July 12, 1960 J. E. KIENEL 2,944,709

PNEUMATIC APPARATUS FOR TURNING AND STACKING HOSIERY

Filed Nov. 12, 1954 2 Sheets-Sheet 1

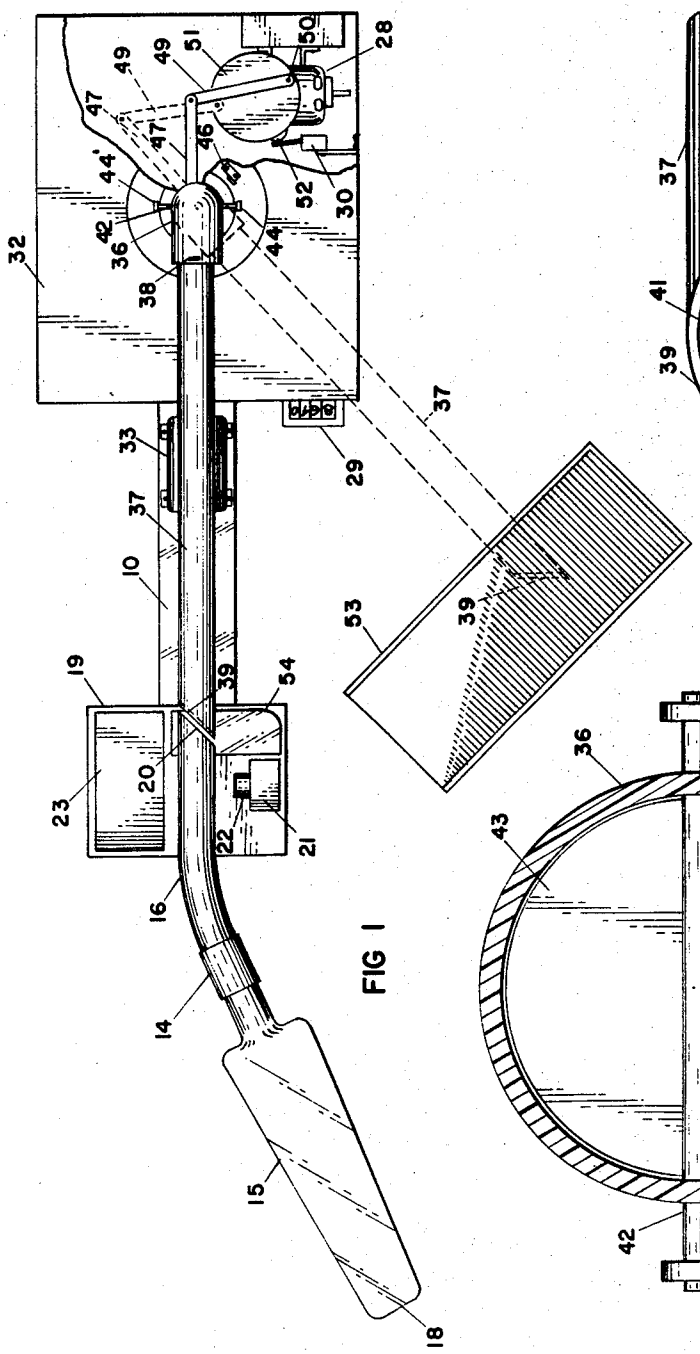


FIG 1

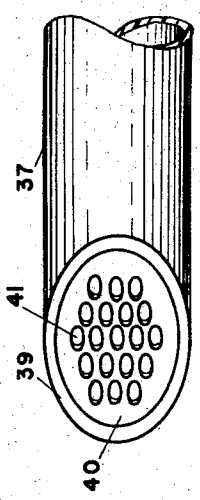


FIG 3

FIG 2

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PNEUMATIC APPARATUS FOR TURNING AND STACKING HOSIERY

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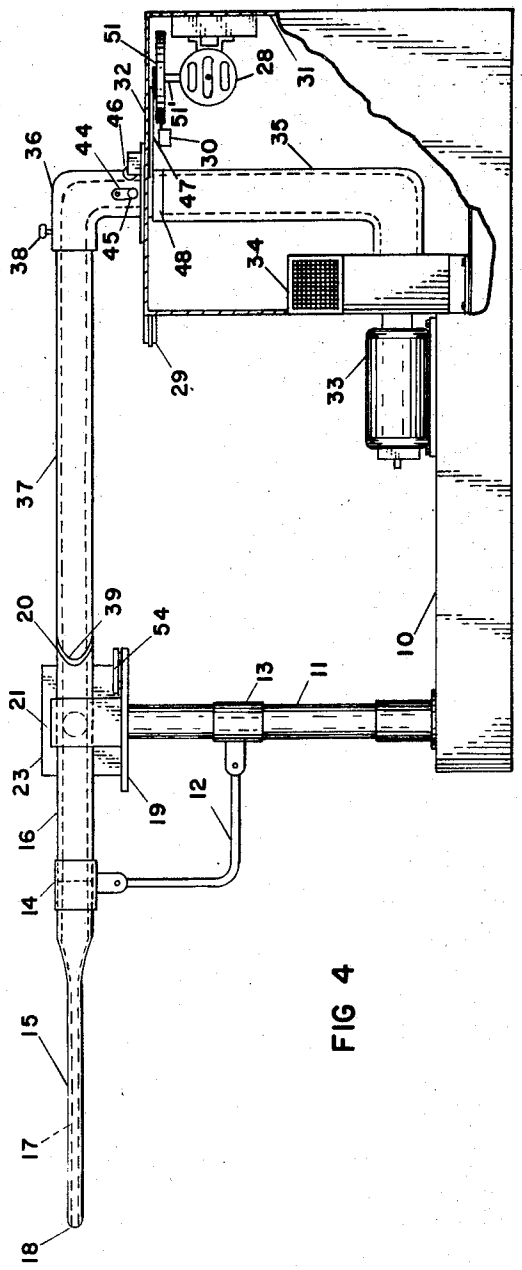


FIG 4

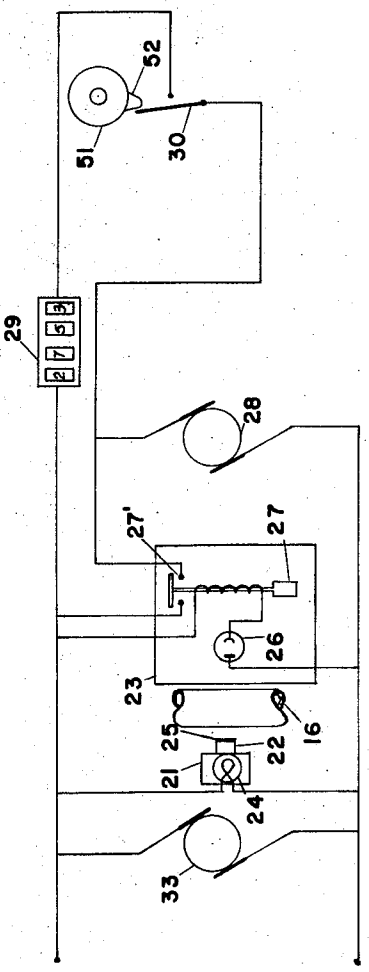


FIG 5

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PNEUMATIC APPARATUS FOR TURNING AND STACKING HOSIERY

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6 Claims. (Cl. 223—43)

This invention relates to a hosiery turner and more particularly to pneumatic apparatus for automatically turning and stacking hosiery.

In the hosiery industry, it is necessary, after a sock or stocking is manufactured, to turn this article of hosiery, thereby presenting a smooth outer surface unmarred by loose thread ends and to stack successively turned hose for further processing. In the past, this operation has been accomplished manually in most plants manufacturing ladies' nylon hosiery, there being no practical apparatus for accomplishing this step.

In my U.S. Patent No. 2,684,187, entitled "Pneumatic Apparatus for Turning Socks," I have disclosed apparatus which includes an exhaust fan connected to a receiving box from which projects a tube over which a sock is placed and reversed or turned by being drawn toe first into the tube; however, after being turned, the socks are deposited in the box in an irregular pile and must later be stacked manually. Such apparatus, however, is not particularly adapted for the turning of nylon hose since any such random piling and manual handling is objectionable because nylon is subject to damage upon any frictional contact of nylon upon nylon, and such is eliminated by the apparatus of the present invention.

