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3,362,087

DRYERS FOR CARPETS AND THE LIKE

Original Filed May 18, 1964

3 Sheets-Sheet 1

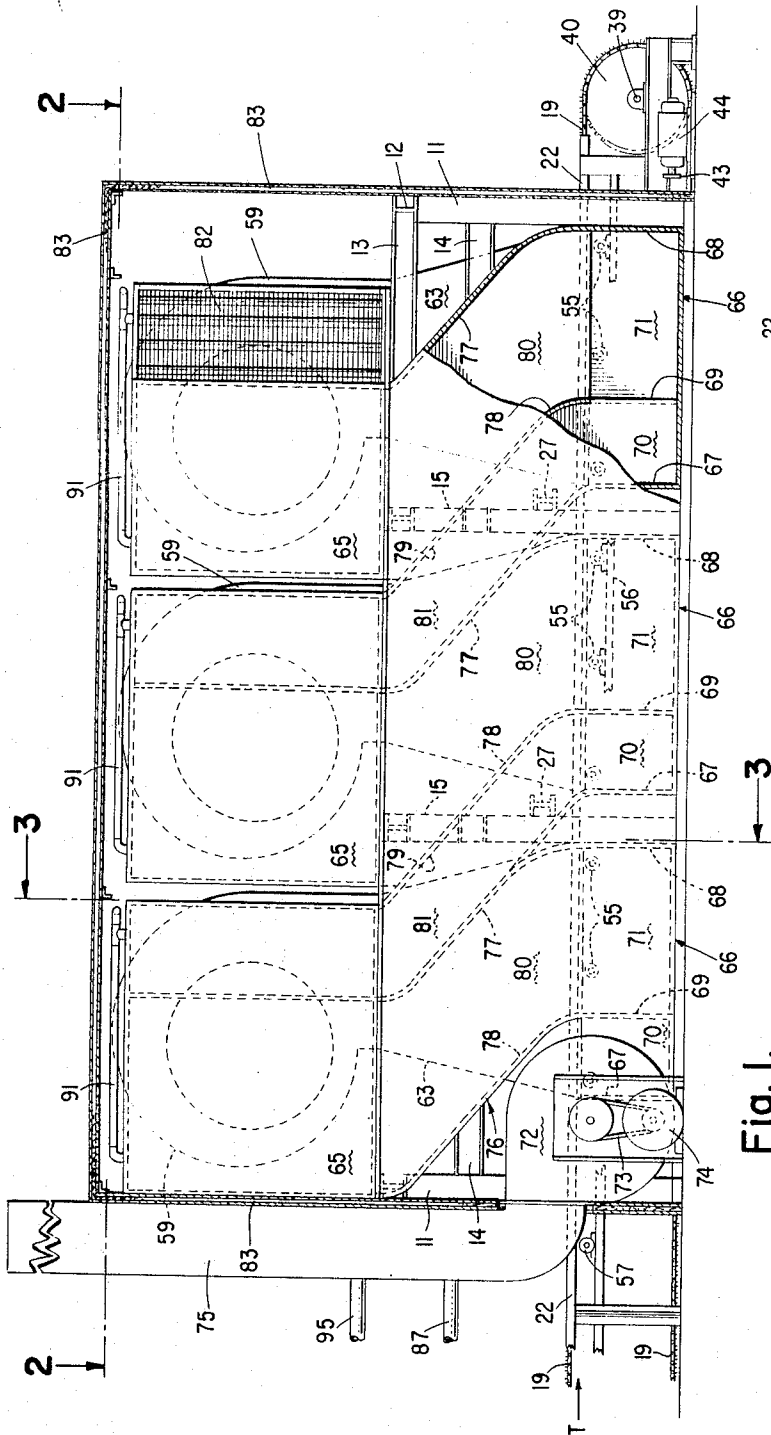


Fig. 1.

