

[54] CARPET DRYING METHOD

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[58] Field of Search 263/3, 8; 34/212, 34/41, 216, 223, 219, 220, 155, 158; 432/8, 59

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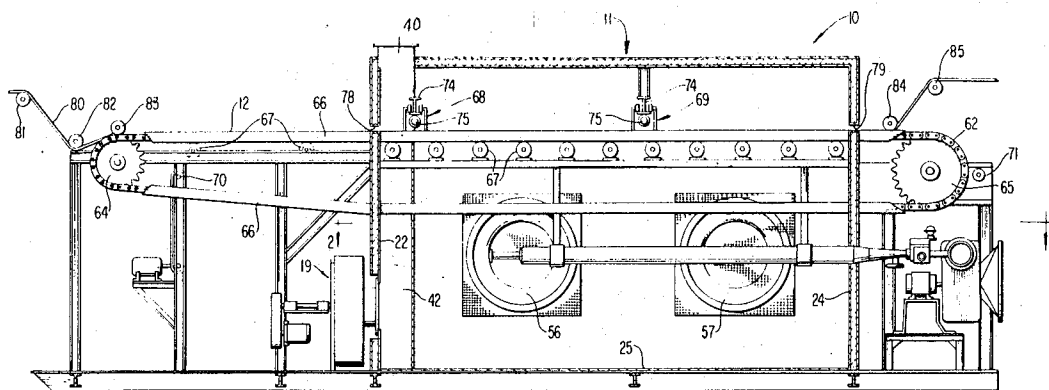
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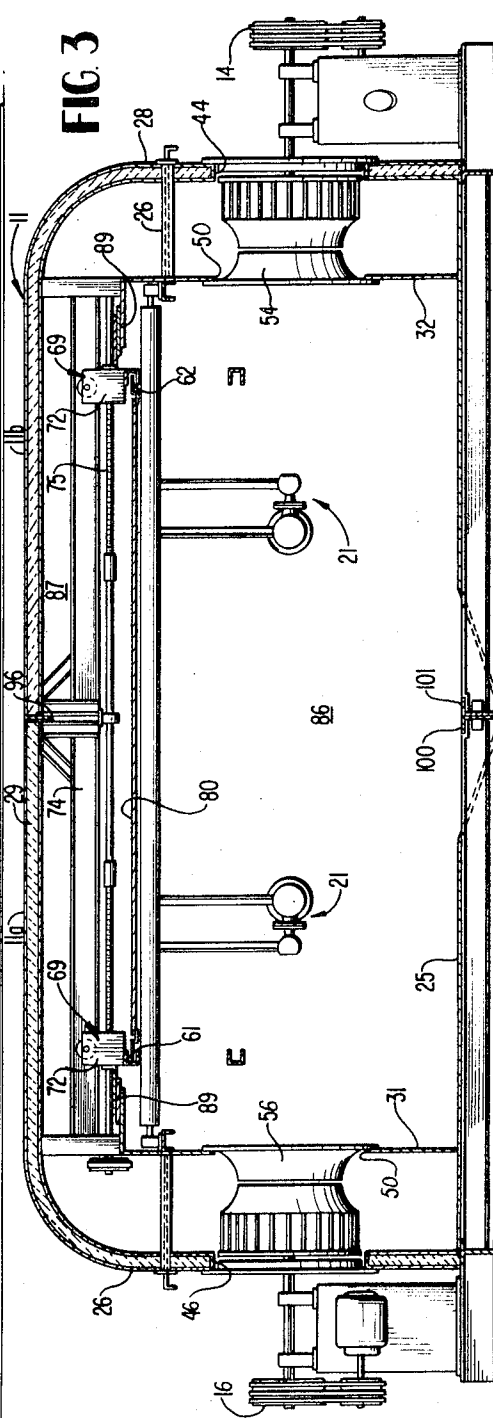
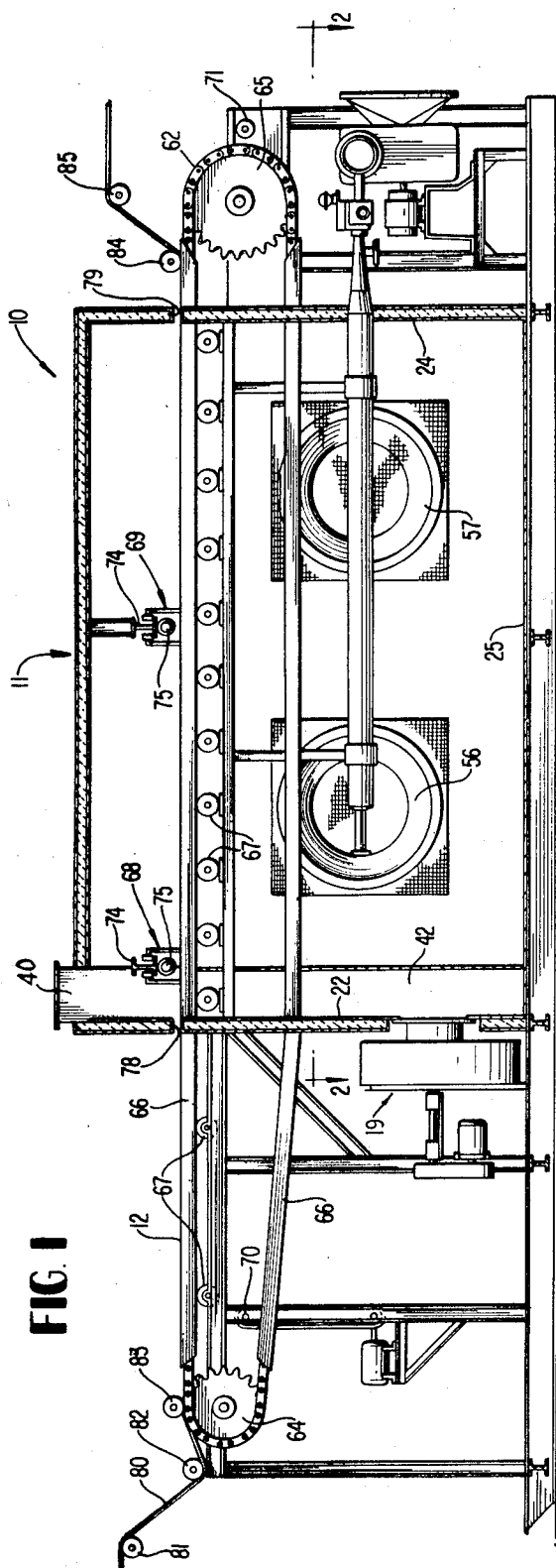
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ABSTRACT

