Oct. 2, 1934. G. D. HARRIS 1,975,717

METHOD AND APPARATUS FOR TREATING MATERIALS

Original Filed July 30, 1930 4 Sheets-Sheet 1

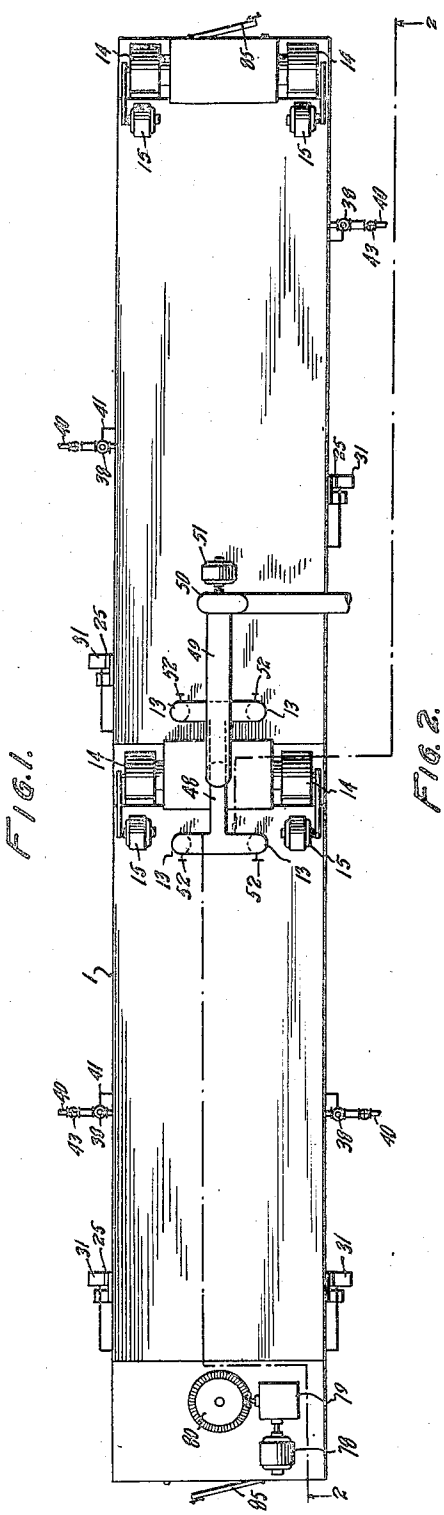


FIG. 1.

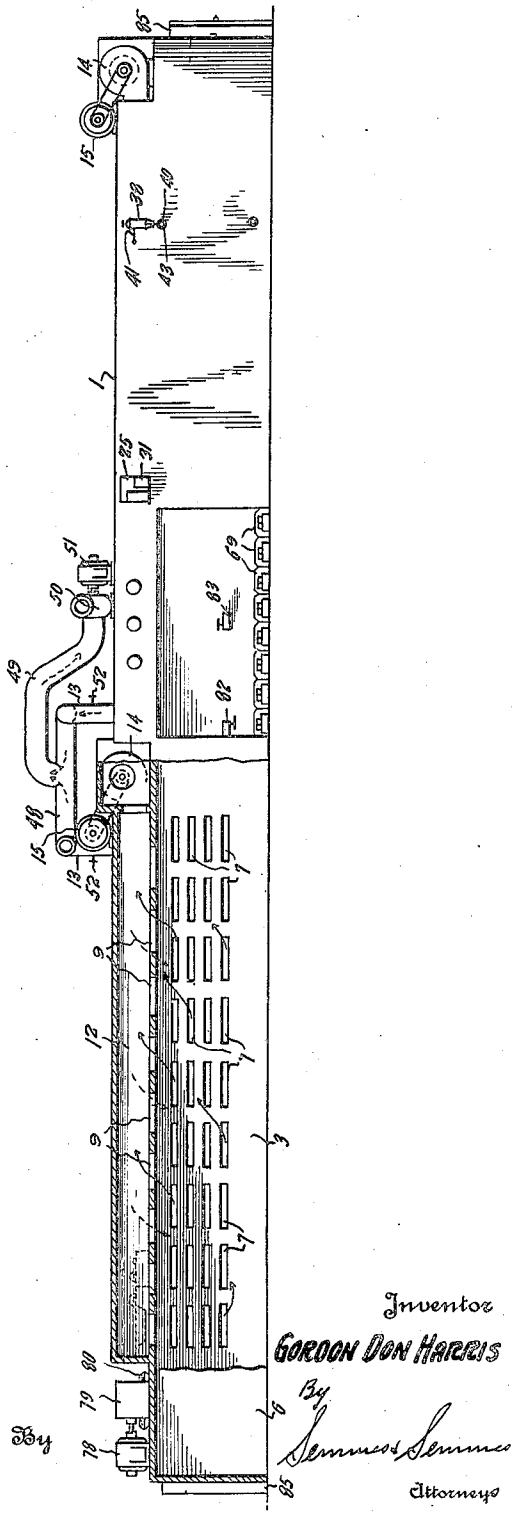


FIG. 2.

