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Villalobos

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[54] **HORIZONTAL FLAT BED THROUGH DRYING SYSTEM**

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[52] **U.S. Cl.** **34/155,** 226/199, 34/216, 34/242

[51] **Int. Cl.** **F26b 13/10**

[58] **Field of Search** 34/155, 158, 208, 26, 23, 34/152, 209, 162, 242, 216, 223, 212, 213, 34/214, 219, 86, 54; 432/4, 14, 26, 64, 8, 59, 34/115; 98/36; 226/199, 179

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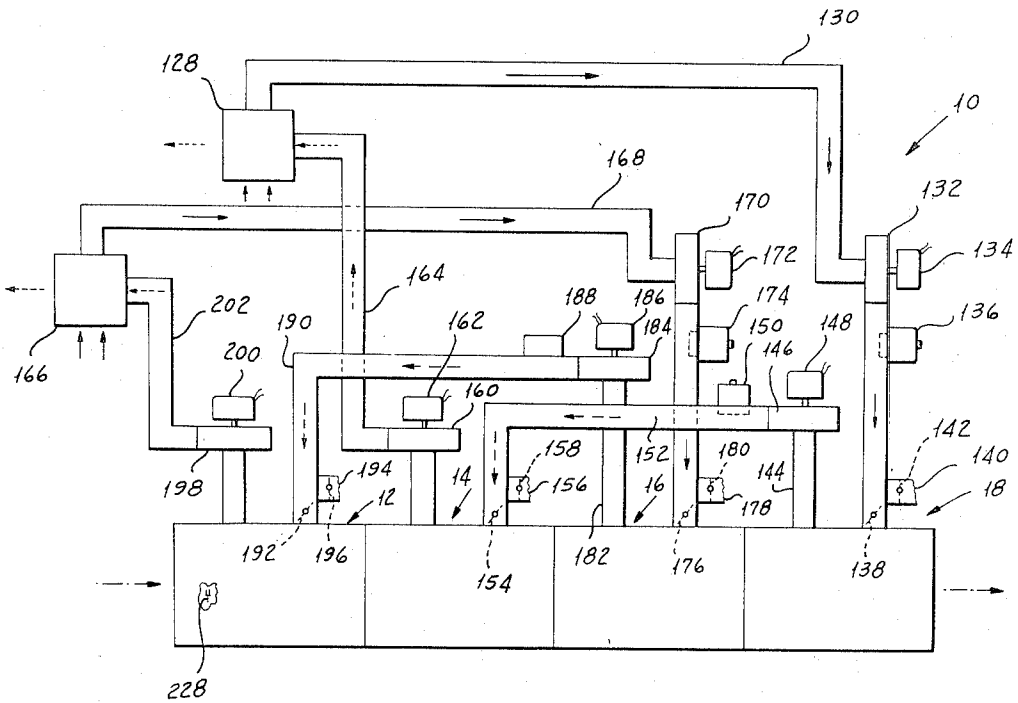
[57] **ABSTRACT**

A horizontal flat bed through drier system for drying a wet web of fibrous material in which air heated directly by burners in the supply ducts is fed to the upper sections of a series of drier units and is drawn through the web and through an air-pervious supporting fabric by suction means connected to the lower sections of the units as the web is carried successively through the units by the fabric and in which air removed from at least one unit adjacent to the dry end of the system is reheated and is supplied to another unit relatively adjacent to the wet end of the system and in which exhaust air from the system is brought into direct heat exchange relationship with fresh air being supplied to the system. Each unit includes adjustable edge deckles forming seals with the underside of the fabric edges and with means providing adjustable fabric edge air curtains for cooling the fabric edges. Means is provided for diverting the heated supply air to the exhaust when the fabric temperature exceeds a predetermined value. At least the unit adjacent to the dry end of the system is provided with suction moisture profile control means.

