

Jan. 22, 1963

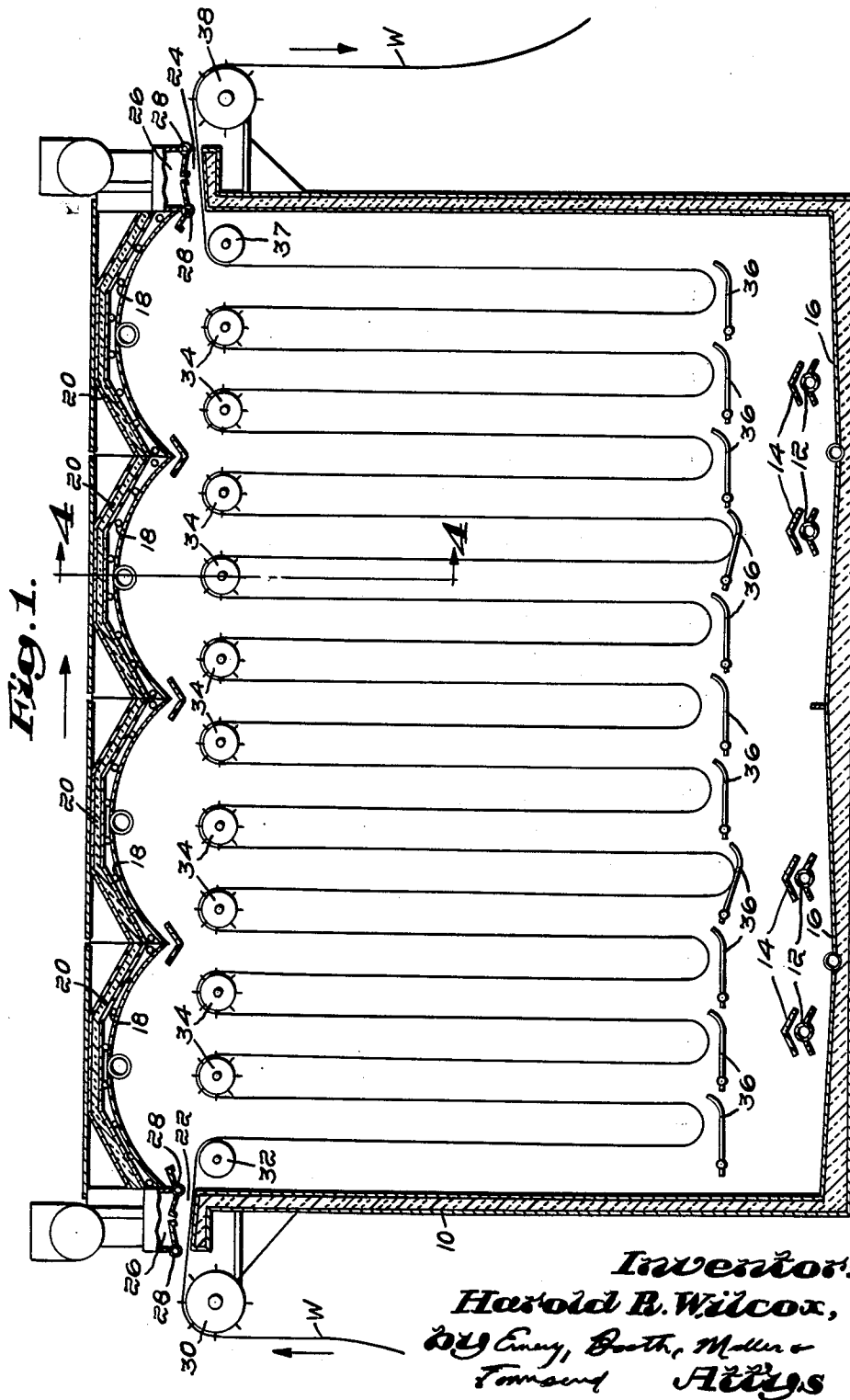
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3,074,261

APPARATUS FOR TREATING WEBS

Filed April 4, 1961

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Fig. 4.