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FIG. 3.

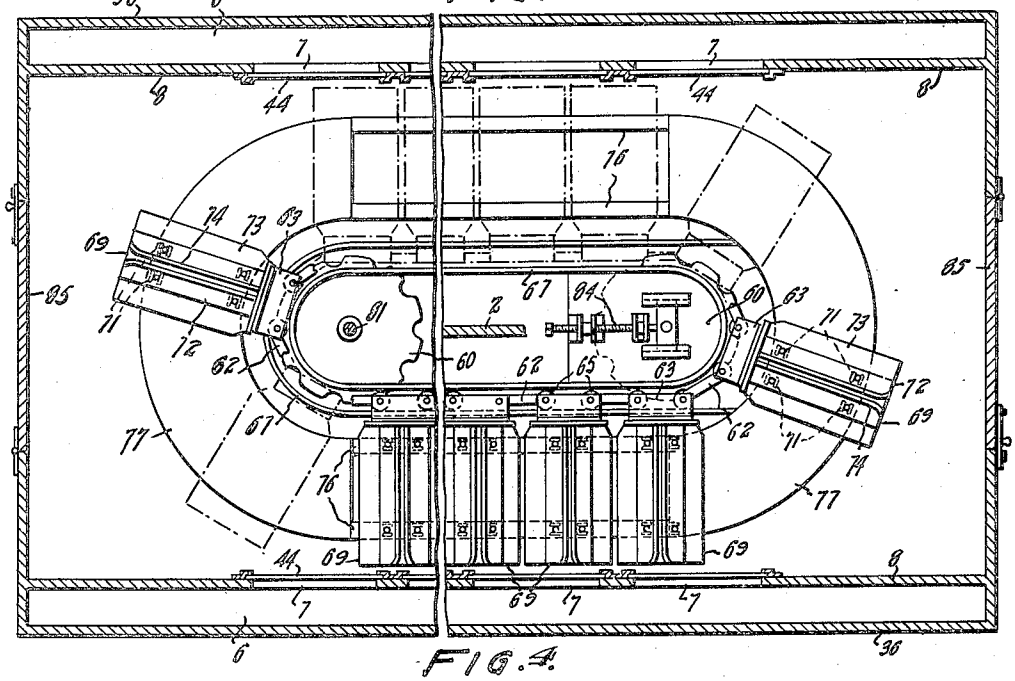


FIG. 4.

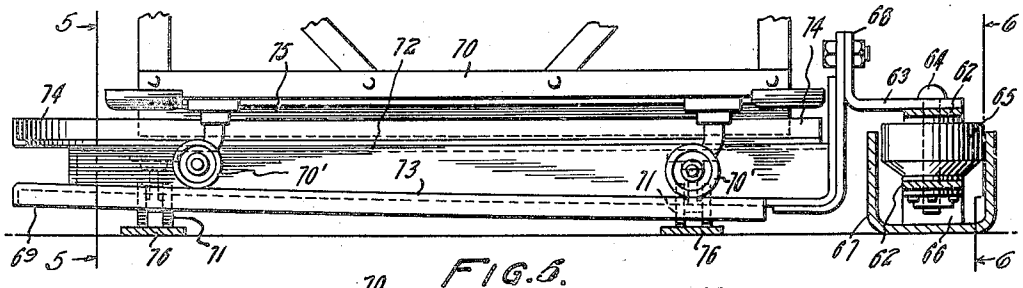


FIG. 5.

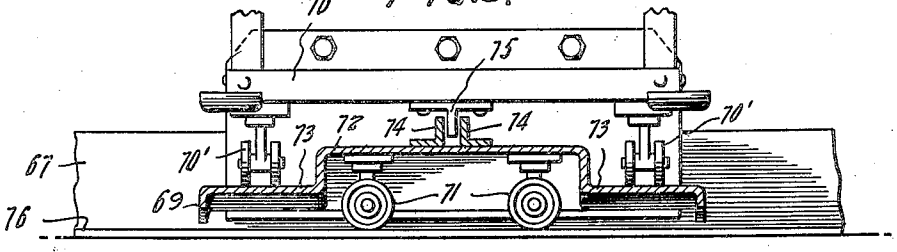
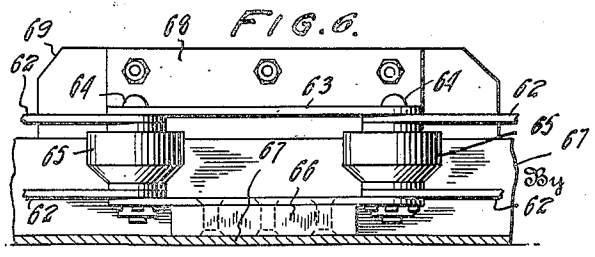


FIG. 6.