Briefly, the present invention includes, for turning articles of hosiery, a tube having a nozzle at one end especially adapted to receive thereover a hose whereby the nozzle projects to the toe. This tube is stationary while the nozzle is rotatable about its axis so that the hose may be inspected. The other end of the tube is adapted to abut the end of a suction pipe which is pivotally connected at its other end to a suction fan or blower; thus, when the pipe is aligned with the tube, suction will be applied against the toe of the hose to draw it into the tube until the toe strikes a baffle at the abutting end of the pipe. A photoelectric cell mounted to supervise the tube detects the presence of the hose in the tube, actuates a horizontally rotating mechanism which causes the pipe to swing about, thus drawing the hose from the tube and depositing it gently in a receptacle at the end of the travel of the pipe when the suction is automatically relieved temporarily.

Accordingly, it is an object of the present invention to provide a hosiery turner which will turn and stack articles of hosiery, such as hose, socks, stockings or the like.

Another object of my invention is to provide a hosiery turner which will operate automatically to turn articles of hosiery which are successively installed on the device and will stack these hose, socks, stockings and the like in a neat pile with a minimum of rubbing.

Another object of my invention is to provide a hosiery turner which will allow each article of hosiery to be inspected immediately prior to turning thereof.

Another object of my invention is to provide a hosiery turner which is inexpensive to construct and operate, durable in structure, efficient in operation and has few moving parts to get out of adjustment.

Other and further objects and advantages of my invention will become apparent from the following description when taken in conjunction with the accompanying drawings in which like characters of reference designate corresponding parts throughout the several views, and wherein:

Fig. 1 is a top plan view of a hosiery turner constructed in accordance with my invention, a portion of the cabinet thereof being partially cut away to illustrate the internal arrangement.

Fig. 2 is an enlarged view of a detail of the hosiery turner illustrated in Fig. 1 showing the butterfly valve within the suction pipe.

Fig. 3 is an enlarged view of a detail of the hosiery turner illustrated in Fig. 1 showing the baffle mounted in the end of the suction pipe.

Fig. 4 is a side elevational view of the hosiery turner illustrated in Fig. 1, a portion of the cabinet thereof being partially cut away to illustrate the internal arrangement.

Fig. 5 is a schematic diagram showing the electrical wiring of the hosiery turner illustrated in Fig. 1.

Referring now in detail to the embodiment chosen for purpose of illustration, numeral **10** denotes the base on which my hosiery turner is mounted, this base **10** being provided at one end with an upright standard **11**. An arm **12** projects from the central portion of standard **11** and is retained rigidly in place by a sleeve **13** which circumscribes standard **11**. The free end of arm **12** terminates above standard **11** and is provided with a second sleeve **14** the axis of which is disposed in a horizontal plane whereby sleeve **14** receives one end of nozzle **15** and one end of suction tube **16**, the respective ends abutting within sleeve **14** as illustrated by broken lines in Fig. 4. The end of nozzle **15** which is received within sleeve **14** is circular, being rotatably retained therein so that nozzle **15** may be rotated about its axis when desired. The remainder of nozzle **15** which projects from sleeve **14** is flattened and tapered toward its free end so that successive articles of hosiery may be fitted over this free end.

In Fig. 4, it is seen that nozzle **15** is provided with a flattened axial channel **17** which has an inlet **18** at the free end of nozzle **15** and through which a hose enters my hosiery turner, passing through channel **17** to tube **16**. Tube **16** projects across the top of a platform **19**, provided at the upper end of standard **11**, and terminates in a vertically beveled end **20**. Tube **16** is formed of clear plastic, glass or the like, or may be of metal, provided aligned windows (not shown) are arranged in a portion of the tube above platform **19**.