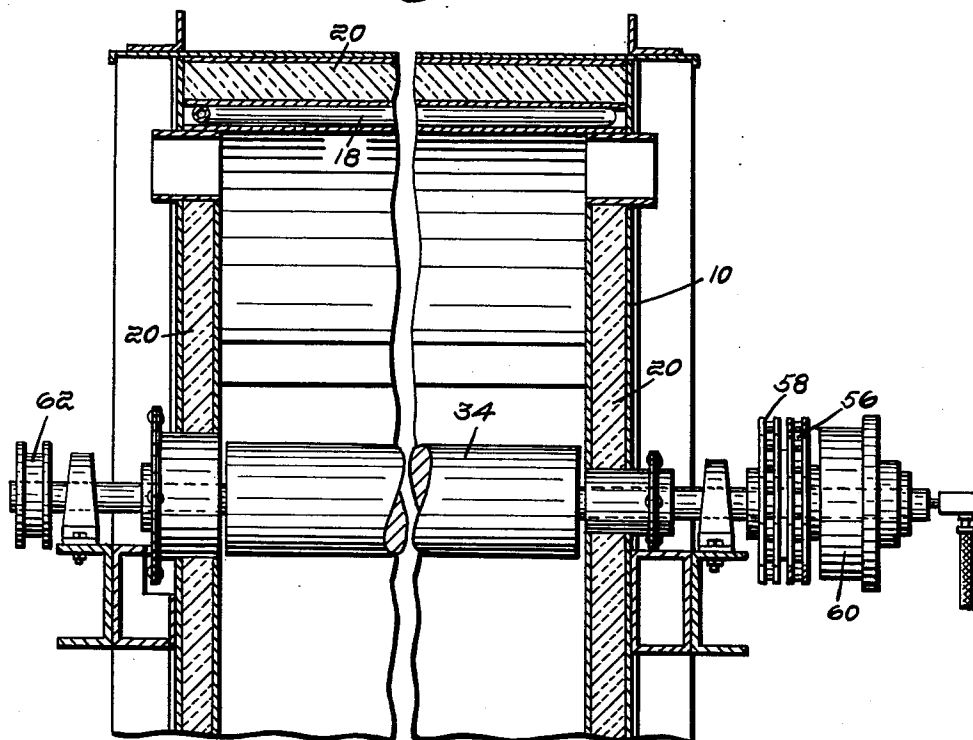
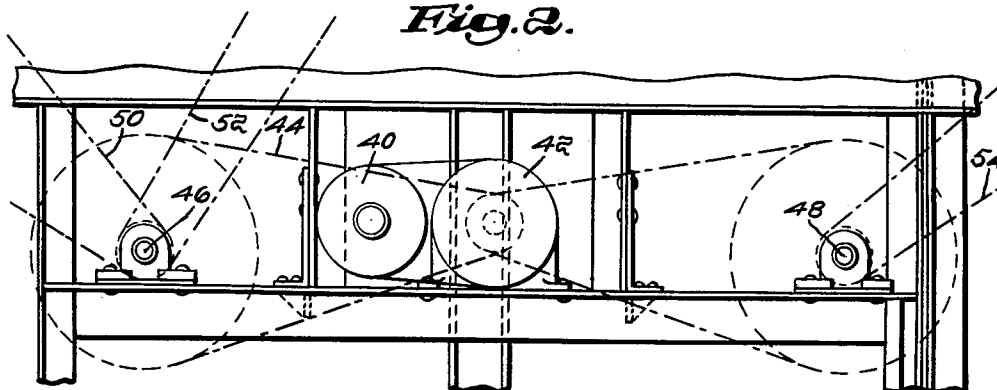


Fig. 2.