32 Claims, 6 Drawing Figures



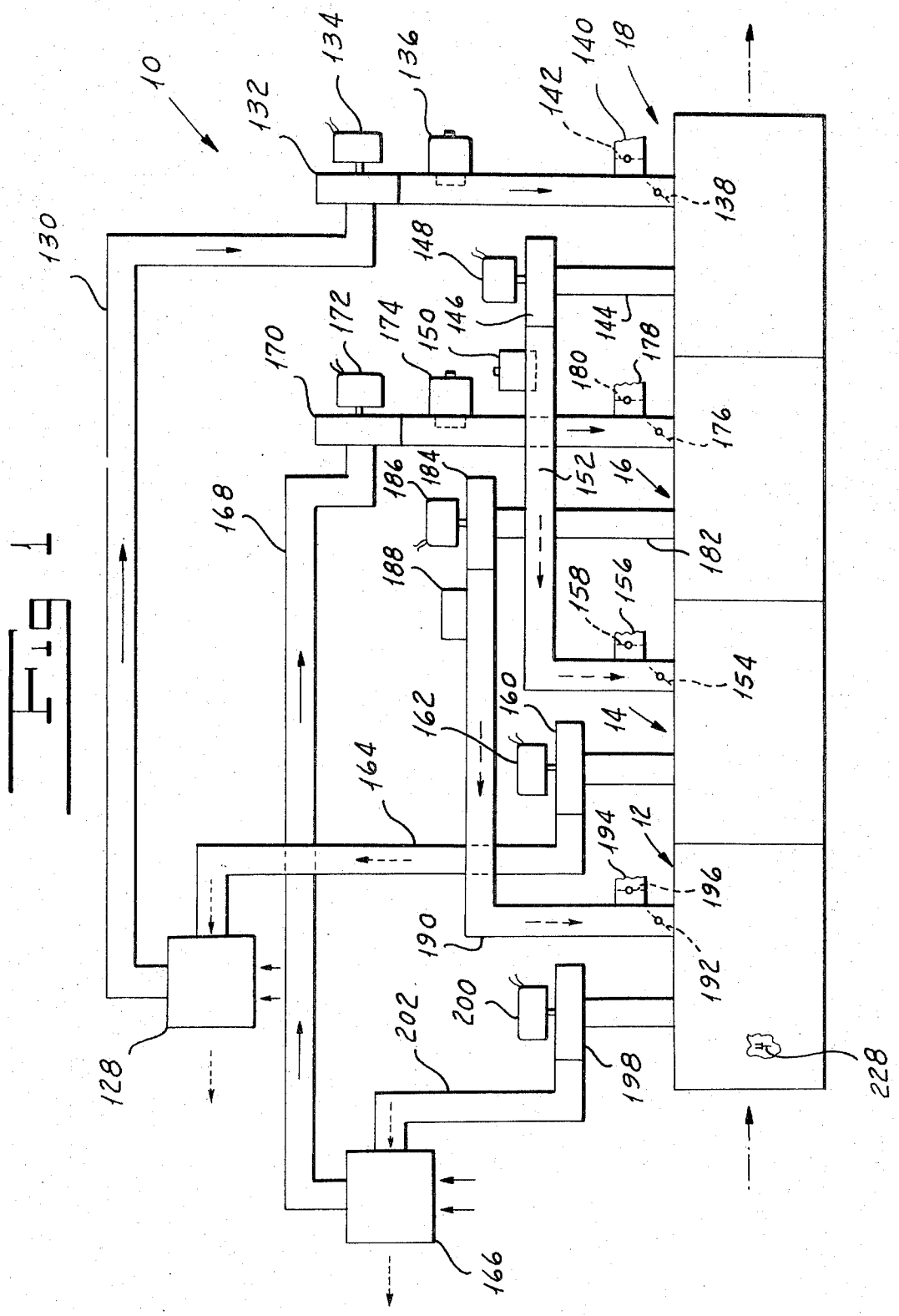

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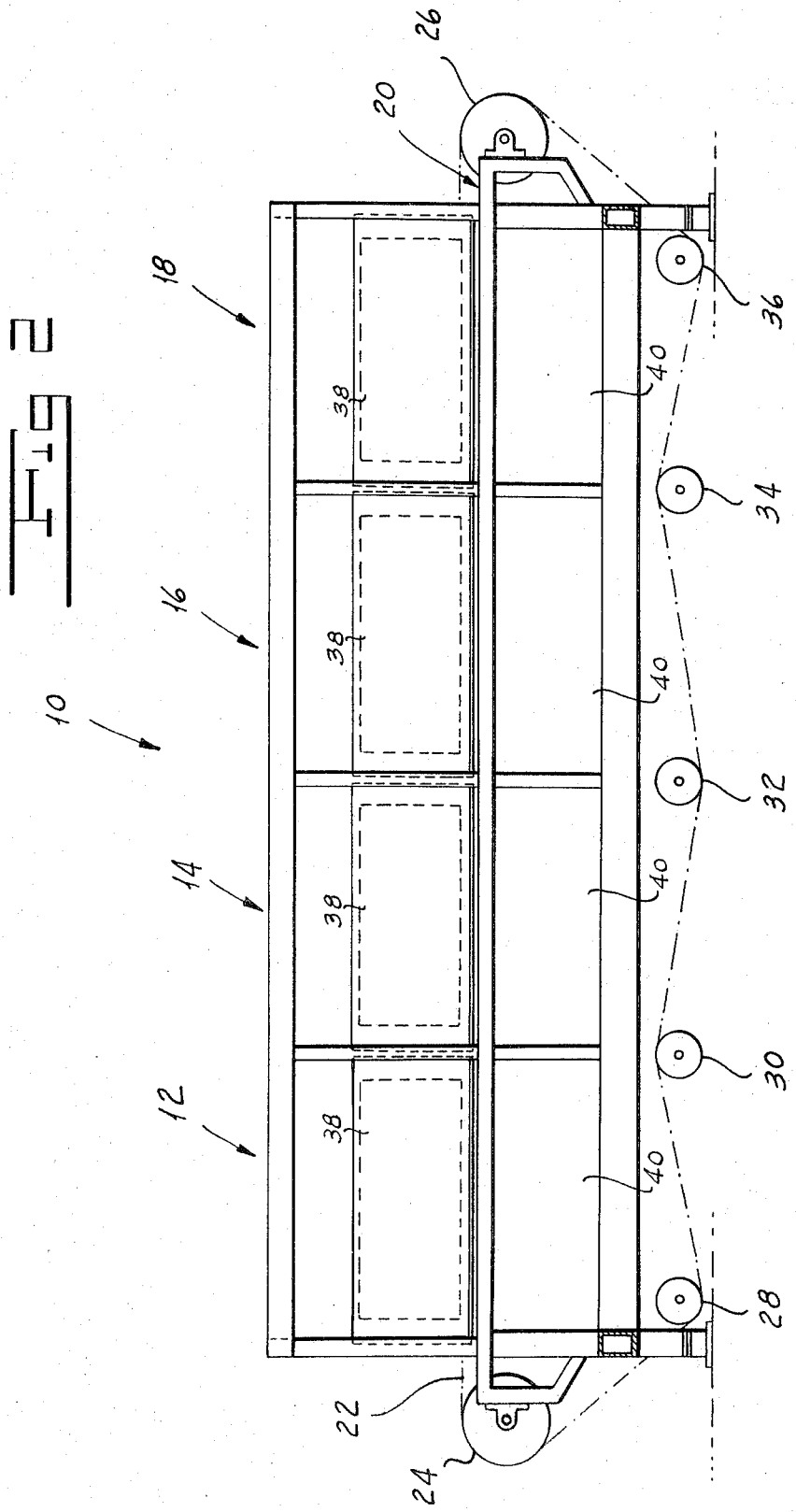
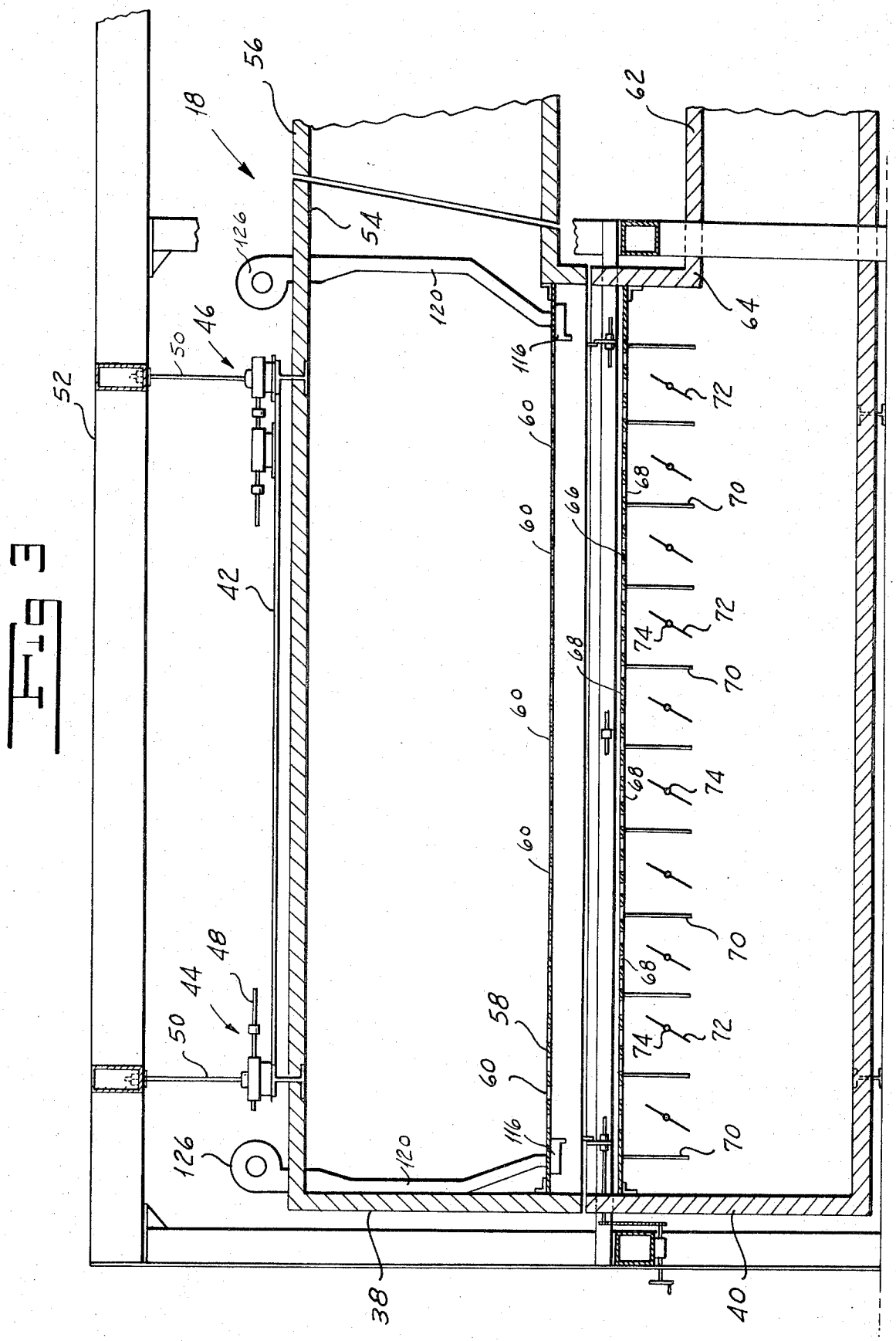
FIG. 1