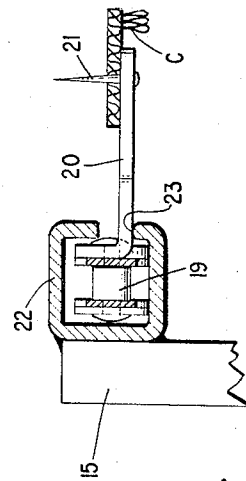


Fig. 4

WITNESS

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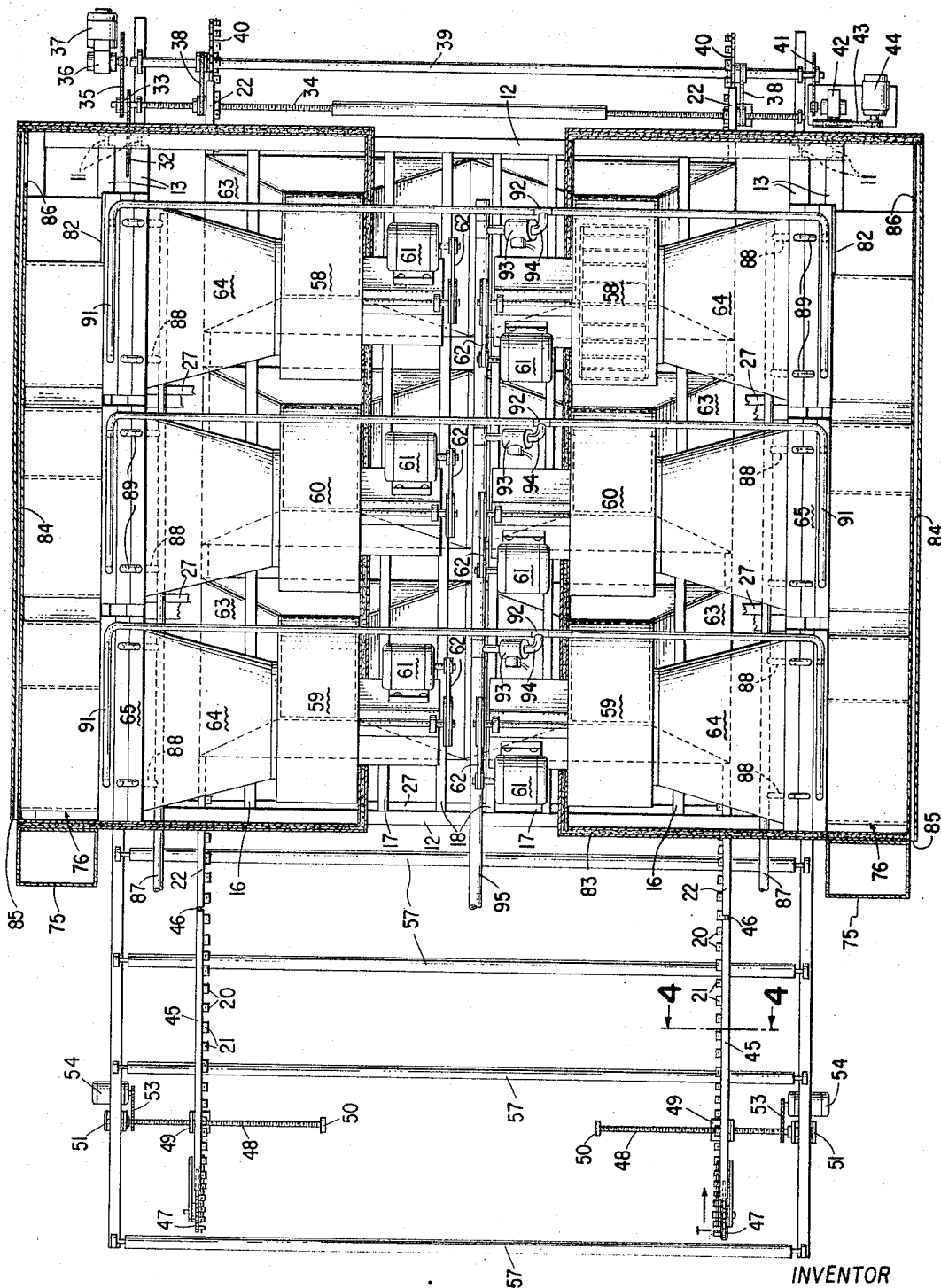


Fig. 2.