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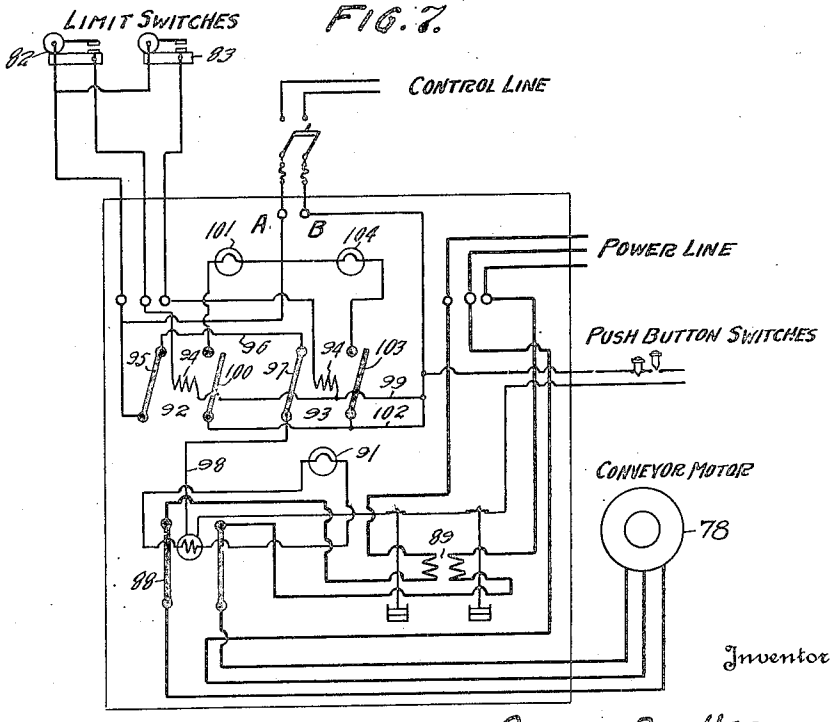
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FIG. 7.



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METHOD AND APPARATUS FOR TREATING MATERIALS

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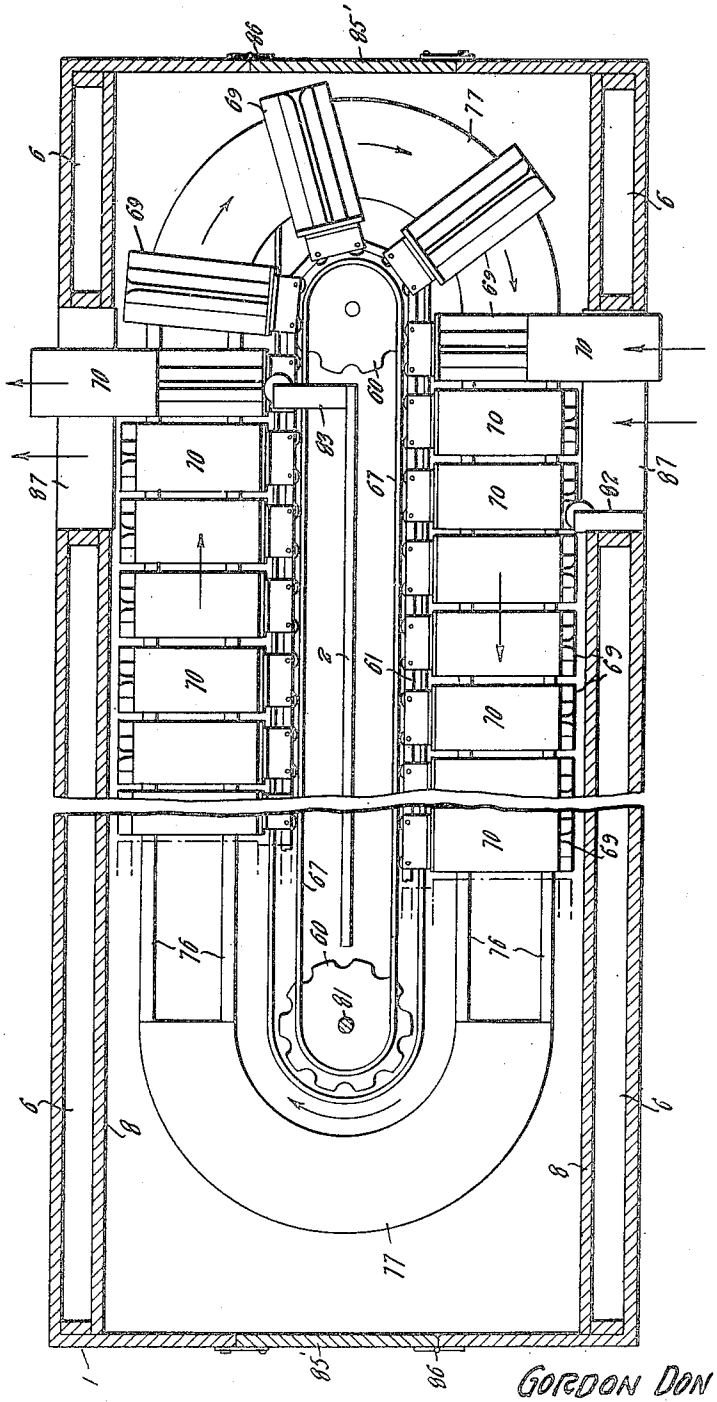


