat conveyor belt having a portion thereof extending along and supported on the bottom interior surface of said main conveyor tube to receive articles delivered thereto by said delivery tubes, means for moving said belt in the direction of the central collection station to transport said articles on the belt to said collection station.

10. Means for collecting articles, such as hosiery, from a plurality of circular knitting machines or the like to a central collection station, said means comprising a main conveyor tube extending along said machines to the central collection station, delivery tubes extending from said machines to said main conveyor tube, means for blowing air through said delivery tubes to transport said articles therethrough and to deliver articles from the machines into said main conveyor tube, a smooth flat conveyor belt having its upper reach extending along and supported on the bottom of the interior surface of said main conveyor tube to receive articles delivered thereto by said delivery tubes, said belt having its lower reach extending below said tube, means for moving said belt for movement of the upper reach in the direction of the central collection station to transport said articles on the belt to said collection stations.

11. Means for collecting articles, such as hosiery, from a plurality of circular knitting machines or the like to a central collection station, said means comprising a main conveyor tube extending along said machines to the cen-

tral collection station and having a main chamber and a lower chamber, delivery tubes extending from said machines to the main chamber of said main conveyor tube, means for blowing air through said delivery tube to transport said articles therethrough and to deliver articles from the machines into said main chamber, a smooth flat conveyor belt having its upper reach extending along and supported on the bottom of the interior surface of said main chamber to receive articles delivered thereto by said delivery tubes, said belt having its lower reach extending through and supported in said lower chamber, means for moving said belt for movement of the upper reach in the direction of the central collection station to transport said articles on the belt to said collection station.

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