WITNESS

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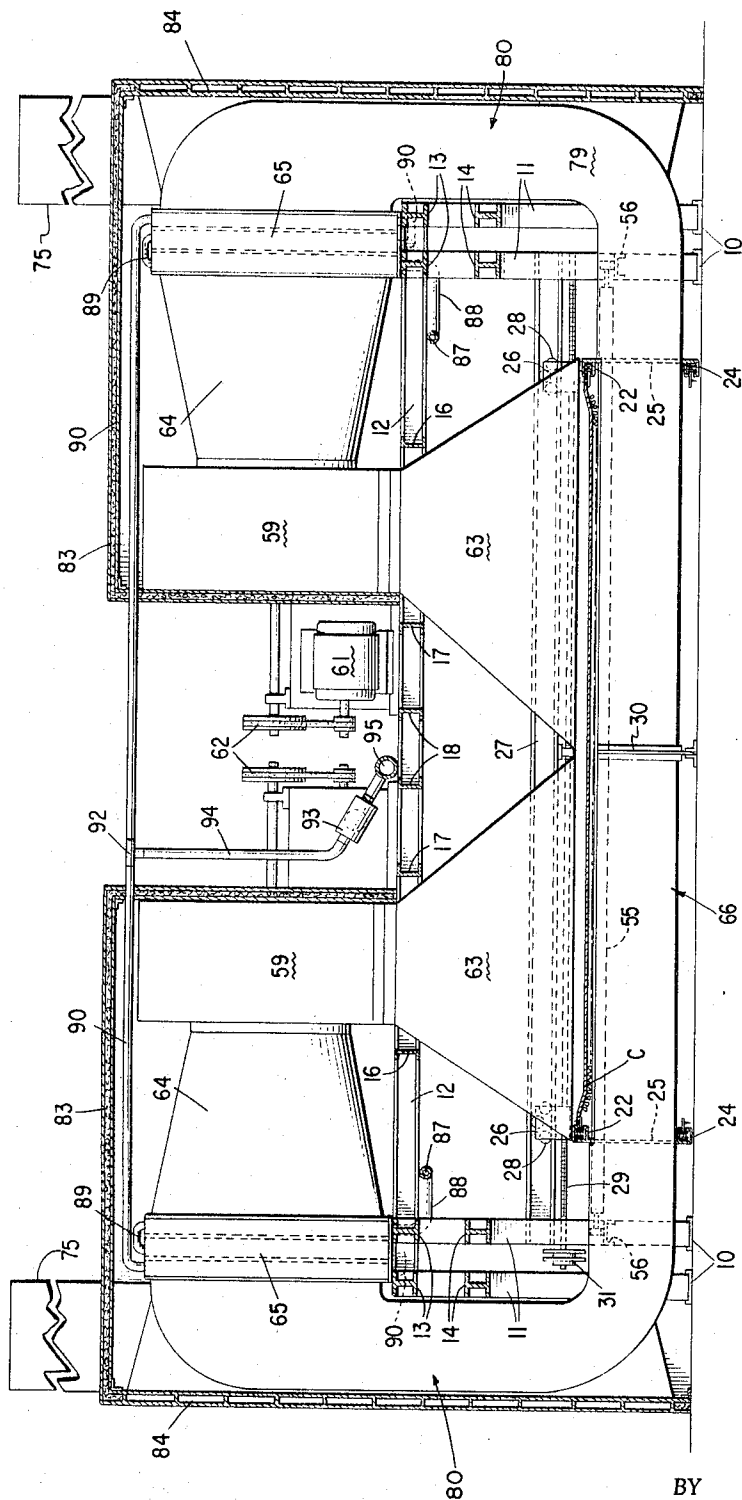


Fig. 3.

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3,362,087

## DRYERS FOR CARPETS AND THE LIKE

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Continuation of application Ser. No. 368,206, May 18, 1964. This application Dec. 20, 1966, Ser. No. 603,392  
5 Claims. (Cl. 34—158)

This is a continuation of application Ser. No. 368,206, filed May 18, 1964, and now abandoned.

The present invention relates to dryers for carpets and the like.

Carpeting is generally produced in lengths which may be in the order of one hundred yards. In subsequent finishing of the carpet, as in dyeing, the carpet becomes wet and must be dried, which may be done by sewing the lengths together end to end and passing the same through a dryer—which may be for example a multiple pass, forced draft, hot air dryer in which the air is heated by an oil or gas furnace. Such dryers usually are quite large—often over one hundred feet long, and because of their size, are quite expensive to build and to house. Also, because of their size, adequate insulation would be expensive while the uninsulated or poorly insulated unit is necessarily inefficient because of the heat loss, which also, because it heats the space in which the dryer is located, makes it uncomfortable for the operators.