FIG. 2





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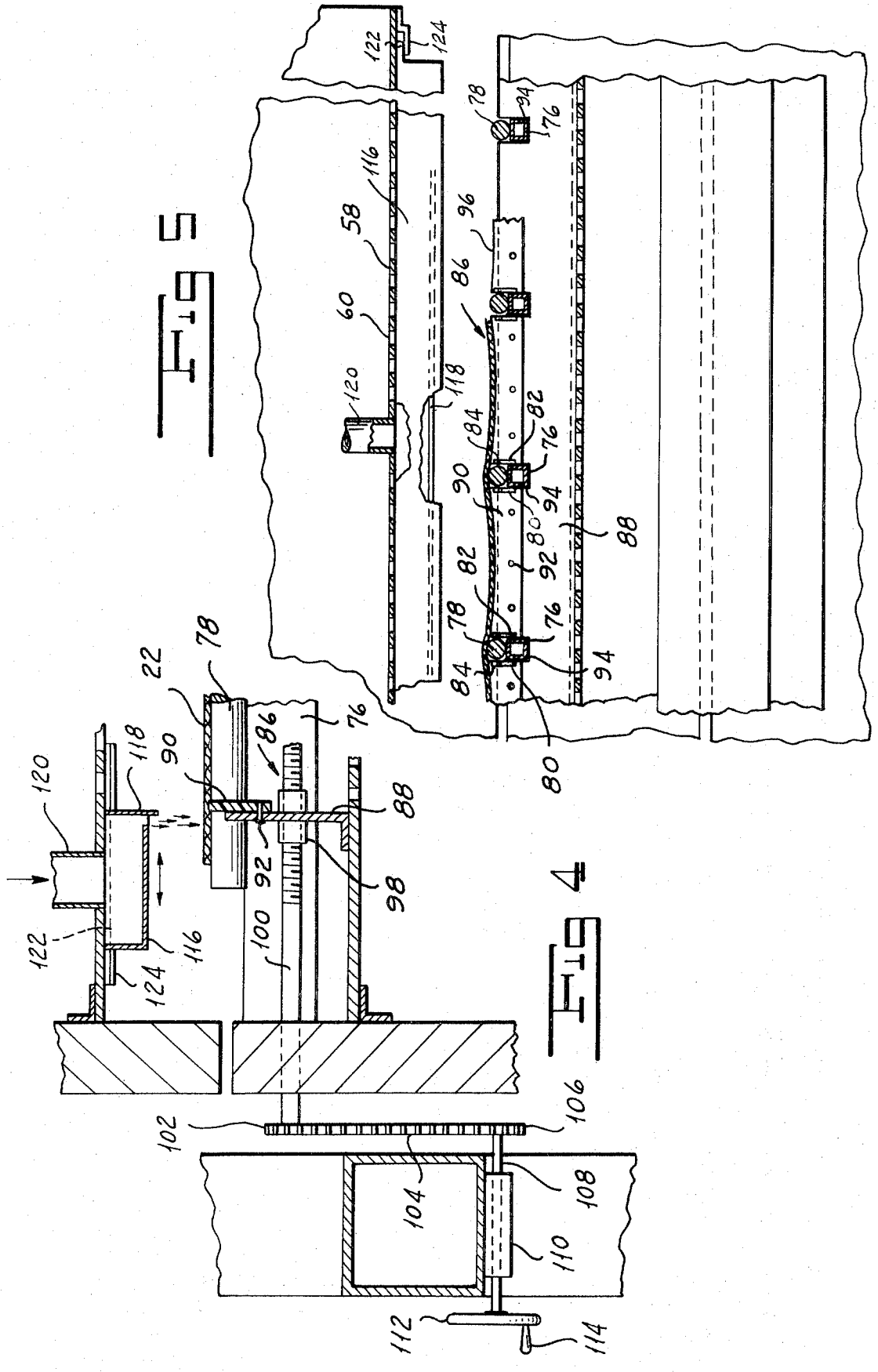
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FIG. 5

