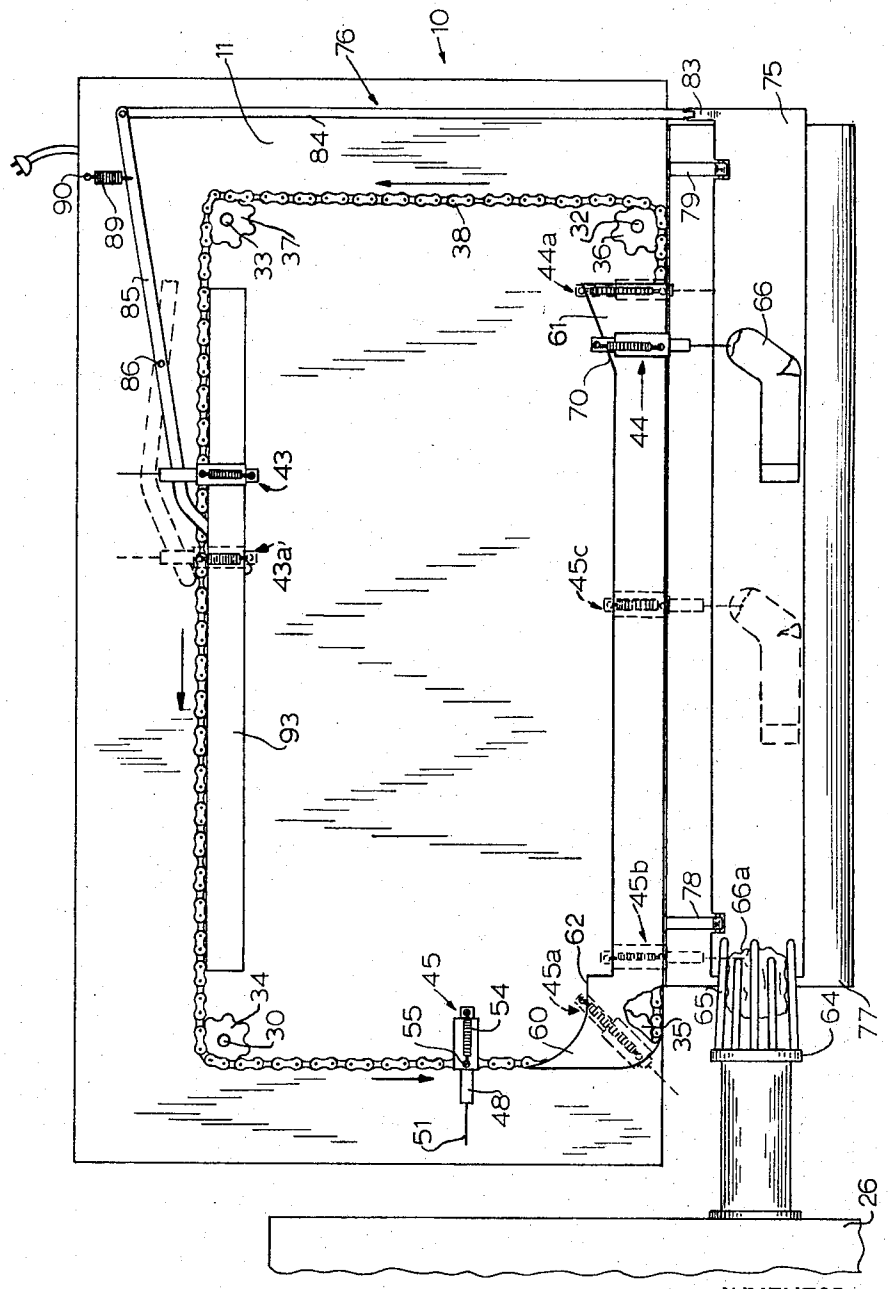
March 26, 1968 C. J. GLOVER 3,374,903

HOSIERY STACKING APPARATUS

Filed Feb. 21, 1966 3 Sheets-Sheet 1

FIG-1



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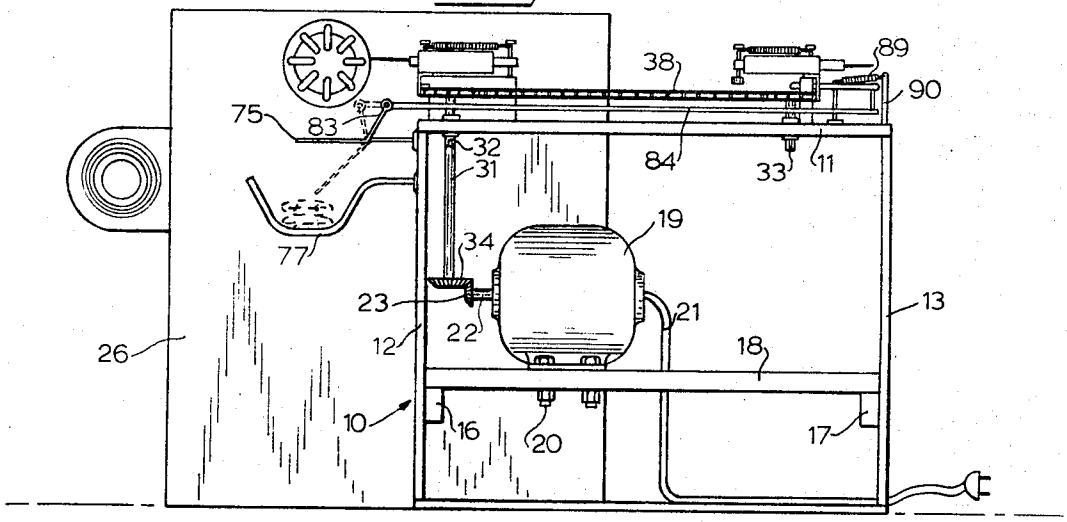
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HOSIERY STACKING APPARATUS