The object of this invention is to provide a carpet dryer which is compact, thus reducing the expense of the unit as well as reducing the space required to house it. It is also an object of this invention to provide a carpet dryer having an increased efficiency and reduced heat loss relative to carpet dryers as heretofore constructed, which not only reduces the expense of operation of the dryer but also maintains a more comfortable atmosphere in the vicinity of the dryer.

Having in mind the above and other objects that will be evident from an understanding of this disclosure, the invention comprises the devices, combinations and arrangements of parts as illustrated in the presently preferred embodiment of the invention which is hereinafter set forth in such detail as to enable those skilled in the art readily to understand the function, operation, construction and advantages of it when read in conjunction with the accompanying drawings in which:

FIG. 1 is a side view of a dryer in accordance with this invention with the side wall of the same sectioned away and the underlying portions of the dryer appearing in elevation.

FIG. 2 is a horizontal sectional view taken substantially on the line 2—2 of FIG. 1.

FIG. 3 is a vertical sectional view taken substantially on the line 3—3 of FIG. 1.

FIG. 4 is a detail sectional view taken substantially on the line 4—4 of FIG. 2.

With reference to the drawings, the illustrated dryer in accordance with this invention is substantially rectangular in outline and includes a fabricated frame comprising a pair of channel members 10 disposed along each side of the unit, that is, extending longitudinally of the dryer or in the direction from the input to the output ends thereof. The members 10 rest on the floor of the space in which the unit is erected. In each corner of the dryer there are a pair of vertically disposed columns 11 rising from the channel members 10, which columns 11 are connected at the tops thereof to the corresponding

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pair of columns at the opposite corner at the same end of the dryer by a beam 12 extending transversely of the unit or in a direction normal to the direction of feed of the fabric. Extending longitudinally of the unit between the vertical columns 11 at the top thereof are a pair of parallel beams 13. Beams 14 are arranged parallel to the beams 13 and beneath the same and are secured at their ends to and intermediate the ends of the vertical columns 11. Additional vertical columns 15, FIG. 1, similar to the columns 11 may be disposed at spaced points between the columns 11 at the sides of the unit and connected to the beams 13 and 14 for supporting the same. A total of six channel members comprising two each of the members 16, 17, 18 extend longitudinally of the unit between the beams 12.

The carpet C is adapted to be transported through the dryer in the direction indicated by the arrow T in FIGS. 2 and 3 by a tenter mechanism which basically is of conventional design. The tenter comprises a pair of endless tenter chains 19 disposed longitudinally of the unit at the sides thereof and having opposed laterally extending lugs 20, FIG. 2, carrying the upstanding pins 21 upon which the longitudinal or selvage edges of the fabric are impaled to suspend the fabric between the two chains and to tension the fabric transversely. The chains 19 are guided longitudinally of the machine and are held in spaced relation against the tension of the fabric by guide rails 22 which are substantially closed except for a slot 23 through which the lugs 20 extend. Return guide rails 24 are disposed beneath the rails 22 and act to guide the chains 19 on their return runs. The rails 22 and 24 are supported at spaced points longitudinally of the machine by webs 25 depending from heads 26 which are carried by rails 27 arranged transversely of the machine and supported at their ends by the vertical columns 15 and the corner columns 11. The heads 26 are mounted on the rails for movement endwise of the rail by wheels 28 cooperating with the flanges of the rail. A rod 29 is supported at its mid-point by a pedestal 30 and has oppositely threaded ends that are threaded through the heads 26. Thus, upon rotation of the rod 29 in one direction, the head and thus the rails 22 are moved toward each other and upon rotation in the opposite direction, they are moved away from each other. To impart rotation to the rods 29, they are each provided with a sprocket 31, which sprockets are connected by a chain 32, FIG. 2, with a sprocket 33 on a rod 34 which in turn carries a second sprocket that is connected by a chain 35 with a sprocket on the output shaft of a speed reduction unit 36 that is driven by an electric motor 37. The rod 34 has oppositely threaded end portions that are threaded through support plates 38 in which is journaled the tenter drive shaft 39. The shaft 39 has mounted thereon sprockets 40 for the tenter chain 19 and is adapted to be driven by a chain 41 from a speed reduction unit 42 which is in turn driven by a belt 43 from a motor 44.