FIG. 4

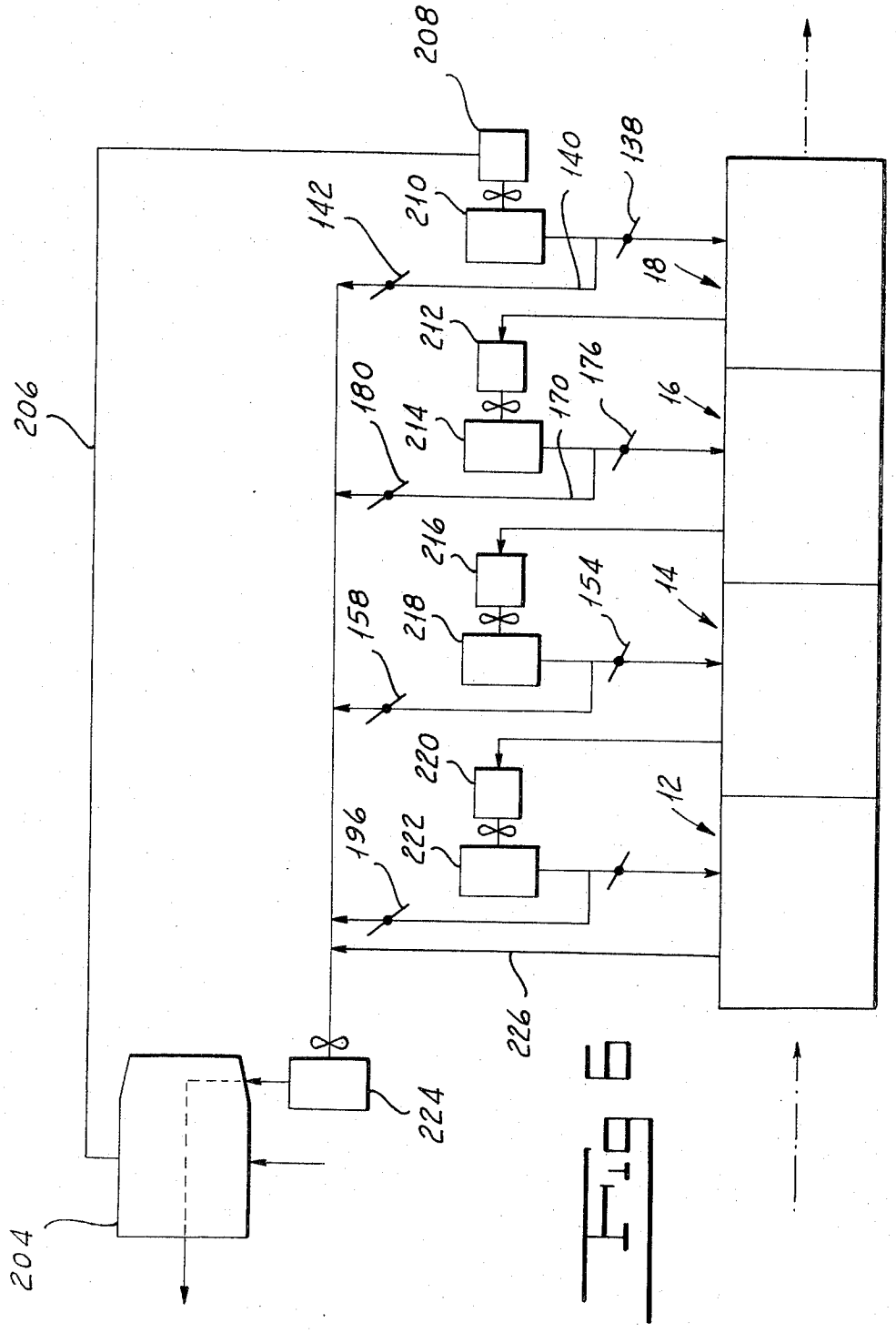
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FIG 6

HORIZONTAL FLAT BED THROUGH DRYING SYSTEM

BACKGROUND OF THE INVENTION

There are known in the prior art various means for removing water or moisture from webs of fibrous material such, for example, as webs of paper. A certain amount of moisture may be removed by mechanical means as by squeezing. Most of the drier systems of paper making apparatus of the prior art use boiler-generated steam as the source of heat and scavenging air to carry away the resultant vapor. More particularly, the web is caused to pass over steam heated drying cylinders which drive the moisture out of the web. Scavenging air is employed to carry away the vapor which is driven out of the paper. Not only are these drying systems of the prior art relatively inefficient but also they are expensive in that they require the auxiliary boiler systems necessary to generate the steam fed to the drier rolls. The speed of operation of the systems of the prior art is limited.

I have invented a horizontal flat bed through drier system which is more efficient than are drying systems known to the art. My system is less expensive than are drying systems known to the prior art. My system eliminates the necessity for auxiliary equipment such as boilers and the like. My system is adapted to produce lighter grades of paper at extremely high speed.

SUMMARY OF THE INVENTION

One object of my invention is to provide a horizontal bed through drying system which is especially adapted for drying relatively thin webs such as tissue paper and the like.

Another object of my invention is to provide a horizontal flat bed through drier system which is more efficient than are drying systems of the prior art.

A further object of my invention is to provide a horizontal flat bed through drier system which is less expensive than are drying installations of the prior art.

Another object of my invention is to provide a horizontal flat bed through drier system provided with safety features for protecting the apparatus against harm.

Still another object of my invention is to provide a horizontal flat bed through drier capable of operating at a high rate of speed.

Other and further objects of my invention will appear from the following description.

In general my invention contemplates the provision of a horizontal flat bed through drier system in which air heated directly by burners in the supply ducts is fed to the upper sections of a series of drier units. Suction means connected to the lower sections of the units draws the heated air through the web and through an air pervious supporting fabric which advances the web successively through the units. Air removed from the lower section of at least one unit adjacent to the dry end of the system is fed to the upper section of a unit relatively adjacent to the wet end of the unit as supply air. Air being exhausted from certain units of the system is passed in indirect heat exchange relationship with fresh air being fed to certain of the units. I provide my system with means for shutting down the operation in the event the fabric temperature exceeds a predetermined temperature. I provide each of the units with adjustable edge deckle means adapted to form a seal with the underside of the fabric adjacent the edges thereof and with adjustable means forming cooling air curtains at the edges of the fabric. At least the unit at the dry end of the system is provided with suction air moisture profile control means. My system incorporates means for supporting the fabric for movement through the units at a relatively high rate of speed.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings which form part of the instant specification and which are to be read in conjunction therewith and in which like reference numerals are used to indicate like parts in the various views:

FIG. **1** is a partially schematic top plan view of a preferred form of my horizontal flat bed through drier system.