On platform **19** is a photoelectric cell mechanism which supervises tube **16** in that it is arranged to detect the presence of a hose within tube **16**. In Figs. 1, 4 and 5, the photoelectric cell mechanism is illustrated as including a lamp housing **21**, and a lens holder **22** on one side of tube **16**, and a photoelectric cell housing **23** on the other side of tube **16**. In Fig. 5, it is seen that a lamp **24** is provided within lamp housing **21** to project light through lens **25** carried by lens holder **22** and through tube **16** to a photoelectric cell **26** within housing **23**. Also within housing **23** is a relay **27** having a normally closed switch **27'** which is held open as long as light is directed onto photoelectric cell **26**. The switch **27'** is in series with a motor **28** whereby a source of electric current is supplied to start motor **28** upon a drop in current passing through relay **27**. In parallel with switch **27'** is a counter **29** of conventional construction which counts the number of times current passes therethrough; and in series with counter **29** is a normally closed switch **30** which when closed will also supply current to motor **28**, the function of which will be described in more detail later.

Mounted at the end of base 10 opposite the standard 11 is a box-shaped cabinet 31 having a flat top 32. A motor 33 is mounted adjacent cabniet 31 on base 10 with its shaft projecting through the side of the cabinet to rotate a centrifugal blower 34 mounted within cabinet 31. Blower 34 exhausts to the outside while the intake thereof communicates with an upwardly projecting conduit 35 which terminates immediately below the central portion of top 32. One end of an elbow member 36 passes through a central aperture in top 32 and is rotatably received within the end of conduit 35 while the other end of elbow member 36 receives one end of suction pipe 37 fixed thereto by set screw 38. Pipe 37 projects horizontally from elbow member 36 toward tube 16 and terminates in a vertically beveled end 39 which is complementary to and normally in registry with end 20 of tube 16. Suction pipe 37 is adapted to swing in a horizontal plane from a normal position shown by full lines in Fig. 1 to an article depositing position as illustrated by broken lines in Fig. 1 upon rotation of elbow member 36 within conduit 35.

It is now apparent that upon actuation of motor 33, blower 34 creates a partial vacuum in conduit 35 which draws air through pipe 37 and elbow member 36. Hence, a partial vacuum is created in tube 16 when, and only when, end 39 is in registry with end 20, the vacuum being sufficient to draw an article of hosiery from nozzle 15 toe first, through inlet 18 and channel 17 into tube 16.

To prevent the hosiery from passing into pipe 37 and to provide a base against which the toe of the hose is firmly held by vacuum when a suction is created in pipe 37, I have provided a baffle 40 which is fixed within end 39 of pipe 37, as illustrated in Fig. 3. Baffile 40 is in a plane with end 39 and is provided with a plurality of spaced apertures 41 sufficiently large so that the toe of the hose will be held against the baffle by vacuum, and sufficiently small so that no appreciable portion of the hose will pass therethrough. The suction end 39 of pipe 37 is therefore a reciprocating traversing means which, with the baffle 40, traverses or reciprocates back and forth from the end 20 of tube 16 to and from the box 53. Thus, after the hose is everted, the baffle 40 engages the toe of the hosiery and as it moves away from the end 20 it draws the hosiery toe foremost from this outlet end 20 to convey the hose to and over the stacking surface within the box 53 and thereby it engages hosiery as it traverses away from the outlet and it releases the hosiery to drop upon the stacking surface of the box at the end of its travel.

In Fig. 2, it is readily seen that elbow member 36 is provided with a butterfly valve which is open when suction pipe 37 is in the normal position illustrated in full lines in Fig. 1 and is closed as suction pipe 37 approaches the hose depositing position illustrated by broken lines in Fig. 1. This butterfly valve includes a shaft 42 which passes diametrically through the vertical portion of elbow member 36 and projects outwardly from the sides thereof. Within elbow member 36, circular blade 43 is fixed to shaft 42 and is adapted to concentrically close elbow member 36 when shaft 42 is rotated to a position as illustrated in Fig. 2.