FIG. 6.

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Patented Oct. 2, 1934 1,975,717

UNITED STATES PATENT OFFICE

1,975,717

METHOD AND APPARATUS FOR TREATING MATERIALS

Gordon Don Harris, Sound Beach, Conn., assignor to The Industrial Dryer Corporation, Stamford, Conn., a corporation of Connecticut

Original application July 30, 1930, Serial No. 471,776. Divided and this application March 30, 1931, Serial No. 526,454

11 Claims. (Cl. 198—181)

This application is a division of my copending application Serial No. 471,776, filed July 30, 1930.

This invention relates in general to the converging of materials.

Manufacturing conditions in shoe factories have undergone certain radical changes with an object of reducing the length of time that shoes are in the process of manufacture. Up until recent times, shoes were dried by allowing them to remain on the lasts in an open room, which not only occupied a considerable length of time, but made it practically impossible to accurately determine production schedules. For instance, in damp weather, shoes will remain on the last longer than in dry weather or during the winter time when the heat is on in the factory.

Under open room methods of drying shoes reaching the shipping room often appear to be dry and in condition to ship, but after reaching the retailer, moisture in the soles and other parts will diffuse to the surface causing blooming, discoloring the soles or the finishing of the upper leather, and this is a very objectionable feature. Furthermore, if shoes have not been properly dried on the last, then further drying and shrinkage will take place after the last has been removed, causing distortion in the shoe.

The use of shoe conditioners has made it possible to eliminate the uncertainty in production and at the same time, improve the quality of the finished shoe, owing to the fact that moisture is removed from the wetter portions of the shoe without subjecting the comparatively dry parts to excessive drying. This results in all of the component parts of the shoe being in a relation to each other as to moisture content, so that a shoe that is properly dried and conditioned will stand up and hold its shape better than shoes which have been dried under the open room method, because shrinkage has been completed on the last.

One method of properly drying shoes has been disclosed in Patent No. 1,667,315. As disclosed in that patent, apparatus for carrying out the process consisted of compartment type conditioners. While the compartment type conditioner produces work that is satisfactory in every particular, the form of the apparatus itself has certain disadvantages in that it is necessary to load a number of racks at a time, which means that continuous loading and unloading is not practical.

It is necessary in employing the compartment type machine to accumulate at least enough racks to partially load a machine, which racks during accumulation, occupy floor space which could be used to advantage for other purposes and causes a loss of production time. In addition, the racks, after treatment of the shoes, are removed from the conditioner after a definite length of time, which results in further accumulation of racks and loss of time on production schedules.

In addition to the above disadvantages encountered in the shoe industry, there are also similar disadvantages met in other industries in which materials are treated with conditioned gases.

An apparatus of the tunnel type, such as set forth in my copending application Serial No. 450,487, filed May 7, 1930, adapted to be continuously operated to treat materials with conditioned gases, is very satisfactory for overcoming the foregoing disadvantages. However, in certain instances, due to lack of availability of floor space or to the location of other machinery, it has been found undesirable to have the loading and unloading ends of the tunnel type treating apparatus remotely located. The present invention seeks to overcome all of the described disadvantages by providing a method and apparatus for continuously treating material in which the material may be both loaded and unloaded at the same point or at spaced points.

A primary object of this invention is to devise methods and apparatus for treating materials in a continuous manner in which the zone for loading the material may be adjacent the unloading zone or positioned in any desired relation thereto.

Another object of this invention is to devise an apparatus and method of treating materials which avoids the disadvantages of the prior art.

Yet another object of this invention is to devise an apparatus for continuously treating shoes to bring about the proper drying of all component parts of the shoes.

With these and other objects in view, which may be incident to my improvements, the invention consists in the parts and combinations to be hereinafter set forth and claimed, with the understanding that the several necessary elements comprising my invention may be varied in construction, proportions and arrangement, without departing from the spirit and scope of the appended claims.

Apparatus for carrying out the present invention consists essentially of an elongated chamber or tunnel through which material undergoing treatment is passed, and across which gas of the proper condition for treating the material is caused to flow.