FIG. **2** is a side elevation of my horizontal flat bed through drier system.

FIG. **3** is a sectional view of one unit of my horizontal flat bed through drier system.

FIG. **4** is a fragmentary sectional view of a unit of my horizontal flat bed through drier system illustrating certain details of construction thereof.

FIG. **5** is a fragmentary sectional view of a unit of my horizontal flat bed through drier system illustrating other details of construction thereof.

FIG. **6** is a schematic view of an alternate form of my horizontal flat bed through drier system.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, the preferred form of my system, indicated generally by the reference character **10,** includes a series of four drier units, indicated generally, respectively, by the reference characters **12, 14, 16** and **18,** supported by a machine frame indicated generally by the reference character **20.** The system includes an air previous web-supporting fabric **22** extending from an inlet roll **24** through the units of the system to an outlet roll **26** and over a plurality of guide rolls **28, 30, 32, 34** and **36** back to the inlet roll **24.** The inlet and outlet rolls **24** and **26** may be driven in any suitable manner known to the art to cause the fabric **22** to advance a web through the drier units. The fabric **22** may be woven or otherwise formed of any suitable material. It may, for example, be formed of a relatively high temperature resistance synthetic resin or from metal. The fabric **22** advances the web from left to right through the units as viewed in FIG. **1** so that the left end of the system is the "wet" end while the right hand end of the system is the " dry" end.

In the particular embodiment of my invention which I have illustrated in the drawings, I have shown a system in which there are four units **12, 14, 16** and **18,** all of which are of the same length. It will readily be appreciated that a system may include more or less than four units and that the units of a system may differ in length. It will further be appreciated that with zones of varying length, following the cascading arrangement of my invention, to be described in detail hereinbelow, the longer of two zones which are linked by cascading will have a lower air density per square foot of drying area. Since the details of construction of the various units are the same, whether the units are of the same or of different lengths, I will describe only one of the units in detail.

Referring now to FIGS. 3 to 5, the unit 18, for example, includes an upper section 38 and a lower section 40. A subframe 42 on the upper section 38 is connected to a frame member 52 by a pair of screw jacks indicated generally by the reference characters 44 and 46. Each jack 44 and 46 is adapted to be operated by a common shaft 48 to move the upper section 38 upwardly on hanger rods 50 to permit access to the interior of the unit. Any suitable means known to the art can be employed to drive shaft 48 to lift the upper section of a unit.

Upper section 38 includes an inlet 54 adapted to be supplied with heated air in a manner to be described hereinbelow by means of a supply duct 56 adapted to register with the inlet 54 in the lowered position of the upper section 38 illustrated in full lines in FIG. 3. I provide each of the drier units with an air distributing plate 58 extending across the lower end of the upper section 38 of the unit. The plate 58 includes a plurality of perforations 60 which make up about one half of the active area of the plate.

Each of the lower sections 40 of the drier units includes an air removal duct 62 connected to an outlet opening 64 in the lower section 40. The overall configuration of my system necessitates removal of the air from the back of the machine which is the same side as that to which the supply air is to be fed. This configuration tends to favor flow of the air toward the back of the machine. The result is a tendency to establish a "short circuit" at the rear of the machine. I have so arranged each of the units as to obviate this result. In addition to the supply air distributing plate 58, I mount a suction air distributing plate 66 across the upper end of the lower section 40 and provide this plate with perforation 68 which, as in the case of plate 58, occupy about one half of the active area of the plate. Thus, the two plates 58 and 66 cooperate to prevent any "short circuiting" of air fed to the machine. That is, they ensure an even distribution of air flow through the web being supported on the fabric 22. It will readily be appreciated that, as an alternative to the perforated distributing plates, I might employ some other means, such as adjustable plates at the rear of the machine to inhibit the short circuiting effect.

I provide at least the unit 18 at the dry end of my system with moisture profile control means on the suction side of the unit. A plurality of partitions 70 secured to the underside of the plate 66 at spaced locations along the width thereof, divide the suction chamber into a plurality of sections. I mount a damper 72 carried by a shaft 74 in the space between each pair of adjacent partitions 70. Any suitable means known to the art may be employed to drive shafts 74 so as to position the respective dampers 72 to achieve the desired moisture profile control. For example, the dampers may be pneumatically operated from a central control station. It will readily be appreciated that in other systems embodying my invention moisture profile control may be provided for additional units as required.

My apparatus is especially adapted for use in paper making apparatus which operates at extremely high rates of speed. For example, present day apparatus for making sanitary paper grades operates at web speeds of from 3000 to 4000 feet per minute. With my apparatus I anticipate that webs of this type can be handled at speeds of up to 6000 feet per minute and higher. At such speeds, rotating members do not function as adequate supports. That is, as the web speed increases and the machines become wider, it is necessary to increase the diameter of the supporting rolls to maintain reasonable rpm's and reasonable roll deflections. Moreover, as the roll diameter increases, the free space between roll to roll becomes critical and obstructs the passage of air thus defeating the efficiency of the through drier system which requires large volumes of air per unit area of wet layer. Not only are rotating supporting assemblies impractical for the purposes described above, but also the large diameter rolls corresponding bearings and the required maintenance make the assembly prohibitively expensive.

I have developed a fabric supporting structure which permits very close center to center support while at the same time providing the necessary free passage for the movement of large volumes of air through the web and the supporting fabric 22. Referring now to FIGS. 4 and 5, I mount a plurality of relatively narrow members 76 having sufficient depth to provide the required stiffness between the sides of the lower section 40 adjacent the top thereof. A plurality of respective rods 78 received on the upper surfaces of the members 76 are held in position thereon by any suitable means such, for example, as set screws 84 extending through pairs of fingers 80 and 82 carried by the members 76. It will readily be appreciated that as many pairs of fingers 80 and 82 spaced along the lengths of the members 76 are provided as required to hold the rod 78 in fixed position. With this arrangement, the web 22 makes substantially line contact with the surface of the rod 78 and is effectively supported for movement throughout the system at relatively high speeds. This arrangement, moreover, permits of adjustment of the rods 78 when wear along the line of contact becomes excessive. It is necessary only to release the clamping means such, for example, as set screws 84 and to rotate the rod to provide a new line of contact between the rod and the web. While I have shown one specific type of adjustable clamping means for the rod 78, it will readily be appreciated that any other suitable clamping means can be employed. The rods 78 may be coated with a low friction material such as a fluorocarbon copolymer or the rods may be made from a more exotic material such as a suitable ceramic.