A method of drying carpets and the like including the steps of passing wet carpet along its length through a housing along a rectilinear path, passing hot air from one side of the path through the carpet and recirculating the air from the other side of the carpet about the side edges of the carpet, heating the air, after it has passed through the carpet prior to recirculating the air, and exhausting to the atmosphere that portion of the air which is passed through the carpet first entering the housing.

5 Claims, 4 Drawing Figures

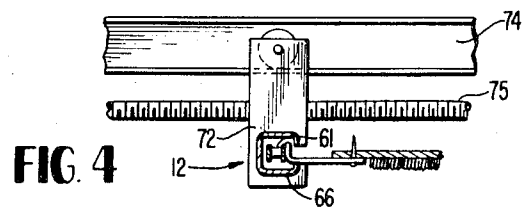
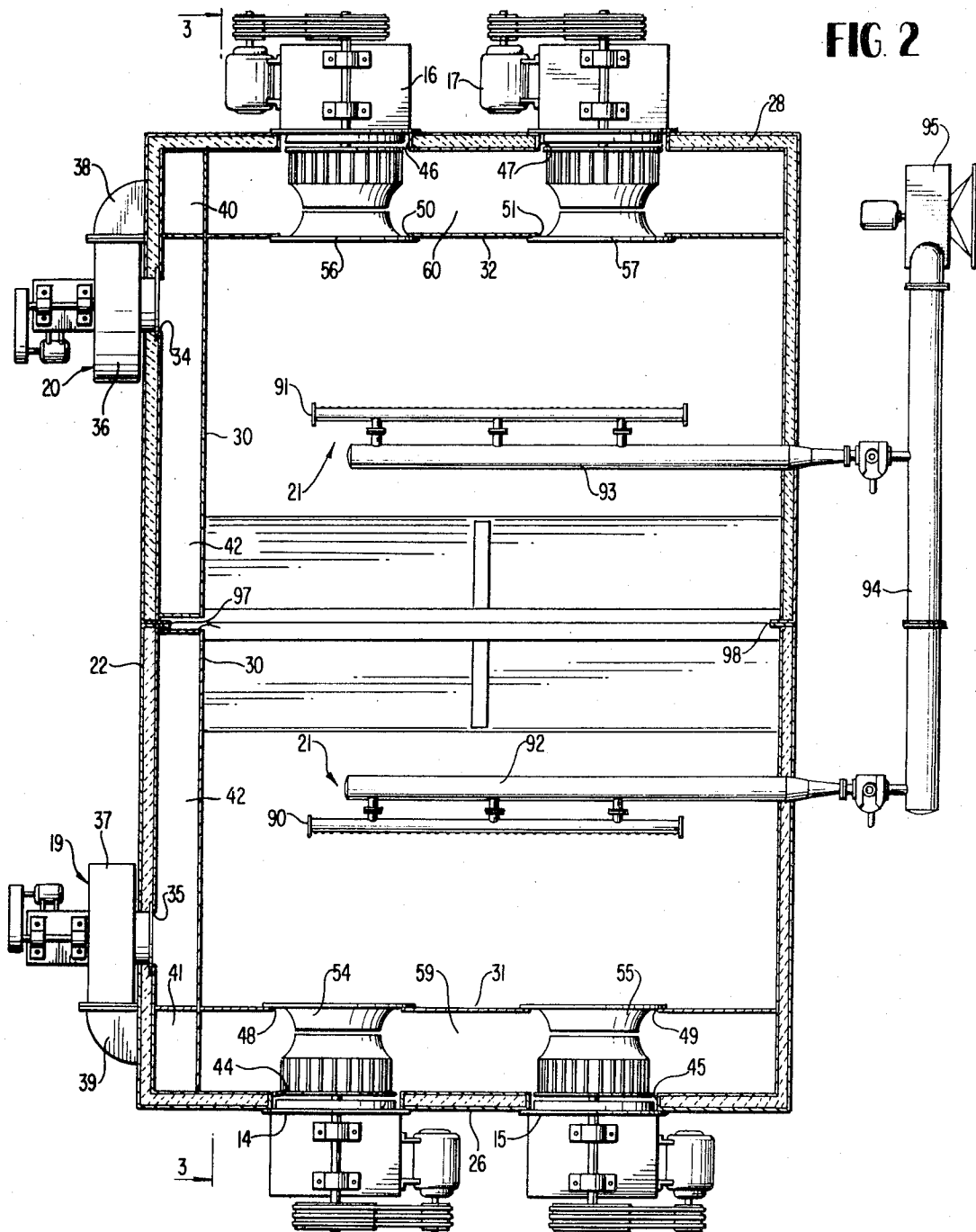




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SHEET 2 OF 2



CARPET DRYING METHOD

CROSS REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of application Ser. No. 864,357, filed Oct. 7, 1969, now U.S. Pat. No. 3,641,681 entitled "Carpet Dryer."

BACKGROUND OF THE INVENTION

In the drying of continuous lengths of carpets and similar continuous porous materials, various devices have been developed for forcing heated air through the carpet material, recirculating the heated air, and continuously exhausting a portion of the recirculated air. While dryers of this type have been somewhat successful and efficient in performing the drying function, the usual dryer structure has been expensive in that it includes a large number of air flow ducts, fans and fan mountings, a large housing structure and a separate heating element for each air duct to properly reheat the recirculated air. Typically, the internal heating elements and fans have been difficult to mount and cannot be practically serviced or removed from the housing for repair or replacement. Usually, the dryer was fabricated at one point, and shipped piecemeal to its erection site for assembly which required an extended time for assembly at the site at which it was to be used.

SUMMARY OF THE INVENTION

Briefly described, the present invention comprises a dryer for drying continuous carpet material and the like which functions to force a high velocity heated stream of air through the carpet as the carpet initially enters the dryer housing, and subsequently flows heated air through the carpet at a lower velocity. The air initially forced through the carpet at high velocity is subsequently exhausted from the housing without recirculating through the housing, while the air subsequently forced through the carpet is continuously recirculated and reheated until exhausted through the exhaust system. This effectively removes the wettest air and coolest air from the housing and rapidly dries the carpet entering the housing. The air recirculated through the carpet is heated in a heating chamber or zone of low air pressure beneath the path of the carpet and moved around the edges of the carpet to a high pressure zone above the carpet. This creates a pressure differential across the carpet which causes the air to flow through the carpet. The same air moved to the high pressure zone above the carpet is drawn through the carpet at the entrance of the housing, so that the single heating means in the low pressure zone functions to heat all of the air flowing through the housing and no further heating elements are required. The low pressure air zone beneath the path of the carpet is substantially unencumbered with air ducts, etc., and the housing is assembled in two sections at the initial construction site and shipped in sections to the erection site where it is expediently erected.