While broadly, apparatus for carrying out the

present invention is somewhat similar to that described and claimed in my copending application Serial No. 450,487, filed May 7, 1930, there is an essential difference in that in the present application, the elongated chamber or tunnel is made continuous so that material to be treated may be loaded onto the conveyor for moving the material through the chamber at one point, and the material may be removed from the chamber at substantially the same point at which it was loaded. This result is accomplished by constructing the treating chamber in the form of a somewhat distorted annulus.

In order to make my invention more clearly understood, I have shown in the accompanying drawings, means for carrying the same into practical effect without limiting the improvements in their useful applications to the particular constructions which, for the purpose of explanation, have been made the subject of illustration.

In the drawings:

Figure 1 is a plan view of an apparatus especially adapted for carrying out the present invention.

Figure 2 is a partial vertical sectional view of the apparatus shown in Figure 1, taken on line 2—2 of Figure 1.

Figure 3 is a partial horizontal sectional view illustrating in detail, the arrangement of the conveying mechanism for moving racks containing material to be treated through the apparatus.

Figure 4 is a detail view of a portion of the conveying mechanism showing the manner in which a material carrying rack is arranged thereon.

Figure 5 is a view taken on line 5—5 of Figure 4.

Figure 6 is a constructional detail view taken on section line 6—6 of Figure 4.

Figure 7 is a diagrammatic representation of the electric circuit employed for controlling the operation of the limit switches.

Figure 8 is a view somewhat similar to that shown in Figure 6 in which the loading and unloading stations are positioned on opposite sides of the treating apparatus.

In the drawings in which similar reference numerals indicate corresponding parts, there is shown an apparatus adapted for carrying out the treatment of shoes and other articles of manufacture and materials in accordance with the present invention. As illustrated, generally, apparatus for carrying out the invention consists essentially of an endless tunnel through which material is adapted to be conveyed while being subjected to the action of conditioned gas. As illustrated, the apparatus consists of a chamber 1 divided by a partition 2 into two passageways 3 and 4 communicating with each other at the ends of the apparatus, thereby forming an endless tunnel through which the material undergoing treatment is passed by means of a suitable conveyor 5, which will be more fully described hereinafter.

A plurality of compartments 6 are associated with each of the side walls of the chamber 1 and communicate with the interior of the chamber through a plurality of slots 7, formed in the walls 8 of the chamber 1. In treating material passing through the endless tunnel formed in the chamber 1, gas passes from the compartment 6 through the ports or slots 7, over the material to be treated, and passes from the chamber into an exhaust compartment as described in application Serial No. 471,776.

One of the features of this invention which contributes to its successful operation is the unique conveying apparatus and its control mechanism. At each end of the apparatus, there is mounted a sprocket 60 over which passes a conveyor chain 61. This chain is of the roller type and is formed of a plurality of links 62 and 63 pivotally connected by pins 64, on which are mounted the rollers 65. As is customary, the sprockets 60 and links and rollers are of sizes so related that the rollers may be received in the depressions or grooves formed on the periphery of the sprockets.

It should be noted that each of the lower links 63 have a wareplate 66 attached thereto adapted to support the chain a predetermined height above a track member 67. The track 67 extends the length of the treating apparatus coextensively with the conveyor chain. Track 67 is of channel shaped cross section, having a plurality of side walls which cooperate with the rollers 65 to maintain the chain in alignment between the sprockets 60.

In place of the ordinary type of link, the upper links 63 are provided with a flange portion 68 to which is attached a carriage 69 for conveying a material carrying rack 70 through the treating apparatus.

As clearly shown in Figures 4 and 5, the carriages 69 for carrying the material supporting racks 70 are mounted on rollers 71 and are provided with platforms, the surfaces of which are shaped to form tracks onto which the rollers 70' of the material carrying rack or truck 70 is to be received. The rollers or casters 70' have been illustrated as of the swivel type, but any suitable type may be used. For instance, as illustrated in Figure 8, the platform of the carriage is formed with a high portion 72 on each side of which are the tracks 73 which are of somewhat lower elevation than the portion 72. It will also be noted from Figure 4, that there is a slight incline or pitch to the platform of carriage 69, which tends to cause the carriage to be retained thereon during transit through the treating apparatus.

In order to maintain the rack 70 in the proper position on the carriage 69, the high portion 72 of the carriage is equipped with a slot which, as shown in Figure 5, is provided for by the two angle members 74. A depending flange 75 carried by the rack 70 is adapted to cooperate with the groove formed between the angle members 74 so as to maintain the rack 70 in position while being transported on the carriage 69 through the treating apparatus.

In order to minimize the friction between the rollers 71 of the carriages 69, suitable tracks 76 are provided for the rollers 71. It has been found preferable to substitute plates 77 for the tracks at the ends of the apparatus where the carriages are moved in an arc in passing about the sprockets 60.