Filed Feb. 21, 1966 3 Sheets-Sheet 2

Fig-2



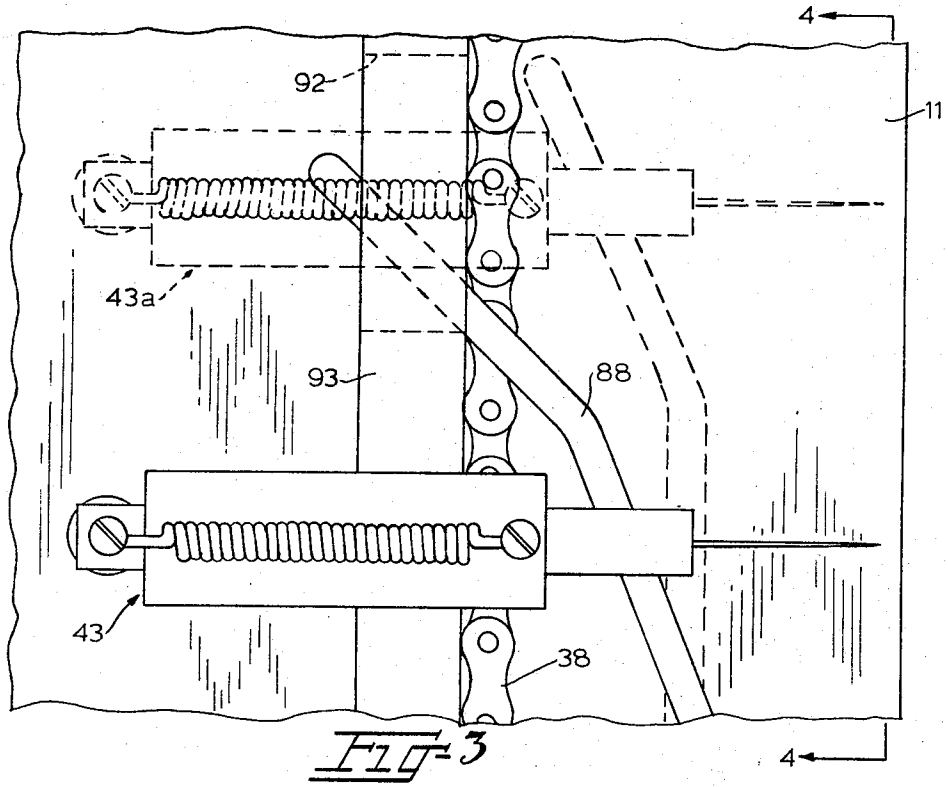


Fig-3

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HOSIERY STACKING APPARATUS

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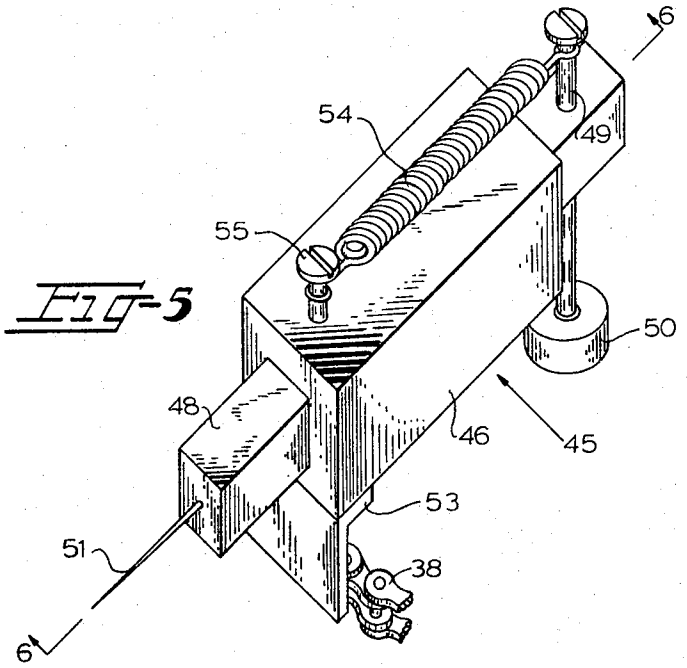


Fig-5

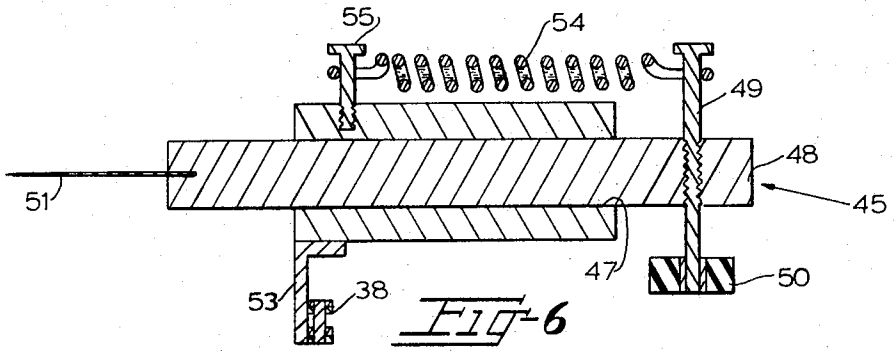


Fig-6

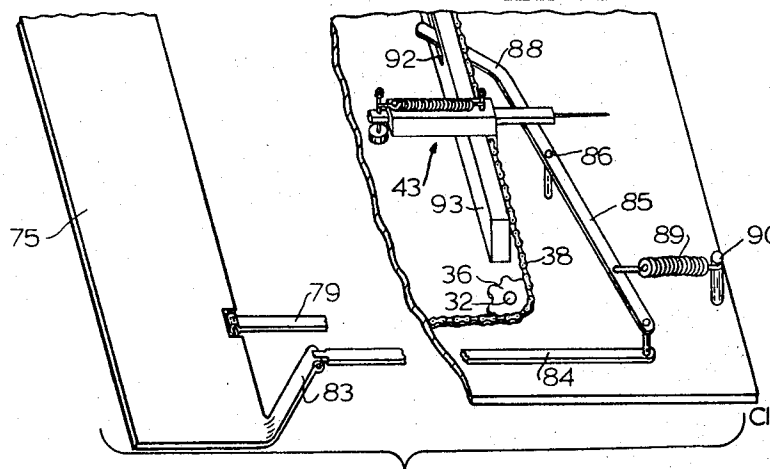


Fig-4

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3,374,903

HOSIERY STACKING APPARATUS

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6 Claims. (Cl. 214—6)

ABSTRACT OF THE DISCLOSURE

An automatic hosiery transfer and stacking device includes a series of chain-mounted retractable needles adapted to engage successive hose in the delivery station fingers of a hosiery everting machine, pull the hose to its full length and then release the hose for stacking.