I provide respective edge deckle arrangements indicated generally by the reference character 86 at each side of each of the units of the system. Each deckle system 86 includes a vertical plate 88 supported on the plate 66 for sliding movement inwardly and outwardly of the centerline of the system. The plate 88 may be formed of any suitable material such, for example, as metal or the like. I mount a strip or strips of relatively softer material 90 such as a suitable synthetic resin at the upper edge of the plate 88 by rivets 92 or the like. Recesses 94 in the upper edge of plate 88 accommodate the members 76 and the rods 78. Preferably, the upper edges 96 of strips 90 are curved to conform to the catenary of the fabric 22 between adjacent supporting bars 78 so as to form a highly effective seal therewith.

I provide the system with the means for adjusting the edge deckles 86 inwardly or outwardly of the unit for different widths of webs being formed on the fabric 22. A common shaft 100 extending across the unit has respective left hand and right hand threaded portions received in collars 98 carried by the plates 88 of the units

86 at the two sides of the unit. Shaft 100 carries a sprocket wheel 102 receiving a pitch chain 104 which extends around a sprocket wheel 106 carried by a shaft 108 rotatably supported in a bearing element 110 carried by the machine frame. I mount a hand wheel 112 provided with a crank 114 on the end of shaft 108 outside the unit. The deckles 86 can be adjusted inwardly and outwardly of the machine by rotating the wheel 112. By dividing the deckle system into a number of assemblies along the length of the system, I accommodate for shrinkage of the web as it dries in the course of its passage through the system. It will readily be apeciated that as it passes through the system, the fabric 22 is protected over the area of the web by the moisture in the web itself. Owing to the fact that the web is not as wide as is the fabric, the edges of the fabric are exposed to the heated air being fed to the units. I provide my system with means for protecting the edges of the fabric from excessive heat from the air supplied to the unit. I adjustably mount a respective manifold 116 at each side of the unit so as to extend along the edge of the fabric 22. Each manifold has an outlet slit 118 positioned at the edge of the web and adapted to direct a curtain of air downwardly toward the fabric. I form the ends of each manifold 116 with flanges 122 slidably received in brackets 124 on the underside of the plate 58 so as to permit adjustment of the manifold inwardly and outwardly of the unit. A supply duct 120 extending through the plate 58 leads into the open upper end of the manifold. A fan 126 is adapted to be driven to supply fresh cool air to the duct 120.

Referring again to FIG. 1, I have shown the preferred form of the air distribution arrangement of my horizontal flat bed through drier system. A first air-to-air heat exchanger 128 is adapted to supply preheated fresh air to a duct 130. The heat exchanger 128 may be of any suitable type known to the art. Preferably I employ a heat exchanger of the type shown and described in U.S. Pat. No. 3,627,040. Duct 130 supplies fresh air to a fan 132 driven by a motor 134. Fan 132 delivers the air to an inlet duct associated with unit 18. A burner or burners 136 in the inlet line directly heats the air being supplied by the fan 132. A damper 138 located in the inlet line of unit 18 may be actuated to regulate the amount of air supplied to the unit or to cut off the supply air in a manner to be described. A branch duct 140 leading to the exhaust is normally closed by a damper 142. Damper 142 may be opened to bypass the supply air in the event the fabric temperature exceeds a predetermined temperature in a manner to be described.

The arrangement illustrated in FIG. 1 is a "half cascade" system. The outlet duct 144 from the unit 18 leads to a fan 146 driven by a motor 148. Fan 146 delivers the suction air from unit 18 to a duct 152 leading to the inlet of unit 14. A damper 154 in line 152 is adapted to be operated to control the supply of air to the unit 14. A burner 150 in duct 152 reheats the air being removed from the unit 18. A branch duct 156 normally closed by a damper 158 leads to the exhaust of the system.

Suction fan 160 connected to the lower section of unit 14 is driven by a motor 162 to carry air from the unit to an exhaust duct 164 leading to the heat exchanger 128 which brings this exhaust air into heat exchange relationship with fresh air being fed to the duct 130. A second heat exchanger 166 similar to heat exchanger 128 is adapted to supply fresh preheated air to a duct 168. A fan 170 driven by a motor 172 feeds air from duct 168 to the inlet of unit 16. A damper 176 in the inlet duct to unit 16 is adapted to be operated to control the supply of air to the unit. A branch duct 178 leading to the exhaust is normally closed by damper 180.

A fan 184 carries air from the outlet duct of unit 16 to an inlet duct 190 of the unit 12. Fan 184 is driven by a motor 186. A burner or burners 188 in the duct 190 heat the air passing through the duct. A damper 192 in duct 190 controls the supply of air to the unit 12. An exhaust branch duct 194 normally is closed by a damper 196. An exhaust fan 198 driven by a motor 200 removes air from the lower section of unit 12 and feeds it to an exhaust duct 202 which directs the air to heat exchanger 166 which brings this air into heat exchange relationship with fresh air being supplied to the duct 168. In the half cascade system illustrated in FIG. 1, the highest moisture level reached will be approximately one half the absolute value of that which would be reached if the air were conveyed in series all the way from the dry end to the web end of the process.

Referring now to FIG. 6, I have shown another form of air circulating system which can be used in my horizontal flat bed through drier system. In the arrangement illustrated in FIG. 6, which may be termed "full cascade" system, fresh air passes through a heat exchanger 204 similar to the heat exchangers 128 and 166 to a fresh air line 206. A blower 210 draws air from line 206 to a burner 208 and feeds it to the upper section of unit 18 past the damper 138. As in the form of my system illustrated in FIG. 1, a bypass duct 140 is adapted to conduct supply air to an exhaust line when damper 142 is open.