Power for driving the conveyor chains through the apparatus may be supplied by a source of power such as the electric motor 78 which is connected through suitable reduction gearing 79 and bevel gear 80 with a vertical shaft 81, on which is secured one of the sprockets 60. The ratio of the reduction gearing will depend upon the particular installation and the speed at which the conveyor is to be operated. In order to compensate for any increase in the length of the chain due to wear or other causes, the idling sprocket 60 at the other end of the apparatus is supported on a floating mounting, the position of which is adapted to be adjusted by the adjusting means 84.

In operation, material or articles to be treated, such as shoes, are loaded on the racks 70 which may be of any desired construction, and the racks are run onto the conveyor platforms 69. If the conveyor is at a lower level than the factory floor, the racks can be run directly on the platforms, but if it is at a higher level which is likely when the floor is not cut to install the conveyor, a small ramp 85' may be employed.

Due to the incline in the platform 69, the rack will probably run all the way to the rear thereof and be maintained in position so that it may be conveyed through the treating apparatus.

In the event that one of the racks is not properly placed on the carriage 69, the rack upon movement of the conveyor, will engage with an automatic stop switch 82 which will break the electric circuit through the conveyor motor and cause the conveyor to stop. If desired, the stop switch 82 may also be connected with a circuit which energizes a signalling device such as a light or bell to indicate to the operator that the conveyor has stopped. Upon the operator shoving the rack into its proper position on the platform 69, engagement of the rack with the stop switch 82 will be avoided and the conveyor will start up again in operation. Of course, if desired, the circuit may be so arranged that it will be necessary for the operator to operate a switch to again start the motor.

In Figure 7 I have shown diagrammatic representation of an electrical circuit for controlling the operation of the conveyor motor by means of the limit switches 82 and 83. Suitable conduits connect a circuit breaker 88 with a power line of suitable capacity. The connection is made through dash pot current control devices 89 so as to avoid a sudden overloading of the line upon actuation of the circuit breaker 88 to complete the circuit to the conveyor motor 78. When the circuit is complete from the power line through the circuit breaker 88 to the conveyor motor 78, an independent circuit is energized which contains signal light 91. The circuit containing the signal 91 may be associated with circuit breaker in any desired manner and in Figure 7 has been illustrated as being inductively coupled with the actuating coil of the circuit breaker.

The circuit for controlling the actuation of the circuit breaker 88 is shown in the upper left portion of Figure 7. This latter circuit includes the limit switches 82 and 83 and a pair of relays 92 and 93. Each of the relays comprises a pair of switch arms adapted to be actuated together by coils 94 which are energized upon completion of an electrical circuit through either of the limit switches.

Normally when the limit switches are in open position, arms of the relays are in the position shown in Figure 7, that is, starting with the point A the current passes to point C and down to the swivel point of contact arm 95, upwardly through arm 95, line 96, through contact arm 97, through conductor 98 to the energizing coil of the circuit breaker 88 thence through the dash pot control device 89 to the push button switches and returns to point B. Upon actuation of limit switch 82 the current will flow from the point A to point C through the limit switch 82 to coil 94 of relay 92 through conductor 99 and return to point B. Upon energizing the coil 94 the arms 95 and 100 will be actuated so that the circuit through arms 95 will be broken and a circuit through arm 100 will be completed. This operation will break the circuit through the actuating coil of circuit breaker 88, thereby causing the circuit from the power line to the conveyor motor 78 to be broken. Of course, upon breaking the circuit from the power line to the conveyor motor signal device 91 will cease operation. Upon completion of the circuit through arm 100 current will flow through the circuit from the point A through signal device 101 through arm 100, conduit 102 and back to point B. Signal device 101 will then be placed in operation which will indicate to the operator that the conveyor motor has stopped.

Assuming that the switch arms are in the position shown in the drawings and that circuit is completed through limit switch 83, in this instance current will flow from point A to point C through limit switch 83, through coil 94 of relay 93, through conduit 99 and back to point B. This will cause coil 94 of the relay 93 to be energized, moving switch arms 97 and 103. Upon movement of the switch arms the circuit through the arm 97 leading to the energizing coil of circuit breaker 88, will be broken, thereby causing the conveyor motor to stop. On the other hand, switch arm 103 will complete an electrical circuit from point A through signal device 104, through arm 103, conductor 102, back to point B indicating that the motor has stopped because of contact of a carriage with limit switch 83.

The control circuit just described has been given by way of illustration and the present invention is not to be limited thereby since other control circuits may be employed if desired.

The carriages 69 with the racks positioned thereon are slowly moved through the treating apparatus, and the material supported in the racks will be subjected to the conditioned gas passing transversely across the path of movement of the material undergoing treatment. As heretofore pointed out, each of the sections of the conditioning apparatus may be operated to produce different results on the material undergoing treatment. After the rack containing the material has moved in a path through the treating apparatus, the rack will engage a second stop switch 83 which serves to prevent any of the racks from repeating the treatment.