Hosiery, such as socks, stockings and the like, are made right-side-out and the operator of the knitting machine turns the hose for the seaming operation or looping, sometimes called closing the toe. The inverted hose may be inspected by slipping it over the unsupported end of a hollow rotatable, tubular form which extends outwardly from a hosiery everting machine and during inspection the operator may remove any dangling threads which are pendent to the individual hose while on the inspection form. The hose is turned right-side-out by inducing a flow of air through the inspection form in the direction away from the unsupported end. This vacuum draws the hose into the tube toe end first. The hose proceeds through the hosiery everting machine and is abruptly stopped and received by spring fingers at a delivery station. Considerable production time is lost in removing the hose from the delivery station both because of the hose being bunched and because of the difficulty of holding the hose and pulling it through the fingers. The prior art teaches various removing and stacking devices which grasp and pull the hose from the delivery station onto a stacking table. Such devices are generally relatively complex because the movement of the stacking device and the release of the hose from the mechanical fingers must be correlated to the operation of the hosiery-everting machine. These devices are further complicated in that the machine must be adapted to handle hose of various sizes and weights.

A primary object of this invention is to provide an improved hosiery-stacking device which is adapted to remove hosiery from the hosiery everting machine, straighten it to its full length and move it to a stacking location.

Another object of this invention is to provide a hosiery stacking device which is adapted to function independently of the operation of the hosiery everting machine.

A further object of this invention is to provide a hosiery-stacking device with an improved gripping means which is adapted to engage the hosiery in the delivery station, pull the hose to its full length and release the hose at a selected point along a defined path while continuously moving along that defined path.

A still further object of this invention is to provide a hosiery stacking device with means, firstly, for receiving the hose in a straightened condition and, secondly, for vertically stacking the hose while avoiding entanglement with previously stacked hosiery.

These and other objects of this invention will become apparent by reference to the following specification when taken in conjunction with the accompanying drawings, in which:

FIGURE 1 is a plan view of the machine showing a plurality of hose-engaging mechanisms which are selectively spaced along a link chain track;

FIGURE 2 is a right hand elevation view of the machine showing the hosiery-everting machine and the everted hosiery stacked in a receiving receptacle;

FIGURE 3 is a fragmentary plan view of the needle mechanism showing the same tripping a lever which actuates the hosiery loading platform;

FIGURE 4 is a fragmentary pictorial view of the invention showing the linkages for tripping the hosiery-loading platform;

FIGURE 5 is a pictorial enlarged view of one of the hosiery-engaging mechanisms and a portion of the link chain to which it is affixed;

FIGURE 6 is a sectional view taken along line 6—6 of FIGURE 5 showing the structural arrangement of the parts comprising the hosiery-engaging mechanism.

One embodiment of the present invention contemplates providing a hosiery-stacking apparatus or attachment which is to cooperate with but function independently of a hosiery everting machine. The hosiery-stacking apparatus is generally comprised of a table or the like which is adapted to rest on a floor adjacent the hosiery everting machine. The table is provided with a plurality of vertically and upwardly extending shafts which are rotatably mounted in its top, horizontal surface and which are adapted to receive chain-engaging sprockets. A selected shaft which extends downwardly through the table top is positively driven by an electric motor or the like which turns the idler sprockets in unison by means of a link chain which meshes with and is trained around the sprockets, the chain being effective to form a closed path. The chain is provided with a plurality of hose engaging mechanisms which are adapted to pierce a hose residing in the delivery station of the hosiery everting machine and to pull the hosiery therefrom onto a tiltable platform. For the piercing function, each hosiery-engaging mechanism is provided with a spring actuated needle which is loaded and quickly released by means of a cam which is located adjacent the closed path and positioned for selective engagement therewith. After the needle is almost instantaneously propelled into the hose, the chain carries the hose-engaging mechanism along the closed path until the hose assumes a relatively straightened position. The needle is rapidly withdrawn from the engaged hose by means of a second cam located along its path of travel at a predetermined stacking station whereupon the hose is laid to rest on a tiltable platform. The tiltable platform is actuated by means of a linkage and lever mechanism. The lever extends across the closed path along which the hosiery-engaging mechanism travels and is energized by the same so that when the hosiery-engaging mechanism contacts the lever, the tiltable board is pivoted downwardly and the hose slides therefrom and into the hose receptacle.