In the system illustrated in FIG. 6, air being removed from the unit 18 adjacent to the dry end of the machine is drawn through burners 212 by a fan 214 which feeds the air to the next unit 16 toward the wet end of the machine. Air being removed from the unit 16 is drawn by a fan 218 through burners 216 and is fed to the unit 14 as supply air. Finally, air being removed from the unit 14 is fed to the unit 12 as supply air by means of a fan 222 which causes the air to pass by burners 220 which reheat the air. Exhaust air from the unit 12 is drawn by a fan 224 from an outlet duct 226. Fan 224 directs this final exhaust air through the heat exchanger 204 in indirect heat exchange relationship with fresh air entering the system.

Further, in the form of my system illustrated in FIG. 6, bypass dampers 180, 158 and 196 associated with the units 16, 14 and 12, may be operated to return supply air directly to the exhaust line in the event the fabric temperature reaches a predetermined high value.

As has been pointed out hereinabove, I provide my system with means for preventing damage to the fabric 22 from an excess of heat. In order to achieve this result, I position a plurality of temperature sensing devices such as thermocouples or the like 228 across the unit 12 at the wet end of the machine. The thermocouples 228 may be disposed immediately below the fabric. When the temperature sensed by the thermocouples is above a predetermined degree, the thermocouples operate switch means (not shown) which, in any manner known to the art, opens all of the dampers 142, 180, 158 and 196 and closes all of the dampers 138, 176, 154 and 192. In this manner, hot air being supplied to the various units is prevented from entering the

units and the bypass ducts conduct this air to the exhaust of the system. Thus the source of heat is immediately removed. At the same time, any appropriate means (not shown) may be employed to turn the various burners of the system to low.

In the half cascade system of FIG. 1 air supplied to unit **18** is at a temperature of about 600°F and air is removed therefrom at a temperature of about 350°F. This air is reheated to about 600°F and fed to unit **14** from which it emerges at about 175°F. Fresh air at about 600°F supplied to unit **16** emerges at about **225**°F, is reheated to about 600°F and is fed to unit **12** from which it is removed at about 200°F. Fresh air entering the heat exchangers is preheated to about 120°F. The temperatures in unit **12** are about 200°F and provide ample margin to activate the fabric protection system up to the tolerance temperature of the conveying fabric **22** which is between about 450°F and 500°F. Thermocouples **228** may for example operate the safety system at a temperature approximately half way between the normal operating temperature of unit **12** and the tolerance temperature of fabric **22.**

In a practical embodiment of the preferred form of my system illustrated in FIG. **1,** the supply fan **184** for zone **12** at the wet end of the system which is the exhaust fan for zone **16** may, for example, be a 134,000 cubic feet per minute at 15 inch static pressure fan. It runs at 1185 rpm, 465 bhp at 70°F. The exhaust fan **198** for zone **12** may be a 100,000 cfm at 20 inch s.p. 1175 rpm, 296 bhp at 70°F. The supply fan **146** for zone **14,** which fan is also the exhaust fan for zone **18,** may be a fan identical to the supply fan **184** for zone **12.** As the exhaust fan **160** for zone **14,** I may employ a 105,000 cfm at 15 inch s.p., 1175 rpm, 359 bhp at 70°F fan. The supply fan **170** for unit **16** may be 87,500 cfm at 3 ½ inch s.p., 612 rpm, 78.9 bhp at 70°F fan. The supply fan **132** for unit **18** may be the same type fan as is used for the unit **16.** The burner **188** for zone **12** should have a capacity of about 38,000,000 btu's per hour and is supplied complete with a 50 h.p. combustion air blower. The burner **150** for unit **14** should have a capacity of 32,000,000 btu's per hour and is complete with a 30 h.p. combustion air blower. The burners **174** and **136** for units **16** and **18** each have a capacity of about 50,000,000 btu's per hour and have a 60 h.p. combustion air blower.

In use of my horizontal flat bed through drier system, I first set up the various edge deckles **86** along the length of the system for the width of the web being produced along the system. As has been pointed out hereinabove, these adjustments may be made taking into account expected shrinkage of the web as it is dried in the course of its movement through the system. It will readily be appreciated that the adjustments can be changed in the course of operation of the system. At the same time the various manifolds **116** of the units are so arranged as to direct the cooling curtains of air at the edges of the fabric just beyond the edges of the web. When that has been done the various burners and blowers of the system are set into operation. In the event that the temperature of the fabric exceeds a predetermined temperature, all of the diverting dampers are moved to positions at which supply air is directed to the exhaust and the various dampers in the supply lines are moved to positions at which they inhibit entry of supply air into the various units. As the system operates and in response to suitable sensing devices (not shown) the suction dampers **72** in the unit **18** at the dry end of the machine will be so set as to provide the desired moisture profile across the machine. Should it become necessary, the upper section of any of the units can be raised by operating the screw jacks **44** and **46** in the manner described hereinabove.

In a particular installation, my system accepts a web which enters the wet end **23**% dry and which leaves the dry end **95**% dry. A fabric speed of **4100** feet per minute was used. After a period of time in use of the machine, if the fabric supporting bar **78** develops wear along the line of contact with the fabric the machine can be shut down and the bars rotated to new positions.

As has been pointed out hereinabove the system illustrated, including four units of equal length is by way of example. A system incorporating the cascading principle of my invention may include as few as two units and as many units as is economically feasible. Moreover, moisture profile control may be provided in only one unit or in more than one unit as is found necessary.

It will be seen that I have accomplished the objects of my invention. I have provided a horizontal flat bed through drier system which is especially adapted for use in high speed production of relatively light grades of paper. My system is more efficient than are systems known to the prior art. My system does not require boilers to supply a heating system. My system permits of very high rates of production. It is less expensive in installation and in operation than are systems of the prior art.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of my claims. It is further obvious that various changes may be made in details within the scope of my claims without departing from the spirot of my invention. It is, therefore, to be understood that my invention is not to be limited to the specific details shown and described.

Having thus described my invention, what I claim is:

1. A system for drying a wet web of fibrous material including in combination, a plurality of drier units each including an air input section and an air outlet section, means mounting said units in series between a wet web end of said system and a dry web end thereof, a support of air pervious material for carrying said web through said units between said sections in a direction from said wet end to said dry end, means for supplying heated fresh air to the input section of one of said units relatively adjacent to said dry end of said system, means independent of said fresh air supplying means for recycling air from the outlet section of said one unit directly to the input section of another unit relatively adjacent to said wet end of said system, and means for removing air from the outlet section of said other unit.