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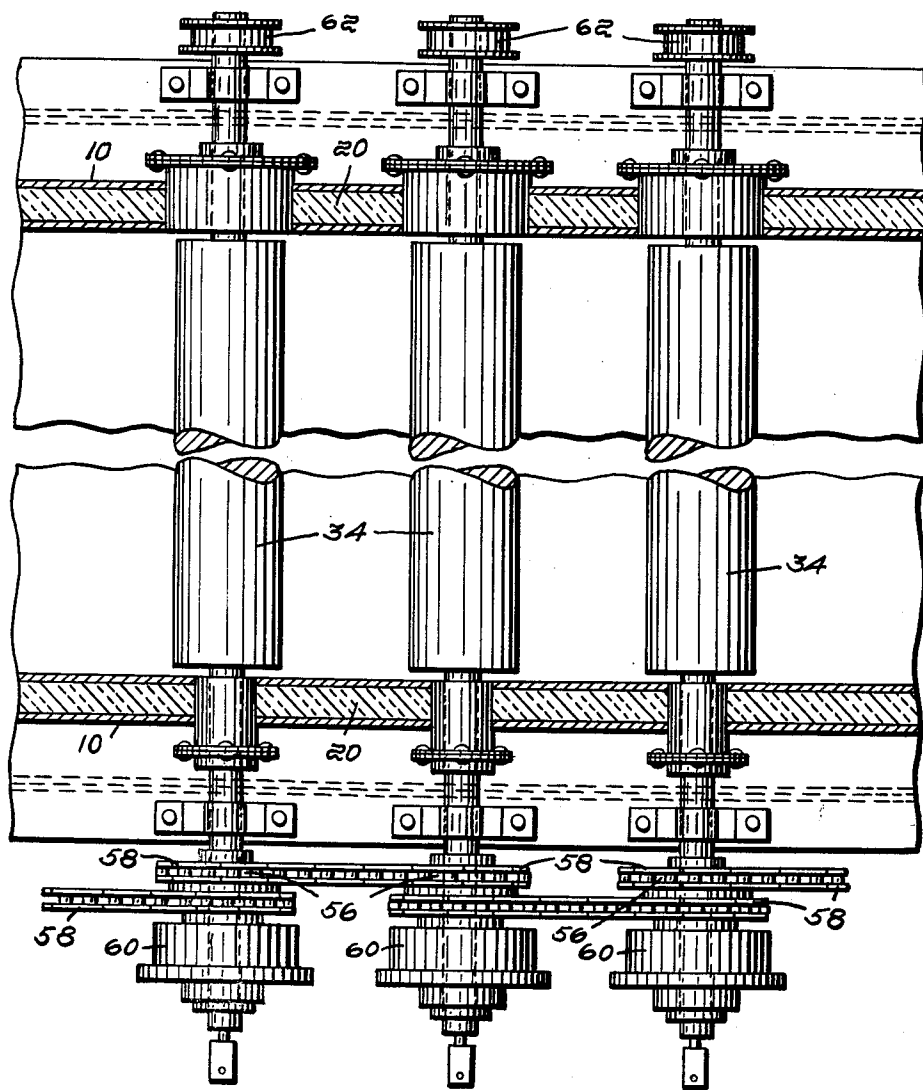
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Fig. 3.



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Fig. 7.

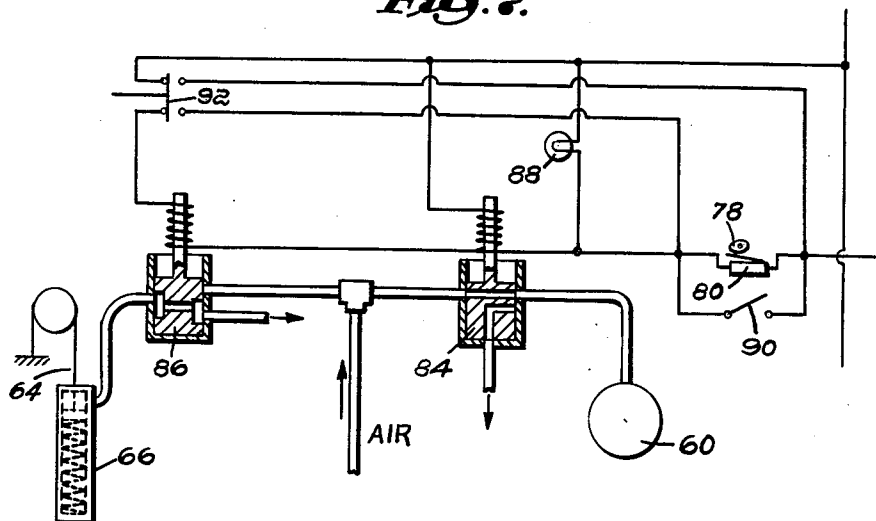


Fig. 5.

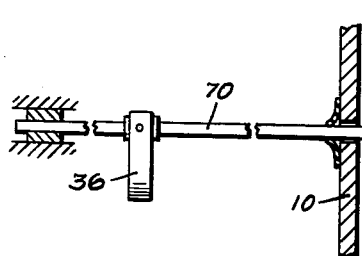
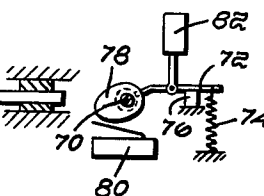


Fig. 6.