Thus, it is an object of this invention to provide a method and apparatus for drying carpets and the like which initially heats the carpet as it moves along a path with a high velocity flow of heated air to rapidly remove moisture from the carpet material, and subsequently continuing the drying process by passing heated air at a lower velocity through the carpet material.

Another object of this invention is to provide a carpet dryer which recirculates the drying air through the carpet and reheats the recirculating air on each cycle with a minimum of air ducts and heating units.

Another object of this invention is to provide a carpet dryer that is initially manufactured in two sections and the two sections are normally connected together at the site of permanent installation.

Another object of this invention is to provide apparatus for drying carpet which is inexpensive to initially construct and subsequently install, which functions to dry carpet at a rapid rate without any substantial hazard of damaging the carpet, and which is efficient and effective in its operation.

Other objects, features and advantages of the present invention will become apparent upon reading the following specification when taken in conjunction with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a side elevational view, in cross section of the carpet dryer, showing the carpet as it passes from left to right through the housing.

FIG. 2 is a plan view of the carpet dryer, taken along lines 2—2 of FIG. 1.

FIG. 3 is an end elevational view, in cross section, of the carpet dryer, taken along lines 3—3 of FIG. 2.

FIG. 4 is a detail showing of the tenter chain and its chain guide.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now in more detail to the drawing, in which like numerals indicate like parts throughout the several views, FIG. 1 shows carpet dryer 10 which includes insulated housing 11, tenter mechanism 12, recirculating air blower assemblies 14, 15, 16, and 17, exhaust air blower assemblies 19 and 20, and gas burner assembly 21. Insulated housing 11 comprises front wall 22, back wall 24, bottom wall 25, side walls 26 and 28, and top wall 29. Entrance partition 30 is positioned closely adjacent front wall 22 and extends from bottom wall 25 up toward the upper flight of tenter mechanism 12. Side partitions 31 and 32 are positioned closely adjacent side walls 26 and 28 and also extend up toward the upper flight of tenter mechanism 12. Front wall 22 defines exhaust openings 34 and 35, and blowers 36 and 37 of exhaust air blower assemblies 20 and 19 have their inlets in communication with openings 34 and 35. Blowers 36 and 37 exhaust air into duct work 38 and 39 which turns inwardly of housing 11 and communicates with corner voids 40 and 41 formed by the extension of entrance partition 30 and side partitions 31 and 32. The upper ends of corner voids 40 and 41 are open, and duct work (not shown) is usually connected to the upper ends and functions to flow the exhaust air away from the carpet dryer. With this arrangement, entrance partition 30 and front wall 22 form an exhaust or blow down conduit 42 which has its entrance located at the upper flight of tenter mechanism 12.

Side walls 26 and 28 define impeller openings 44, 45, 46, and 47, and side partitions 31 and 32 define air openings 48, 49, 50, and 51. Impellers 54, 55, 56, and 57 are mounted in impeller openings 44—47 with their inlets extending through air openings 48—51. With this arrangement, recirculating conduits 59 and 60 are defined between side partition 31 and side wall 26 and

side partition 32 and side wall 28, respectively. When impellers 54-57 are rotated at high angular velocities, a flow of air is created from the area below tenter mechanism 12 within housing 11 through impellers 54-57 into recirculating conduits 59 and 60 to the area above tenter mechanism 12 below top wall 29.

Tenter mechanism 12 comprises a pair of endless chains 61 and 62 that are spaced apart and extend around feed sprockets 64 and delivery sprockets 65. As is shown in FIG. 4, each tenter chain is carried in chain guides 66. Chain guides 66, feed sprockets 64 and delivery sprockets 65 are movable toward and away from each other by means of hanger mechanism 68 and 69 within housing 11 and support mechanisms 70 and 71 adjacent feeder sprockets 64 and delivery sprockets 65. As is shown in FIG. 3, hanger mechanisms 68 and 69 comprise roller mounted hanging blocks 72 suspended from rail 74 within housing 11, and oppositely threaded turning shafts 75. When shafts 75 are rotated, hanging blocks 72 move toward or away from each other, thereby carrying chain guides 66 and tenter chains 61 and 62 toward or away from each other. Thus, the spacing between tenter chain 61 and 62 is variable.