Of course, if it is necessary to subject the material to more than one treatment in the conditioning apparatus the rack can be removed from the unloading station and introduced into the conveyor at the loading station. In most instances, however, it will be found that a once through treatment of the material contained on the rack will be sufficient.

As is clearly shown in the drawings, the loading and unloading station may be at the same point. This construction is very desirable, particularly in a factory where economy of floor space is necessary. For instance, in a shoe factory, it may be desirable to position the loading and unloading station at a point just between the levelers and heelers so that the shoes may be loaded onto the racks at the point where the leveling operation is carried out, and the racks introduced into the conditioned apparatus at a point adjacent the levelers. After being conveyed through the apparatus to treat the shoes, the racks may be removed therefrom at substantially the same point at which they were loaded onto the apparatus and moved only a short distance to the location where the heeling operation is taking place.

The present invention also contemplates positioning the loading and unloading stations at any point on the apparatus. For instance, they

may be positioned adjacent either end of either side thereof or at the ends or at any point midway between the ends. It is also within the concept of the present invention to have the loading station at one point on the apparatus and the unloading station at an entirely different point.

For instance, in Figure 8, there is shown an apparatus in which the material to be treated is loaded onto the conveyor just after it has passed around one of the sprockets 60. In this form of the invention, the racks are adapted to be moved from the conveyor at substantially the same end of the apparatus but on the other side thereof. Of course, this feature of the invention is susceptible to many modifications and the loading station may be positioned at any point on the apparatus and the unloading station may be positioned at any point. Also, it may be desirable to provide a plurality of loading and unloading stations.

As shown in the drawings, particularly Figure 8, the size of the doorways constituting the loading and unloading stations are of a width to permit the loading or unloading of two material carrying racks at the same time. I wish it to be clearly understood that the showing of the drawings is more or less by way of illustration and that the invention is not to be limited thereby, but that the width of the loading and unloading openings may be varied, as desired, to permit the loading of any required number of carriages at the same time.

In the drawings, there have been shown doors arranged in the ends of the treating apparatus in addition to those serving as the loading and unloading stations. These doors 85 which are supported by hinges 86, serve the purpose of permitting an operator to enter into the treating chamber at the ends thereof so as to inspect and repair the apparatus if necessary. In addition to the doors at the ends, similar inspection doors or openings may be provided at other places in the apparatus.

The present invention is of particular advantage especially when employed for conditioning shoes and other materials requiring similar treatment in that the control of the conditions existing in the apparatus may be so regulated that the shoes or other articles may be permitted to remain in two or three times longer than is ordinarily required for the drying and conditioning operation, without the shoes being overdried. This feature is desirable from the manufacturing standpoint in that when there is some delay in production, or the operation beyond the heelers, shoes undergoing treatment, may be left in the machine without detrimentally affecting the condition thereof. Racks of shoes may be left in a machine over night without becoming overdry and will be in perfect condition for the heeling and subsequent operation the next morning.

To illustrate the flexibility of control of an apparatus constructed in accordance with this invention, a single rack of shoes may be sent through the machine alone and immediately thereafter the machine may be loaded to capacity and in each case the shoes being taken from the machine after treatment will be found to be in substantially the same uniform condition.

Another advantageous feature of an apparatus constructed in accordance with the present invention resides in the construction of the apparatus which prevents an operator from removing a rack of shoes or other material undergoing treatment from the machine after the rack has passed from the loading station.

For instance, after a rack containing material to be treated has passed from the loading station, it will be impossible for the operator to walk into the apparatus and withdraw the rack containing the material from the conveyor. This feature is of advantage in that it is impossible to remove a rack of material undergoing treatment from the apparatus until the material has been subjected to the prescribed period of treatment.

Another desirable feature of the present invention is that the same can be installed in a factory without cutting into the floor of the factory to position the conveying mechanism relative to the treating apparatus. All that is necessary is that the tracks or wearing strips which support the conveying apparatus be secured to the factory floor.

It will be appreciated from the foregoing description that the present invention provides an apparatus which is especially adapted for conditioning materials with conditioned air. The apparatus described is also advantageous in that it is practically impossible to remove a rack containing material to be treated after it has once been put into the apparatus, at a time before it has received the complete treatment to be given in passing through the apparatus. Another desirable feature is that it is not necessary to remove the material from the apparatus after it has been passed therethrough but the material may be permitted to remain in the apparatus until it is needed for a subsequent operation. This feature is also advantageous in that there is no reason for an accumulation of racks on the floor of the factory, taking up space which could be used to advantage for other purposes.

While I have shown and described the preferred embodiment of my invention, I wish it to be understood that I do not confine myself to the precise details of construction herein set forth, by way of illustration, as it is apparent that many changes and variations may be made therein, by those skilled in the art, without departing from the spirit of the invention, or exceeding the scope of the appended claims.