This invention is illustrated in connection with the accompanying drawings in which the figures are illustrative of the preferred embodiment of the invention.

Referring to the figures, the device shown in the drawings includes a fixed frame assembly generally designated by reference numeral **10**. Frame **10** is comprised of a table top **11** which is supported by legs **12**, **13**, **14** and **15** (legs **14** and **15** not shown). Legs **12** and **14** are connected by means of brace **16** and legs **13** and **15** are connected by means of brace **17**. Braces **16** and **17** are interconnected by support member **18** which rigidly receives an electric motor **19** by means of nut and bolt arrangement **20**. Motor **19** which is connected to a power source (not shown) by means of cord **21** is provided with a drive shaft **22** having a bevel gear **23** rigidly mounted on its exposed end. Frame **10** is located adjacent hosiery everting machine **26** and in communication with delivery station **64** thereof.

Table top **11** rotatably receives a plurality of upwardly

extending and spaced shafts 30, 31, 32 and 33. Shaft 31 extends downwardly through the surface of table top 11 and is integrally provided with bevel gear 34 which is in meshing engagement with bevel gear 23 of drive shaft 22. Shafts 30, 31, 32 and 33 are respectively provided with sprockets 34, 35, 36 and 37 which are rigidly secured thereon for rotation therewith. An endless flexible link chain 38 extends around the outer peripheries of sprockets 34, 35, 36 and 37 and is in meshing engagement therewith thus forming a closed path. Upon the energization of motor 19, shaft 31 is rotated thus driving endless chain 38 around the sprockets.

Chain 38 which forms the closed path is provided with hose-engaging mechanisms 43, 44 and 45 which are equidistantly spaced along the length thereof. Hosiery engaging mechanism 45 (shown enlarged in FIGURE 5) which is identical to hose-engaging mechanisms 43, 44 is comprised of a housing 46 having a substantially square passageway 47 extending lengthwise therethrough, an elongated block 48 slidably mounted in square passageway 47, a shaft 49 threadably mounted in and extending through one end of elongated block 48, a cam follower 50 rotatably mounted on the lower extending end of shaft 49, and a needle 51 which is rigidly and axially mounted in the other end of elongated block 48. Hosiery engaging mechanism 45 is mounted on chain 38 by means of an inverted L-shaped support 53 which is integrally secured to the lower portions of housing 46 at its upper end and rigidly secured to chain 38 at its lower end so as to point needle 51 outwardly and away from the interior of the closed path as defined by endless chain 38. Needle 51 and elongated block 48 are normally in an outwardly extended position and are maintained in such position by means of a tension spring 54 which is suspended between the upper end of shaft 49 and a stake 55 which is threadably mounted in the outer end of housing 46.

To withdraw needle 51 and elongated block 48 inwardly toward the center of the closed path, a cam, hereafter described, is provided for cam follower 50 which rides thereon and at desired locations overcomes the tension forces of spring 54 and pulls elongated block 48 inwardly. It can therefore be seen that needle 51 travels inwardly and outwardly by allowing cam follower 50 to ride along a selected cam surface.

Chain 38 is associated with cams 60 and 61 which are mounted on table top 11 by any convenient means (not shown) and are selectively positioned along the inside of the closed path as defined by chain 38 so as to withdraw elongated block 48 and needle 51 inwardly and establish spring tension at selected locations and to release elongated block 48 and needle 51 from such tension at other selected locations. When hose engaging mechanism 45 is in position as shown in skeleton by reference numeral 45*a*, cam follower 59 impinges against the inner surface 62 of cam 60 and is forced inwardly thereby overcoming and increasing the tension in spring 54 and thus pulling elongated block 48 and needle 51 inwardly. As hose engaging mechanism 45 continues to be carried by chain 38 along the path as defined by it, cam follower 50 rolls along the inner surface 62 of cam 60 and rolls off the end of cam 60 whereupon spring 54 accelerates elongated block 48 and needle 51 outwardly so that needle 51 which was formerly in a position outside of delivery station 64 enters the same almost instantaneously between spring fingers 65 and pierces hose 66*a* which is held thereby. Needle 51, when hose-engaging mechanism 45 is in position 45*b*, has pierced sock 66*a* and is positioned to pull hose 66*a* from spring fingers 65. At position 45*c*, hose engaging mechanism 45 has pulled hose 66*a* from spring fingers 65 and has substantially straightened the same. Hose-engaging mechanism 44 is positioned to release hose 66 by engaging cam 61 when hose-engaging mechanism 45 is at its first mentioned location (in solid lines). When follower 50 impinges against and rides upwardly along inclined inside surface 70 of cam 61, elongated block 48 and needle 51 are rapidly pulled inwardly thereby sliding needle 51 out of engagement with appendant hose 66 whereupon hose-engaging mechanism 44 assumes the position indicated by reference numeral 44*a*. Hose 66 rests on tilting platform 75 in a straightened condition after it has been released by needle 51 and is adapted to be stacked in trough-shaped receptacle 77.