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APPARATUS FOR TREATING WEBS

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3 Claims. (Cl. 68—5)

This invention relates to an apparatus for treating textile webs with vaporous or gaseous fluid for predetermined periods of time. In general the purpose may be said to be to provide a compact and inexpensive piece of apparatus subject to suitable control for predetermining the time element involved. It finds the particular application to the treatment of heavy fabrics and also pile fabrics, rugs or carpeting for instance which are both heavy and have a piled, looped or tufted surface. The construction of the apparatus is such that the pile side is not engaged by mechanical elements during treatment in the process. An important application is in the development of dyes in a steam atmosphere after they have been padded onto the surface of a rug and the example to be disclosed is a mechanism specifically adapted for such use.

The invention will be well understood by reference to the illustrative embodiment thereof shown by way of example in the accompanying drawings wherein:

FIG. 1 is a somewhat simplified and schematic view essentially a vertical section just inside the interior wall of the treating chamber. It is not to an exact scale;

FIG. 2 is a partial side element showing the main drive.

FIG. 3 is a broken away section showing in plan a number of rolls and the immediate driving means thereof;

FIG. 4 is a vertical section showing one of the rolls in FIG. 3 in elevation;

FIGS. 3 and 4 are on a larger scale than FIG. 2;

FIG. 5 is a schematic view showing how the movement of a sensing mechanism may actuate a control switch;

FIG. 6 is a section on line 6—6 of FIG. 5; and

FIG. 7 is a diagram indicating the clutch and brake for one of the rolls, piping and valves for operating the same and an electric diagram of the valve operating means.

In accordance with the invention, in order to economize space and limit the amount of steam or other fluid expended, the fabric is treated in a closed chamber through which it travels in a series of closely arranged vertical loops. While the loops might appropriately be termed festoons, they differ from the "festoons" in which fabric webs are sometimes assembled in order to economize space and which are advanced bodily without travel of the web through the meandering path. Herein, on the contrary, since the web travels each portion of the length is uniformly treated independently of local variations in the atmosphere in different parts of the chamber. If the web moves through the meandering path at a predetermined linear speed, each portion from entrance to exit will be treated for a fixed length of time, dependent on that speed and the length of material subjected to conditions substantially uniform for each part of the length during such time.

Referring now to FIG. 1, I there show in vertical section a large enclosure or chamber 10 which may be provided with suitable doors, windows and lighting devices to permit observation of and access to its interior, which parts it is unnecessary to show. Perforated steam pipes 12 at the bottom overlaid by baffles 14 discharge steam to the interior. The bottom forms gutters 16 underneath these pipes to drain off any condensate. At the upper part of the chamber heating coils 18 just beyond the "ceiling" serve to prevent condensate from forming and these may be covered with insulation 20. An inlet 22 and outlet 24 are formed at opposite ends of the chamber near

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the top. Adjacent to 22 and 24 there are provided ducts 26 through which escaping steam may be drawn and closed steam pipes 28 may be provided adjacent the entrances to the ducts to prevent condensation.

The web W is supplied to the inlet 22 by an exterior feeding-in or let-off roll 30 which has spikes on its periphery to engage the back of the fabric and positively to feed the same. Interiorly of the chamber the web is received first by a smooth idler roll 32 and then passes to a series of spiked rolls 34, herein ten, between which the fabric depends in long loops as shown. Opposite the bottoms of these loops are sensing devices, herein shown at light tripping levers or feelers 36 which control the operation of the machine in a manner to be explained. At this point it may be said that if a loop extends too low the feeding of the fabric into it is stopped while the feeding out from it continues until the condition is corrected. The web passes over a smooth idler roll 37 and through the exit to a spiked take off or feeding out roll 38.

Referring now to FIG. 2 the parts of the mechanism may be driven from a motor 40 through a variable speed apparatus 42 which permits the driven elements to be run with the same relative speeds but at different absolute rates.

Such "variable speed drives" are well known articles of commerce and require no specific illustration. Chains 44, shown only by their pitch lines, drive at reduced speed two shafts 46 and 48 at either side. From the left-hand shaft 46 chains 50 and 52, shown broken away, may transmit motion to the feeding in roll 30 and the first of the driven interior rolls 34 (third roll from the left in FIG. 1) and from the right-hand shaft 48 chain 54 may transmit motion to an intermediate interior roll, in this case the seventh interior roll in FIG. 1. All driven rolls to the left of this one receive motion from shaft 46 all to the right from shaft 48.