To provide for rotation of shaft 42 to open and close the butterfly valve, a pair of lever arms 44, 44' respectively project down from the ends of shaft 42 and terminate in weights 45, 45'. In the normal position of elbow member 36, the butterfly valve is open due to the pendant weights 45, 45'; however, as suction pipe 37 swings toward the position shown by broken lines in Fig. 1, arm 44 strikes cam 46, appropriately mounted on top 32, which causes rotation of shaft 42 and movement of the butterfly valve to a position where blade 43 obstructs passage of air through elbow member 36 as shown in Fig. 2. As suction pipe 37 begins its return to its normal position, arm 44 clears cam 46 whereby weights 45, 45' cause the butterfly valve to open again.

To reciprocate suction pipe 37 as described above, an

arm 47 retained by collar 48 on the lower portion of elbow member 36 projects outwardly and is pivotally connected to one end of a pitman 49. The other end of pitman 49 is connnected by means of a pivot pin 50 to the upper surface of disc 51 adjacent the periphery of the same, disc 51 being carried by vertical shaft 51' and arranged for rotation by motor 28 mounted on the side of cabinet 31.

To open normally closed switch 30, which is fixed to top 32 adjacent the periphery of disc 51, a cam member 52 is provided on the periphery of disc 51 for camming engagement with the operating lever thereof; thus, upon rotation of disc 51, switch 30 will be opened momentarily as cam member 52 strikes it and will remain closed otherwise.

At a location below end 39 of suction pipe 37, when in the position shown by broken lines in Fig. 1, is a hosiery receiving box 53 wherein the turned hose which are removed from tube 16 are stacked; and to insure that the hose are not snagged or damaged, a polished plate 54 is placed below end 20 of tube 16.

Operation

When my hosiery turner is to be used, an operator sits between nozzle 15 and box 53 in a position where hose may be fed by the operator onto the nozzle and the stacking of these hose observed.

To operate my hosiery turner, electricity is supplied from an external source (not shown) simultaneously to motor 33, lamp 24 and to photoelectric cell 26 through relay 27. With suction pipe 37 in its normal position, current is not supplied to motor 28 since light from lamp 24 shining onto photoelectric cell 26 causes sufficient current to pass through relay 27 to hold switch 27' open, and switch 30 is held open by protuberant cam member 52.

Next, the operator slips an article of hosiery over nozzle 15 and holds it in place while rotating the nozzle to inspect the hose. After the hose has been inspected, the operator releases the hose which is then drawn by suction created by blower 34 through channel 17 and into tube 16 where the toe of the hose strikes baffle 40 and is piled up thereagainst by the air pressure differential. As the hose bunches between lamp 24 and photoelectric cell 26, it blocks the beam of light and thus causes a reduction in the amount of current passing in the photoelectric cell circuit so as to allow the switch 27' of relay 27 to close, thereby actuating motor 28.

Upon actuation of motor 28, disc 51 is rotated sufficiently to allow closing of switch 30. As disc 51 rotates, pitman 49 pushes against arm 47 which rotates elbow member 36 to move suction pipe 37 away from its normal position, carrying with it the hose, the toe of the same being held against baffle 40. As the hose is withdrawn from tube 16, light from lamp 24 again shines fully upon photoelectric cell 26 and thus switch 27' of relay 27 is again opened; however, current is supplied to motor 28 through switch 30 and hence disc 51 continues to rotate. As suction pipe 37 approaches the position illustrated in broken lines in Fig. 1, the butterfly valve in elbow member 36 is closed since arm 44 strikes and rides on cam 46; therefrom, at this position, a vacuum is no longer established in suction pipe 37 and the pressure differential which causes the toe of the hose to be held by baffle 40 disappears. It is thus apparent that upon the closing of the butterfly valve, the hose is dropped into box 53.

Disc 51 then continues its rotation to swing suction pipe 37 back to its normal position. As suction pipe 37 begins its travel back to its normal position, arm 44 is disengaged from cam 46 and the butterfly valve opens; and as suction pipe 37 reaches its normal position, switch 30 is again opened by protuberant cam member 52, thus completing the cycle of operation.

It is now apparent that my hosiery turner is in a position to receive another hose to be turned in a manner

described above. Of course, at substantially any time during the cycle previously described, a second hose may be slipped over nozzle **15** and released after or as suction pipe **37** returns to its normal position.