Once hose 66 has been deposited on tilting platform 75 and is free of needle 51, tilting platform 75 is pivoted downwardly by linkage mechanism 76 whereupon hose 66 is dropped into trough shaped receptacle 77 which is rigidly attached to frame 10 and which is in vertical communication with tilting board 75 and delivery station 64 as shown in FIGURE 2. Tilting platform 75 is pivotally mounted on horizontally extending arms 78 and 79 which are rigidly secured to frame 10 and extend outwardly therefrom in the direction of trough 77. Tiltable platform 75 is provided with an integrally mounted and upwardly extending stake 83 which is pivotally connected to a connecting rod 84. Connecting rod 84 substantially traverses the width of table top 11 and is pivotally connected to a tripping lever 85. Tripping lever 85 is pivotally mounted on a vertically extending pin 86 which is rigidly attached to table top 11. Tripping lever 85 is provided with a flared end 88 which traverses the path as defined by chain 38 and which is adapted to strike inverted L-shaped connection 53 of hose-engaging mechanism 45. Flared end 88 normally resides in an opening 92 in a plank 93; plank 93 serves as a backstop for chain 38 and aids in maintaining chain 38 in a fixed path between sprockets 34 and 37 for when hose-engaging mechanism 43 strikes flared end 88, it normally would have the tendency to be pushed inwardly thereby. The flared end 88 is held in position across the path as defined by chain 38 by means of spring 89 which is mounted to and between tripping lever 85 and a perpendicularly arranged stake 90 which is rigidly secured on table top 11 and extends upwardly therefrom. Linkage mechanism 76 is energized as shown in FIGURE 3 when hose engaging mechanism 43 moves to the position 43*a* (in skeleton) whereupon connecting member 53 of hose-engaging mechanism 43 impinges against flared end 88 of tripping lever 85 and pushes it outwardly thus pivoting tripping lever 85 about pin 86 and pushing connecting link 84 toward tilting platform 75. As connecting rod 84 pushes against stake 83, tilting platform 75 is forced downwardly into the position as shown in skeletons in FIGURE 2. When in the tilted position, hose 66 slides off into trough receptacle 77. As tripping member 88 passes over L-shaped connection 53, spring 89 pulls linkage mechanism 76 back into its normal resting position thus pivoting tilting platform 75 upwardly and into a position parallel with table top 11.

In operation, hose engaging mechanisms 43, 44 and 45 are equidistantly spaced along the length of endless chain 38 to provide for the continuous removal of hosiery from an everting machine at a predetermined rate which can of course be controlled by selection of the motor speed, gear ratios and the like but which should be at sufficient speed to insure the rapid needle action heretofore discussed. It can be seen that the hose engaging, withdrawing and stacking steps occur independently from the operation of the hosiery everting machine. That is, the apparatus of the invention is operable as an independent attachment to the conventional everting machine. By energizing motor 19, shaft 31 is turned thus positively driving sprocket 35 and chain 38. From the positions of hose engaging mechanisms 43, 44 and 45 as shown in FIGURE 1, as mechanism 44 releases hose 66 by having its traveler strike cam surface 70, mechanism 43 approaches tripping lever 85 and mechanism 45 approaches cam 60. After mechanism 44 has released hose 66, mechanism 43 strikes and pivots tripping lever 85 whereby tilting platform 75 is pivoted downwardly by linkage 76 thus depositing hose 66 in trough receptacle 77. Immedi-