The shafts of all the rolls to the right of idler roll 32 in FIG. 1 (with the exception of idler roll 37) carry pairs of loose sprockets 56 which may be clutched to their shafts selectively and chains 58 between the sprockets keep them turning. The immediate chain drive for the feeding out or take off roll 38 (traced through right-hand shaft 48) provides for driving this roll at a slower speed than the others say, by five or ten percent, for a purpose which will appear.

The loose sprockets 56 on the roll shafts may be connected to the shafts in order to drive the same by a pneumatically operated clutch 60 of conventional form which it is unnecessary to show in detail. Normally air under pressure is supplied to the clutch mechanism and the clutch is engaged. When the air is exhausted the clutch disengages. On the opposite end of each shaft is a brake drum 62 cooperating with a strap brake 64 (see FIG. 7) controlled by a pneumatic cylinder 66. Again the details are conventional and need not be illustrated. When the clutch is released air under pressure is admitted to the cylinder for the brake and the brake goes on and prevents the roll from spinning. When the clutch is closed the cylinder is exhausted and the brake is relaxed.

While the sensing mechanism by which the conditions of the loops are observed and suitable control action initiated may take various forms, a suitable mechanical arrangement for controlling an electric circuit is here shown. Referring to diagrammatic FIGURE 5 each feeler 36 is carried by a shaft 70 which extends to the exterior of the chamber and has an arm 72 drawn by means of a spring 74 against a stop 76 to hold the feeler in a normal elevated position, substantially horizontal. If the loop lengthens downwardly and engages the feeler the shaft is rocked and a wiper cam 78 on the shaft closes a snap switch 80. An adjustable dash pot 82 connected

to the arm 72 may adjustably delay its return and prevent unsuitable rapidly recurring oscillations of the mechanism.

Herein the motion of each of the driven rolls is under control of a supply of air under pressure for operating the clutch and brake. FIG. 7 shows schematically the air lines, two three way valves 84 and 86 for controlling the supply and exhaust of air to the clutch and brake respectively and electrical control means for the valves. The particular illustration of the valves is directed by a desire to show the air control by two simple vertical sections. It is not intended to be realistic. Commercial three way valves are available which may readily be connected up as required. There will be one circuit and one pair of controlling valves for each roll. Obviously in practice the wiring will be such that the manually controlled switches, signal lights and so on, which will be referred to will be grouped together on a convenient control panel.

Let us suppose the machine to be in action with substantially uniform loops depending as shown in FIG. 1. Never mind just now how they got that way. As the web is being fed in faster than it is taken out the loops tend to lengthen. If one lengthens so that it moves the feeler arm 36 which is beneath the same the switch 78 which is governed thereby will be closed. This switch is in the circuit shown which includes solenoids for operating the valves controlling that roll of the series over which the fabric enters this loop. In the FIGURE 7 the switch 80 is open, no current flows, the solenoids are not energized and the moving interior elements of the valves are in down position. Air under pressure has flowed through valve 84 and the clutch is closed (the roll is turning) and the brake cylinder 66 is exhausted. When the switch 80 closes both valves are shifted, the clutch operating mechanism is exhausted and air is permitted to flow to the brake operating cylinder 66. The roll controlled, which is at the feeding in side of the loop which has tripped its feeler 36 and caused switch 80 to close then no longer feeds the web into the over-long loop. But the web is being fed out by the succeeding spiked roll and the loop is shortened until this controlled action is terminated by the opening of switch 80 after suitable delay by the dash pot.

A manual switch 90 may be provided in parallel with the switch 80 permitting stopping of a selected roll independent only of the automatic control. A signal lamp 88 is arranged in the circuit to show when the circuit is energized. Another manual switch 92 controlling differentially the circuits of the two solenoids is shown in FIG. 7. Its purpose will be later described.

The clutch and brake for feed out roll are controlled by a manual switch only similar to 90 with switch 80 omitted and a signal lamp is provided.

If the speed of the intake roll and the rolls within the chamber are somewhat greater than the speed of the feeding out roll, say five percent, obviously fabric tends to accumulate in the chamber and the loops lengthen and operate the control mechanisms described. The former rolls are idle one minute out of twenty but not all the rolls at the same time and probably none for one uninterrupted minute. The web is always in motion and as a whole never comes to a dead stop. Its time in the machine is determined by the speed of the feeding out or take off roll 38.