At its front or input end, the tenter mechanism is provided with extension rails 45 that are the same as the rails 22 and receive the chain 19 in the same manner. The extension rails 45 are pivoted to the rails 22 at 46 in end-to-end fashion. At their forward end, the extension rails 45 carry the reversing sprockets 47 for the tenter chain 19. The forward ends of the extension rails 45 are adapted to be moved toward and away from each other thereby closing and opening the input end of the tenter in accordance with the width of the fabric to accommodate the usual variations in the width of the fabric.

To move the input ends of the extension rails 45 in and out independently of each other, there is provided for each rail a threaded rod 48 threaded through a block 49 secured to the rail 45 and journaled at its ends in supports 50 and 51. The rods 48 are driven by motors 54 connected thereto by chain 53.

Within the unit, carpet C is also supported transversely at spaced intervals by rollers 55 supported at their ends in bearings carried by a channel member 56, FIG. 3, extending between the columns 14. At the input end of the unit, there are also provided rollers 57 for supporting the carpet transversely.

As mentioned above, the tenter mechanism is generally of conventional design. The width of the rails 22 is adjusted by operation of the motor 37 to stretch the fabric to the designed width and to hold it at that width as it is dried. The motor 44 acts to drive the tenter chain to move the fabric through the dryer. As the carpet is advanced into the unit, edge sensing devices (not shown) actuate the motors 54 to move the leading edge of the extension rails 45—which is the input end of the tenter, to follow the edge of the carpet so that it will be impaled upon the tenter pins 21 at the edge. As the fabric is advanced along the extension rails 45, it is stretched to the desired width and then passes onto the rails 22 and through the dryer to the output end thereof.

As the carpet is moved through the dryer by the tenter mechanism it is subjected to a drying action which is designed to dry the carpet rapidly and efficiently. The dryer is divided into three drying zones that extend transversely of the unit and the drying medium is hot air that is forced through the carpet with a portion of the air in each zone being recirculated within that zone while the remainder thereof is passed into the next zone. New make-up air is taken in at the zone at the output end of the dryer, and expended air is exhausted from the zone at the input end of the dryer.

The air in each of the drying zones is circulated by a pair of centrifugal blowers mounted on the channel members 16 and 17. The blowers for the final drying zone which is at the output end of the dryer are designated 58, while those for the first drying zone which is at the input end are designated 59, and those for the intermediate zone being designated 60. The blowers are each driven by an electric motor 61 mounted on the channel members 17 and 18 and connected to the blower by belting 62.

The discharge of the blowers 59 for the zone at the input end of the dryer are directed into diverging ducts 63, the discharge end of which substantially covers the carpet in the drying zone. The intake of the blower 59 is connected to an intake duct 64 which is connected to a heat exchange 65 mounted on the beams 13 so that the blower will draw air through the heat exchanger.

Beneath the carpet, there is provided a chamber 66 extending completely under the mouth or discharge of the duct 63 and having a front end wall 67 and a rear end wall 68 extending transversely of the unit on lines substantially conforming to the front and rear edges of the mouth of ducts 63. There is also provided an intermediate partition 69 disposed between the end walls 67 and 68 to divide the space therebetween into a discharge portion 70 disposed between the intermediate partition 69 and the front end wall 67 and a recirculation portion 71 between the intermediate partition 69 and the rear end wall 68. The chamber 66 is open at the top and is adapted to receive the air from the duct 63 that passes through the carpet C. Preferably the discharge portion 70 constitutes one-third of the space between the end walls 67 and 68 while the recirculation portion 71 constitutes two-thirds thereof, so that one-third of the air passing through the carpet C will enter the discharge portion 70 and two-thirds will enter the recirculation portion 71. The discharge portion 70 is connected by duct work to the intake of a blower 72 that is driven by belts 73 from

a motor 74. The discharge of the blower 74 is connected to a vertical exhaust duct 75 that is adapted to be vented to the atmosphere outside the space in which the dryer is housed.

The intake of the heat exchanger 65 is enclosed within a duct designated generally at 76 and which includes a partition 77 disposed between the front and rear end walls 78 and 79 of the duct 76 with the space or distance therebetween divided two-thirds between the front end wall 78 and the partition 77 to define the recirculation duct 80 and one-third between the rear end wall 79 and the partition 77 to define the discharge duct 81. The recirculation duct 80 is connected to and constitutes a continuation of the recirculation portion 71 of the chamber 66 to direct the drying medium that passes through the carpet into the portion 71 back through the heat exchange 65 to reheat the same and then to pass it again through the carpet. The discharge duct 81 draws air from the succeeding drying zone thereby providing make-up for the air that is exhausted through the blower 72 and exhaust duct 75. With the proportions as indicated, about two-thirds of the air discharged by the blowers 59 is recirculated while one-third is exhausted.