It will be obvious to those skilled in the art that many variations may be made in the single embodiment chosen for purpose of illustration without departing from the scope of my invention as defined by the appended claims.

I claim:

1. Apparatus of the class described comprising a tubular means, exhaust means connected to said tubular means for withdrawing air therefrom, valve means selectively operable to block said exhaust means, power means for reciprocally swinging said tubular means about a vertical axis, inlet means adapted to be selectively connected with said tubular means, said tubular means drawing air through said inlet means when connected with the same, said inlet means being provided with a free end over which hose may be fitted for turning by being drawn off said end and through said inlet means, said valve means being adapted to be closed upon swinging of said tubular means away from said inlet means, and means carried by said tubular means for holding said hose and withdrawing said hose from said inlet means upon swinging of said tubular means and dropping said hose upon closing of said valve means.

2. The apparatus as claimed in claim 1 wherein automatic control means is connected to said power means to actuate said power means upon the passage of said hose into said inlet means.

3. The apparatus as claimed in claim 2 wherein said automatic control means includes a light source directing light through said inlet means and a photoelectric cell receiving said light, said power means being connected to said photoelectric cell and operable thereby to reciprocally swing said tubular means upon a decrease in light shining on said photoelectric cell.

4. A hosiery turner comprising a transparent tube having a nozzle over which a hose is placed to be drawn toe-first into the same, a blower, tubular means connected to the inlet of said blower, motive power means connected for moving said tubular means to be normally in operable connection with said transparent tube to apply reduced pressure through the same when in operable connection therewith or to be disconnected therefrom by movement of said motive power means, a photoelectric cell mounted adjacent said transparent tube, a light source mounted adjacent said tube opposite said cell to direct light through said tube onto said cell, said photoelectric cell being connected to said motive power means to actuate the same upon interruption of said light by said hose passing through said transparent tube, baffle means in said tubular means against which said hose is held as said tubular means is moved away from said transparent tube, a valve arranged to control pressure in said tubular means, and a cam arranged to operate said valve upon movement of said tubular means to close said valve when said tubular means is moved out of operable connection with said transparent tube to release said hose from said baffle member.

5. A hosiery turner comprising a nozzle over which a hose is placed to be drawn toe-first into the same a transparent tube connected to said nozzle and through which said hose travels, a blower, a tubular member connected to the inlet of said blower, an elbow member pivotally mounted on said tubular member, motive power means connected for reciprocally moving said elbow member, a pipe extending from said elbow member and apated to be normally in operable connection with said transparent tube to apply reduced pressure through the same when in operable connection therewith or to be disconnected therefrom by movement of said elbow member, a photoelectric cell mounted adjacent said transparent tube, a light source mounted adjacent said tube opposite said cell to direct light through said tube onto said cell, said photoelectric cell being connected to said motive power means to actuate the same upon interruption of said light by said hose passing through said tube, baffle means in said pipe against which said hose is held as said pipe is rotated, a butterfly valve arranged to control pressure in said pipe, and a cam positioned to operate said butterfly valve upon movement of said elbow member to close said butterfly valve when said pipe is moved out of operable connection with said tube to release said hose from said baffle member.

6. A hosiery turner comprising a nozzle over a hose is placed to be drawn toe-first into the same, a transparent tube connected to said nozzle and through which said hose travels, a blower, a tubular member connected to the inlet of said blower, an elbow member pivotally mounted on said tubular member, motive power means connected for reciprocally moving said elbow member, a pipe extending from said elbow member and adapted to be normally in operable connection with said transparent tube to apply suction through the same when in operable connection therewith or to be disconnected therefrom by movement of said elbow member, a photoelectric cell mounted adjacent said transparent tube, a light source mounted adjacent said tube opposite said cell to direct light through said tube onto said cell, said photoelectric cell being connected to said movtive power means to actuate the same upon interruption of said light by said hose passing through said tube, baffle means in said pipe against which said hose is held as said pipe is rotated, a butterfly valve in said elbow member, and a cam adjacent said elbow member adapted to operate said butterfly valve upon movement of said elbow member to close said butterfly valve when said pipe is moved out of operable connection with said tube to release said hose from said baffle member.

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