ately after mechanism **43** moves free of tripping lever **85**, mechanism **45** engages cam **60** thus moving needle **51** and elongated block **48** inwardly. After mechanism **45** has moved past cam **60**, elongated block **48** and needle **51** are substantially instantaneously released thereby and needle **51** moves outwardly and penetrates hose **66***a* which is held in delivery station **64** by spring fingers **65**. It can be seen that a hose may be removed from delivery station **64**, straightened and deposited into receptacle **77** for each complete cycle of a hose-engaging mechanism around the closed path as defined by chain **38**.

Many different embodiments of this invention may be made without departing from the scope and spirit thereof. It is contemplated that various numbers of hose-engaging mechanisms may be used depending upon the needs of the user. Therefore, it is to be understood that this invention is not to be limited to the specific embodiment shown and described herein, except as defined in the appended claims.

What is claimed is:

1. An automatic hosiery transfer and stacking apparatus comprising:

(a) a plurality of retractable needle means horizontally positionable to positively penetrate the leading portion of successive hose retained internally of the delivery station fingers of a pneumatic type hosiery-everting machine;

(b) means for continuously moving said retractable needle means in a horizontal plane along a defined single direction endless path which includes and extends from said delivery station fingers to a stacking station, said needle means being separated on said moving means by an amount at least equal to the length of said hose;

(c) means for actuating said retractable needle means successively such that each positively moves to said hose penetrating position within said fingers when at said delivery station and to a positively withdrawn retracted position when at said stacking station thereby being effective to positively engage said hose by the penetration of its leading portion within said fingers and to move the engaged hose from said fingers such that it assumes a straightened full length condition at said stacking station and to successively positively release said retractable needle means from engagement with said hose by the positive withdrawal of the retractable needle means therefrom; and

(d) receptacle means located at said stacking station in front of said delivery station, below and in vertical alignment with said defined path for receiving in vertically stacked relation successive ones of said hose.

2. In a hosiery-stacking apparatus as claimed in claim **1** including tiltable platform means positioned below said path above said receptacle means for receiving said hose while the same is engaged by said needle means; and means coordinated with the withdrawal of said needle means at said stacking station for tilting said platform to allow said hose to fall into said receptacle in a stacked relationship.

3. In a hosiery-stacking apparatus as claimed in claim **2** wherein said needle means comprises a plurality of needle means movable in a closed path which includes said fixed path; means to maintain said needle means in continuous movement independent of the operation of said pneumatic everting machine; and means biasing each said needle means to move substantially instantaneously to said penetrating position when at said delivery station and rapidly to said withdrawn position when at the terminal of said stacking station.

4. In a hosiery-stacking apparatus as claimed in claim **3** wherein said closed path is substantially defined by an endless link chain; means associated with said chain to support the same and to maintain said chain in a position to define said closed path; and means for moving said chain continuously along said closed path.

5. In a hosiery-stacking apparatus as claimed in claim **4** wherein said needle means is comprised of an inverted L-shaped member extending upwardly from and rigidly connected to said chain; a housing integrally connected to said L-shaped member and having a passageway extending therethrough being perpendicularly arranged with respect to said chain; a shaft slidably mounted in said passageway; a needle rigidly secured to a first end of said shaft and positioned externally of said closed path; and means associated with said shaft for moving said needle substantially instantaneously to penetrate said hose retained in said delivery station when adjacent said delivery station and for withdrawing said needle rapidly from contact with said hose when at the terminal of said stacking station.

6. In a hosiery-stacking apparatus as claimed in claim **5** wherein said means for moving said needle to penetrate said hose and for withdrawing said needle from contact with said hose is comprised of a first cam stationarily positioned inside said closed path adjacent said delivery station; a second cam stationary located inside said closed path adjacent said stacking station; a roller rotatably mounted on a second end of said shaft and adapted to roll along selected surfaces of said first and second cams; and a spring connected to and suspended in tension between said housing and said second end of said shaft whereby said needle is normally maintained in an outwardly projecting position with respect to said closed path and, selectively, in a withdrawn position when said roller traverses said selected surfaces of said first and second cams.

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