In order to make the system associated with the blowers 59 as air-tight as practical to prevent the escape of the air from the designated path, the sides of the discharge ducts 63 at the mouth thereof are disposed very close to the top of the rails 22 which are in turn disposed very close to the open top of the chamber 66. Also, there may be provided flaps (not shown) depending from the front and rear edges of the discharge ducts 63 and adapted to engage and to be deflected by the carpet.

The intermediate drying zone is substantially the same as the first drying zone as discussed above and includes various components that are identical to components of the preceding zone and are designated by the same reference numerals. The intermediate drying zone is distinguished by the fact that the discharge portion 70 thereof is connected to the discharge duct 81 of the first drying zone so that the air that passes through the carpet C and into the discharge portion 70 of the chamber 66 at the intermediate drying zone is directed to the intake for the first drying zone to compensate for the air that is exhausted from the first drying zone by the compensate for the air that is exhausted from the first drying zone by the blower 72.

The final drying zone is also similar to the first drying zone and is characterized by the fact that the intake portion of the radiator 65 in the first drying zone which is the portion connected to the discharge duct 81 and thus draws make-up air from the intermediate drying zone, is, in the final drying zone open to the interior of the unit so that make-up air is drawn into the dryer. This exposed portion of radiator 65 is designated 82. The unit is substantially enclosed and insulated as shown by a laminated exterior wall 83 on the top and all walls of the unit except for the side walls 84 which are hollow and have openings 85 to the atmosphere at the input end of the unit and openings 86 to the interior of the unit at the output end. Thus new make-up air is drawn into the system primarily through the openings 85 with this air traveling through the walls 84 which serves not only to preheat the air but also to cool the walls of the dryer, thereby minimizes heat loss which increases the efficiency of the unit and helps to keep the temperature of the building in which the unit is erected at a more comfortable level.

The radiators 65 may be fed with a heating fluid of any desired type but preferably hot oil from a furnace (not shown) through two supply conduits 87, one feeding the three radiators 65 along one side of the unit and the other feeding the three radiators 65 along the other side of the unit. The supply conduits 87 are connected

to the bottom of the radiators by inlet tubes 88. The illustrated radiators 85 are triple-pass with reversing conduits 89 at the top between the first and second passes and reversing conduits 90 at the bottom between the second and third passes. The heating fluid is exhausted at the end of the third pass through the radiator into a return conduit 91. The return conduits 91 for the two radiators 65 for one drying zone are connected together by a T-coupling 92. The heating fluid is directed from the conduits 91 through a remotely controlled valve 93 in a conduit 94 to a return header 95 by which it is returned to the heating element for reheating and re-use. Suitable temperature gauges may be disposed in the system for automatically controlling the valves 93.

By means of the valves 93, the flow of the heating fluid through the radiators can be controlled, thereby controlling the temperature in the coils of the radiators and thus the temperature of the air passing through the radiators.

Excess heat in the drying cycle damages the carpet. However, the wet or saturated carpet in the first drying zone at the input end of the dryer is capable of being subjected to relatively high temperatures without being damaged. Thus in the dryer in accordance with this invention, a relatively high temperature is maintained in the first drying zone—a temperature which if used in the succeeding drying zones would be so high as to damage the carpet. Progressively lower temperatures are maintained in the intermediate and final drying zones, with the temperature in the final zone being sufficiently low that it can be safely applied to the dry carpet. By the use of the higher temperatures the drying time is thus significantly decreased. Passing the air through the carpet also decreases the drying time by increasing the exposure of the wet fibers of the carpet to the air.

In operation of the dryer, the wet carpet enters at the front of the unit and is transported through the same in the direction of the arrow T by the tenter mechanism including the tenter chain 19, and thus passes progressively from the first, to the intermediate and to the final drying zones. The drying medium, which may be air, is used initially in the final drying zone which is at the output side of the unit where the carpet is already relatively dry. In the final drying zone, two-thirds of the air that is passed through the carpet enters the recirculating portion 71 of the chamber 66 and is directed by the duct 80 back to the intake side of the radiator 65 and is thus recirculated in that zone. The other one-third of the air for the final drying zone is make-up air and is drawn through the portion 82 of the radiator 65 from the inside of the dryer housing, most of which air is drawn through the hollow side walls 84. Thus, the air circulated in the final drying zone where the carpet is already relatively dry, is thus itself relatively dry and at a low temperature.