As is shown in FIG. 1, front wall 22 defines carpet inlet opening 78 which is in alignment with the upper flights of tenter chains 61 and 62, and back wall 24 defines carpet outlet opening 79 arranged in a similar manner. Carpet 80 is extended over guide roller 81, beneath guide rollers 82 and 83 so that its edges are impaled by the pins of tenter chains 61 and 62 and carried with the upper flights of the tenter chains. The carpet enters carpet opening 78 of housing 11 and passes with the upper flight of tenter chains 61 and 62 until it emerges from outlet opening 79, where it is guided beneath guide roller 84 and over guide roller 85. Thus, the passage of carpet 80 through the housing is effective to divide housing 11 into low air pressure zone 86 below the path of the carpet and high air pressure zone 87 above the path of the carpet. In order to isolate low air pressure zone 86 from high air pressure zone 87, overlapping sliding plates 89 are connected to hanging blocks 72 in the upper edge of side partitions 31 and 32. Thus, when hanging blocks 72 are moved toward or away from each other, sliding plates 89 will move with the hanging blocks 72 and prevent air from flowing around the edges of carpet 80 from high air pressure chamber 87 toward low air pressure chamber 86.

Open flame gas burners 90 and 91 are positioned in low air pressure chamber 86 beneath the path of carpet 80. Burners 90 and 91 are supplied with gas through headers 92 and 93 and conduit system 94 that is connected externally of housing 11 to blower 95 which receives a supply of both air and gas and functions to deliver a mixture of air and gas to headers 92 and 93 and their respective burners 90 and 91. The flames created by burners 90 and 91 are directed generally toward the inlets of impellers 54-57.

As is shown in FIGS. 2 and 3, housing 11 is divided into two sections, section 11a and section 11b by central seam 96 in top wall 29, and seams 97 and 98 in front and back walls 22 and 24. The centerline of bottom wall 25 slopes in a downward direction (FIG. 3) and each half thereof joins to the bottom flange of channel beams 100 and 101. When housing 11 is initially assembled, it is assembled in two sections and subsequently shipped to its site of erection. Upon reaching the site of erection, the seams 96, 97 and 98

and channel beams 100 and 101 are placed in abutment and connected together. The lighter air exhaust blower assemblies 19 and 20 are attached to front wall 22 at the construction site and shipped with the housing while the heavier recirculating air blower assemblies 14, 15, 16, and 17 usually are individually shipped and subsequently connected to housing 11 at the erection site.

OPERATION

When carpet dryer 10 is put into operation, carpet 80 is fed over roller 81, beneath rollers 82 and 83 so that its side edges become impaled upon the pins of tenter mechanism 12 and are passed toward housing 11, through carpet inlet opening 78 of front wall 22, through housing 11, and ultimately out of carpet outlet opening 79 in back wall 24. Gas burners 90 and 91 are ignited to create open flames in low air pressure chamber 86, and recirculating air blower assemblies 14-17 are energized to create an air flow from low air pressure chamber 86 to high air pressure chamber 87 through recirculating conduits 59 and 60 about the side edges of carpet 80. Also, exhaust air blower assemblies 19 and 20 are energized to create a flow of exhaust air into blow down conduit 42 and back up through corner voids 40 and 41 of housing 11 to the atmosphere.

Recirculating air blower assemblies 14-17 are constructed so that they each move approximately 30,000 cubic feet per minute from low air pressure chamber 86 through recirculating conduits 59 and 60 to high air pressure chamber 87. This functions to move approximately 120,000 cubic feet per minute of air through the carpet passing through housing 11. Exhaust air blower assemblies 19 and 20 are each constructed to move approximately 6,000 cubic feet per minute of air from high air pressure chamber 87 down through carpet 80 into blow down conduits 42, and ultimately back up through corner voids 40 and 41. Thus, approximately 12,000 cubic feet per minute of heated air moves down through the carpet as it initially enters housing 11. The spacing of entrance partition 30 from front wall 22 is approximately 1 foot, while the distance between entrance partition 30 and back wall 24 is approximately fifteen feet. The distance between side partitions 31 and 32 is approximately 20 feet.

The approximate velocity of air flowing through the carpet is computed as follows:

At blow down conduit 42:

$$Vel_1 = Vol_1 / Length_1 \times Width = 12,000 / 1 \times w$$

For carpet widths of 15, 12 and 9 feet, the respective velocities would be 800, 1,000 and 1,333 feet per minute.