If a particular roll 34 is stopped the loop immediately preceding it will lengthen and cause its feeler lever 36 to be contacted and this stops the roll which feeds into this loop. Fabric is not being fed out of the preceding loop but is being fed into it. This in turn tends to lengthen and may trip its feeler. The action will carry on back through the machine from loop to loop. Therefore during the operation of the machine there will be a continuing jockeying of the loops. However at the slow speed (two to ten feet per minute) at which the ma-

chine is designed to operate and with the time delay described this is not objectionable. It is intended that the machine would operate with a maximum variation of the loops one relative to the other, not exceeding about six inches.

In order to start the machine into operation it is only necessary to carry the web across the top of the machine from the let off roll 30 to the take out roll 38 in a substantially straight line over the intervening rolls. The take out roll 38 is stopped selectively by operation of its manual control switch. A loop will feed down between the two rolls at the right-hand end in FIG. 1 nearest the exit because that is where forward motion ceases. Loops then form successively toward the entering end since as the first loop reaches its feeler or trip level 36 it will cause the immediately preceding roll to stop and so on for all loops. When all the loops are formed all rolls will be disengaged and the progress of the web through the machine will be halted. Then it will be necessary only to engage the clutch on the feeding out roll to start the web through automatically, the rolls 34 and 32 starting one after another.

If it is desired to run the machine for a shorter period of treatment any number of loops at the exit end of the machine may be omitted and this may be accomplished by disengaging the clutch of the roll immediately preceding the loop in question without however applying the brake. This may be accomplished by a manually operated two position switch which when moved to the right from the position shown breaks the circuit of the solenoid of valve 86 so that that valve remains in the position shown with the brake off until the switch 92 is returned to its initial position. The circuit which controls the solenoid of valve 84 is not affected by this movement of switch 92 although switch 80 will more likely than not be open. Movement of switch 92 to its second position however closes a bridging circuit around switch 80 and independently of that switch, energizes the valve 84 thereby exhausting 60 and releasing the clutch. The shaft of the roll is then entirely free to rotate in the forward direction. Impediment to reverse rotation would not be objectionable but this point has not been emphasized by the illustration of any means for effecting it.

The signal lights 88 indicate what rolls are disengaged at any given time. They also indicate when a feeler has been contacted.

To unload the machine all the driven rolls except the feeding out roll are disengaged from the drive by the manually operated switches 92. This will permit the web to be pulled out of the machine without any additional feed in.

The particular machine here shown is one designed to treat rugs and in the actual embodiment the faces of the various rolls are 18' 6" in length. It is designed for a speed varying from two to ten feet per minute and accommodates a length of 180 feet of fabric in the chamber at any one time disposed in a series of eleven loops as indicated in FIG. 1.

It will be apparent that the invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and the present embodiment should therefore be considered in all respects as illustrative and not restrictive, as is in fact clear in several matters from the description itself. Reference is to be had to the appended claims to indicate those principles of the invention exemplified by the particular embodiment described and which it is desired to secure by Letters Patent.

I claim:

1. An apparatus for treating webs of textile or the like comprising a chamber having means for establishing and maintaining therein an atmosphere suitable for the treatment and having entrance and exit passages for the web, let off means in advance of the entrance pas-

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sage for dispensing the web into the chamber, and, within the chamber, an elevated series of spaced transporting rolls over which the web may pass (between the entrance and exit passages) with loops of the web hanging down between them, means to normally drive all said rolls at the same surface speed, means for receiving the web from said rolls and carrying it away through the exit passage at a somewhat lower speed and sensing devices apposing the lower bights of the loops for reaction to such bights when the latter reach an undesirably low position and means controlled by the reaction of such sensing devices temporarily to retard the driven movement of the preceding roll in the series.

2. An apparatus as in claim 1, wherein manually operatable means are provided for selectively starting and stopping the various web moving elements independently of the control provided by the sensing devices.

3. Festooning mechanism for supporting and advancing a travelling web in and through a meandering path formed by a plurality of long and narrow depending

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loops, said mechanism comprising a plurality of web-driving rolls operating about fixedly spaced axes for underriding and supporting the upper bights of the festoon with the lower bights hanging down freely between them, means for driving the rolls to move the web through the meandering path so defined and sensing devices apposing the lower bights of the loops influenced by abnormal displacement of said bights and means governed thereby for altering the speeds of individual rolls to correct the abnormality and provide over a period of time, independently of local and transitory variations of speed of individual rolls, an advance of a fixed length of web through the path.

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