I claim:

1. A conveying mechanism for moving material comprising horizontally arranged driving and idling sprockets, a chain passing over said sprockets, an annular track positioned about the sprockets and chain, and carriages secured to said chain and having casters mounted on said track adapted to be moved on said track by said chain, each of said carriages having runways formed thereon adapted to receive the wheels of a truck, said runways being slanted to hold the carriages thereon by gravity.

2. An apparatus for moving material in a chamber comprising an endless track, carriages positioned on said track, an endless chain arranged in a path parallel to said track and secured to the carriages, and means for moving the chain and carriages, a guide trough for the chain, rollers on said chain for engaging the sides of said trough, and wear members mounted on the underside of alternate links of the chain for spacing the chain from the bottom of the trough.

3. An apparatus for moving material in a chamber comprising an endless track, carriages positioned on said track, a guideway arranged co-extensive with said track, a chain positioned in said guideway, means for securing the car-

riages to said chain, and means for moving said chain to cause the carriages to move on the track, each of said carriages having runways formed thereon adapted to receive the wheels of a truck, said runways being slanted to hold the carriages thereon by gravity.

4. An apparatus for moving material in a chamber comprising an endless track, carriages positioned on said track, a guideway arranged coextensive with said track, a chain positioned in said guideway, said chain comprising a plurality of links, alternate ones of which have the carriages secured thereto, each of said carriages having runways formed thereon adapted to receive the wheels of a material carrying truck, said runways being sloped, and means for moving the chain and attached carriages through the chamber.

5. A conveying mechanism for moving material comprising horizontally arranged driving and idling sprockets, a chain passing over said sprockets, an annular track positioned about the sprockets and chain, and carriages secured to said chain and having casters mounted on said track adapted to be moved on said track by said chain, each of said carriages having runways formed thereon adapted to receive the wheels of a truck, and means on the carriage intermediate of the runways adapted to cooperate with means on the truck to cause the trucks to move with the carriages.

6. An apparatus for moving material in a chamber comprising an endless track, carriages positioned on said track, a guideway arranged coextensive with said track, a chain positioned in said guideway, means for securing the carriages to said chain, and means for moving said chain to cause the carriages to move on the track, each of said carriages having runways formed thereon adapted to receive the wheels of a truck, and means on the carriages intermediate of the runways adapted to cooperate with means on the truck to cause the trucks to move with the carriages.

7. An apparatus for moving material in a chamber comprising an endless track, carriages positioned on said track, a trough-like guideway, arranged coextensive with said track, a chain positioned in said guideway, said chain comprising a plurality of links, alternate ones of which have the carriages secured thereto the links to which the carriages are attached also having wear plates affixed thereto, and means for moving the chain and attached carriages through the chamber, and means for arresting the operation of said moving means after a carriage has moved to a predetermined position.

8. An apparatus for moving material in a chamber comprising an endless track, carriages positioned on said track, an endless chain arranged in a path parallel to said track and secured to the carriages, means for moving the chain and carriages, said chamber having a charging and discharging opening, means at said opening for loading the carriages secured to said chain, and means adjacent said opening for controlling the stopping of said chain moving means upon the improper loading of said carriages.

9. An apparatus for moving material in a chamber comprising an endless track, carriages positioned on said track, an endless chain arranged in a path parallel to said track and secured to the carriages, means for moving the chain and carriages, said chamber having a charging and discharging opening, means at said opening for loading the carriages secured to said chain, and means adjacent said opening for controlling the stopping of said chain moving means upon the approach of a loaded carriage at that point, and means adjacent said opening for stopping the means for moving the chain upon the improper loading of said carriages.

10. An apparatus for moving material in a chamber comprising an endless track, carriages positioned on said track, an endless chain arranged in a path parallel to said track and secured to the carriages, means for moving the chain and carriages, each of said carriages having runways formed on the surface thereof adapted to receive the wheels of a truck, said runways being so disposed on said carriage that the truck will be run onto the carriage in a direction transversely to the movement of said carriage, said runways being inclined to cause the truck carried thereby to have a tendency to move toward the chain so as to retain the truck on the carriage during movement of the carriage.

11. An apparatus for moving material in a chamber comprising an endless track, carriages positioned on said track, an endless chain arranged in a path parallel to said track and secured to the carriages, means for moving the chain and carriages, each of said carriages having runways formed on the surface thereof adapted to receive the wheels of a truck, said runways being so disposed on said carriage that the truck will be run onto the carriage in a direction transversely to the movement of said carriage, said runways being inclined to cause the truck carried thereby to have a tendency to move toward the chain so as to retain the truck on the carriage during movement of the carriage, and means on said carriage adapted to engage means on said truck for causing the truck to move with the carriage.

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