2. A system as in claim **1** in which said plurality of units comprises four units mounted in sequence between said wet end and said dry end and in which said one unit is the fourth unit and said other unit is the second unit, said system including means for supplying heated fresh air to the third unit, means independent of said fresh air supplying means for recycling air from the outlet section of said third unit directly to the input sec-

tion of said first unit, and means for removing air from the outlet section of the first unit.

3. A system as in claim **2** in which said means for supplying heated fresh air to said fourth unit comprises means for passing fresh air into indirect heat exchange relationship with air removed from said second unit and which said means for supplying heated fresh air to said third unit comprises means for passing fresh air into indirect heat exchange relationship with air being removed from said first unit.

4. A system as in claim **1** in which said one unit and said other unit are immediately adjacent to each other, said system including means for passing air removed from the unit at said wet end into indirect heat exchange relationship with air being supplied to the unit at said dry end.

5. A system as in claim **1** in said supplying and removal means comprise means for passing air removed from one of said units in heat exchange relationship with fresh air being fed to another unit.

6. A system as in claim **1** including means responsive to the temperature adjacent to said support for exhausting air supplied to said units.

7. A system as in claim **1** including moisture profile control means associated with one of said units.

8. A system as in claim **1** including moisture profile control means associated with one of said units, said moisture profile control means comprising means for dividing the outlet section of said one unit into a plurality of subsections across the width of said support and a plurality of adjustable dampers associated with said subsections.

9. A system as in claim **1** in which the edges of said support extend beyond the edges of said web, said system including means for cooling the edges of said support.

10. A system as in claim **1** in which the edges of said support extend beyond the edges of said web, said system including means for cooling the edges of said support, said cooling means comprising means forming curtains of air directed onto the edges of said support.

11. A system as in claim **1** in which the edges of said support extend beyond the edges of said web, said system including means for cooling the edges of said support, said cooling means comprising means forming curtains of air directed onto the edges of said support, and means for adjusting the position of said curtains with reference to the centerline of said support.

12. A system as in claim **1** in which each of said units includes air distributing means located in the outlet section thereof.

13. A system as in claim **1** including a respective perforated air distributing plate in the outlet section of each of said units.

14. A system as in claim **1** including a respective perforated air distributing plate in the outlet section of each of said units and a respective second air distributing perforated plate in the inlet section of each unit.

15. A system as in claim **1** in which each of said units comprises respective edge deckles forming seals with the edges of said supports.

16. A system as in claim **1** in which each of said units comprises respective edge deckles forming seals with the edges of said supports and means for adjusting the positions of said edge deckles with respect to the centerline of said support.

17. A system as in claim **1** in which each of said units comprises a plurality of spaced elongated stationary rods extending across said unit for carrying said support in the course of its passage through said unit.

18. A system as in claim **1** in which each of said units comprises a plurality of spaced elongated stationary rods extending across said unit for carrying said support in the course of its passage through said unit and means for rotatably adjusting said rods.

19. A system as in claim **1** in which said supplying means comprises ducts connected to said inlet sections and heaters located in said ducts.

20. A drier unit for use in a system for drying a wet web of fibrous material including in combination an upper section, a lower section, a flexible air pervious fabric for carrying said web through said unit between said sections, a plurality of elongated stationary elements extending across said lower section and in spaced relationship therealong for supporting said fabric in the course of its movement through the unit, means for supplying heated air to the upper section, and means for removing air from the lower section to cause air supplied to the upper section to pass through said web and said fabric to dry said web.

21. A drier unit as in claim **20** in which said elements are generally cylindrical rods and means for rotatably adjusting the position of said rods.

22. A drier unit as in claim **20** including respective air distribution plates extending across said upper and lower sections.

23. A drier unit as in claim **20** in which said fabric extends beyond the edges of said web and respective means for cooling the edges of said fabric beyond the web edges.

24. A drier unit as in claim **20** in which said fabric extends beyond the edges of said web and respective means for cooling the edges of said fabric beyond the web edges, said cooling means comprising means for directing respective curtains of cooling air onto said fabric edges.

25. A drier unit as in claim **20** in which said fabric extends beyond the edges of said web and respective means for cooling the edges of said fabric beyond the web edges, said cooling means comprising means for directing respective curtains of cooling air onto said fabric edges, and means for adjusting the positions of said curtains with respect to the centerline of said fabric.

26. A drier unit as in claim **20** including edge deckles carried by said lower section adapted to form a seal with the underside of said fabric adjacent to the edges of said web.

27. A drier unit as in claim **20** including edge deckles carried by said lower section adapted to form a seal with the underside of said fabric adjacent to the edges of said web and means for adjusting the positions of said edge deckles with respect to the centerline of said fabric.

28. A drier unit as in claim **20** in which said fabric extends beyond the edges of said web, said unit including means carried by said upper section for directing cooling air curtains onto the upper surface of said fabric adjacent to the edges of said web and respective edge deckles carried by the lower section adapted to form seals with the underside of said fabric adjacent to the web edges.

29. A drier unit as in claim **20** in which said fabric extends beyond the edges of said web, said unit including means carried by said upper section for directing cooling air curtains onto the upper surface of said fabric adjacent to the edges of said web and respective edge deckles carried by the lower section adapted to form seals with the underside of said fabric adjacent to the web edges, and means for adjusting the position of said curtains with respect to the centerline of said fabric and means for adjusting the positions of said deckles with respect to the centerline of said fabric.

30. A drier unit as in claim **20** including a plurality of partitions spaced across said lower section for dividing said section into a plurality of subsections, respective dampers associated with said section and means for adjusting said dampers to achieve a desired moisture profile control across the width of said web.

31. A drier unit for use in a system for drying a wet web of fibrous material including in combination, an upper section, a lower section, a flexible air pervious fabric for carrying said web through said unit between said sections, said fabric extending beyond the edges of said web, means for supplying heated air to said upper section, means for removing air from said lower section to cause air supplied to said upper section to pass through said web and said fabric to dry said web, means carried by said upper section for directing curtains of cooling fluid onto the upper surface of said fabric adjacent to the web edges, and respective edge deckles forming seals with the underside of said fabric adjacent the web edges.

32. A drier unit as in claim **21** including an air distributing plate extending across said lower section.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,849,904 Dated November 26, 1974

Inventor(s) Joseph A. Villalobos

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 12, line 15, "21" should be -- 31 --.

Signed and sealed this 21st day of January 1975.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

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