At low air chamber 86:

$$Vel_2 = Vol_2 / Length_2 \times Width = 120,000 / 15 \times w$$

For carpet-widths of 15, 12 and 9 feet, the respective velocities would be 533,666 and 888 feet per minute.

The ratio of air velocities through the carpet at the blow down conduit as compared to that at the low air chamber is computed by:

$$\frac{Vel. 1}{Vel. 2} = \frac{\frac{Vol. 1}{Length 1 \times Width} \times \frac{12,000}{1 \times W}}{\frac{Vol. 2}{Length 2 \times Width} \times \frac{120,000}{15 \times W}} = \frac{3}{2}$$

When the tenter chains are moved apart to a wide position to carry wide carpet through the housing the tenter drive mechanism (not shown) is operated at a slow speed; and when the tenter chains are moved together to a narrow position to carry narrow carpet through the housing the tenter drive mechanism is operated at a faster speed. This allows approximately the same volume of drying air to pass through each square foot of carpet.

The initial "blow down" of the carpet is established as the carpet initially enters the housing and is in its dampest and coolest condition. The result is that the high velocity initial blow down rapidly heats the carpet and removes a large amount of moisture from the carpet. Moreover, the air passing through the carpet into blow down conduit 42 becomes the wettest and coolest air in housing 11 and is immediately exhausted from housing 11 through corner voids 40 and 41. As the carpet passes beyond blow down conduit 42, it will be at a suitable temperature for continued drying, and the air being passed therethrough will have a relatively low humidity and high temperature and high drying capacity.

As the carpet first enters housing 11, it carries more moisture and is therefor more dense than it is when it makes its exit from the housing. Thus, the initial blow down and heat up of the entering carpet takes place on the denser portion of the carpet, where the air is harder to urge through the carpet material. Thus, a higher air pressure differential is required to create the blow down of the carpet.

The make up air required to replace the air being exhausted through blow down conduit 42 and its exhaust air blower assemblies 19 and 20 is fed in through gas burners 90 and 91 and in through carpet openings 78 and 79 in the front wall 22 and back wall 24. Of course, since low air pressure exists in blow down conduit 42 and low air pressure chamber 86, the carpet will tend to be urged in a downward direction by the higher air pressure in high air pressure chamber 87. This causes the carpet 80 to tend to drag over the bottom edges of carpet openings 78 and 79 to more effectively close the low pressure chambers while permitting more air inflow into upper air pressure chamber 87. Of course, carpet openings 78 and 79 are gauged to admit primarily only the carpet thickness and to minimize the air inflow at these points, so that most of the make up air will enter housing 11 through gas burners 90 and 91. Also, support rollers 67 within housing 11 further support carpet 80 and prevent the pressure differential across the carpet from causing the carpet to sag.

While the carpet passing through the housing is dried principally by air flow through the carpet, it will be understood that the open flames emitted from gas burner

91 will function to dry the carpet by radiation, thus speeding up the drying of the carpet. Also, while the burner 91 has been disclosed as being a gas burner it should be understood that the burner can comprise other type heating means, but preferably open flame burners such as gas or oil burners so as to emit radiant heat.

While this invention has been described in detail with particular reference to preferred embodiments thereof, it will be understood that variations and modifications can be effected within the spirit and scope of the invention as described hereinbefore and as defined in the appended claims.

I claim:

1. A method of drying carpet and the like comprising: moving a length of carpet along its length through a predetermined path, passing air at an elevated temperature from one side of the path through the carpet to the other side of the path at a first position along the path at a given velocity and then exhausting the air to the atmosphere or the like, passing air at substantially the same elevated temperature from the one side of the path through the carpet to the other side of the path at a second position along the path at a velocity lower than the said given velocity and recirculating the air back to the one side of the path.
2. A method of drying carpets and the like including the steps of passing wet carpet along its length through a housing along a rectilinear path, passing hot air from one side of the path through the carpet and recirculating the air from the other side of the carpet about the side edges of the carpet, heating the air after it has passed through the carpet prior to recirculating the air, and exhausting to the atmosphere that portion of the air which is passed through the carpet first entering the housing.
3. The method of claim 2 and wherein the step of heating the air comprises heating the air with a gas flame.
4. The method of claim 2 and wherein the step of passing the carpet along its length through a housing comprises moving the carpet laterally through the housing, and the step of passing hot air from one side of the path through the carpet comprises passing the hot air in a downward direction from above the path through the carpet, and the step of heating the air comprises heating the air below the path.
5. The method of claim 2 and wherein the step of heating the air comprises heating the air with an oil flame.

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