One-third of the air passing through the carpet in the final drying zone enters the discharge portion 70 of the chamber 66 and is directed by the duct 81 to the input side of the radiator 65 at the intermediate drying zone. This air constitutes one-third of the air passed through the carpet in this drying zone, the remaining two-thirds of the air being recirculated air that passes through the carpet into the recirculation portion of the chamber 66 and is directed by the duct 80 back to the intake side of the radiator 65. The temperature in the intermediate drying zone can be higher than in the final drying zone since the carpet at this point is substantially wetter than in the final drying zone. The make-up air for the intermediate drying zone which is being drawn from the final drying zone through the duct 81 is not only relatively dryer, but is also heated to a higher temperature, thus further lowering its relative humidity and increasing its drying capacity.

The remaining one-third of the air that passes through

the carpet into the chamber 66 at the intermediate drying zone, enters the portion 70 of the chamber and is passed by the duct 81 to the intake side of the radiator 65 at the first drying zone where it is combined with air recirculated in the first drying zone—the air from the intermediate zone constituting approximately one-third of the air in the first zone and the remaining two-thirds being recirculated air. The air passing through the carpet in the first drying zone passes into the chamber 66 with two-thirds entering the recirculating portion 71 and the other one-third entering the discharge portion 70 which is drawn off by the blower 72 and exhausted from the system. Since the carpet in the first drying zone is wet, the temperature and thus the drying capacity of the air can be made relatively high without damage to the carpet.

Numerous alterations of the structure herein disclosed will suggest themselves to those skilled in the art. However, it is to be understood that the present disclosure relates to a preferred embodiment of my invention which is for purposes of illustration only and not to be construed as a limitation of the invention. All such modifications which do not depart from the spirit of the invention are intended to be included within the scope of the appended claims.

I claim:

1. A dryer for carpet or the like having an input end and an output end and including a plurality of drying zones, a tenter mechanism for transporting the carpet through the dryer from the input end to the output end, said dryer including at each of said drying zones a blower means, duct means for directing the discharge of said blower means onto the carpet, a chamber disposed on the opposite side of the carpet from said duct means for receiving air passing through the carpet, a partition dividing said chamber into a discharge portion and a recirculating portion, a duct connecting the recirculating portion of said chamber with the intake of said blower means, a heating element disposed at the intake of said blower means, a duct connecting the intake of said blower means of each drying zone with the discharge portion of each succeeding drying zone except the intake of the drying zone at the output end of said dryer, a duct connecting the discharge portion of said chamber of the drying zone at the input end of dryer to exhaust, and means for introducing make-up air to the intake of the blower means of the drying zone at the output end of said dryer.

2. A dryer for carpet and the like having an input end and an output end, and having three drying zones comprising a first, an intermediate and a final drying zone arranged respectively from the input to the output ends of the dryer a tenter mechanism for transporting the carpet through the dryer from the input end to the output end, said dryer including at each of said drying zones a blower means, duct means for directing the discharge of said blower means onto the carpet, a chamber disposed on the opposite side of the carpet from said duct means for receiving air passing through the carpet, and a partition dividing said chamber into a discharge portion and a recirculating portion, a duct connecting the recirculating portion of said chamber with the intake of said blower means, and a heating element disposed at the intake of said blower means, ducts connecting the discharge portions of said chambers at the intermediate and final drying zones with the intakes of the blower means for the first and intermediate drying zones respectively, a duct connecting the discharge portion of said chamber at the first drying zone to exhaust, and means for introducing make-up air to the intake of the blower means at the final drying zone.

3. A dryer in accordance with claim 2 in which said discharge portions comprise substantially one-third of said chambers and said recirculating portions comprise substantially two-thirds of said chambers.

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4. A dryer in accordance with claim 2 in which said dryer has hollow side walls and the means for introducing make-up air to the intake of the blower means at the final drying zone comprises said side walls whereby the make-up air is preheated by being drawn through said side walls and also acts to cool said side walls.

5. A dryer in accordance with claim 2 in which there is provided means for controlling said heating elements whereby different temperatures may be maintained in each of said drying zones with a relatively higher temperature in said first drying zone and progressively lower temperatures in said intermediate and final drying zones.

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