Nov. 22, 1966 R. G. COULSON 3,286,288

LEATHER MULLING APPARATUS

Filed Aug. 8, 1963 4 Sheets-Sheet 1

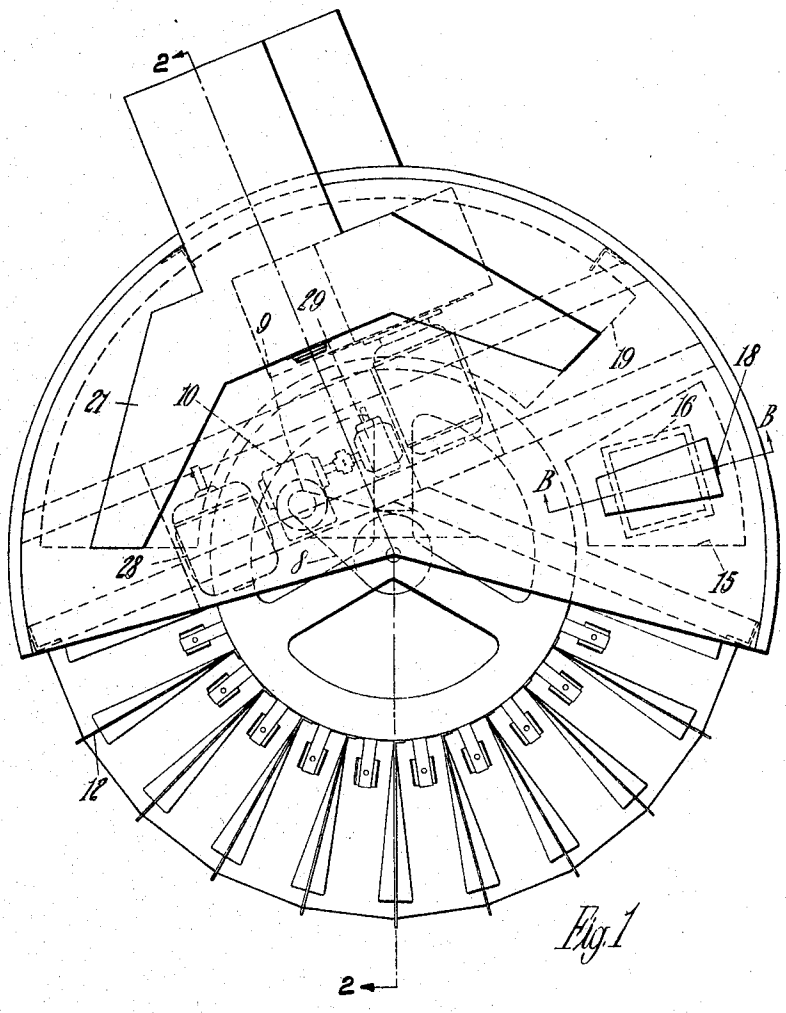

Fig. 1

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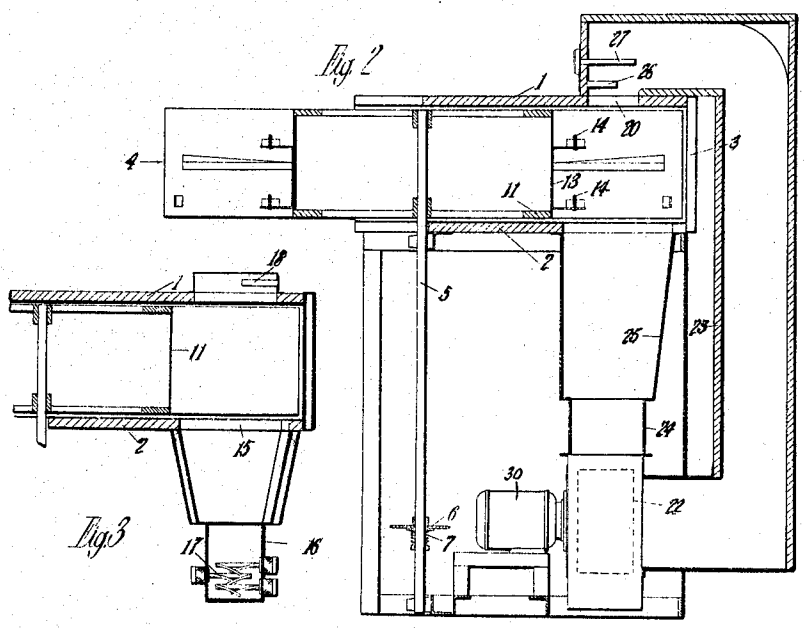
LEATHER MULLING APPARATUS

Filed Aug. 8, 1963 4 Sheets-Sheet 2



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LEATHER MULLING APPARATUS

Filed Aug. 8, 1963 4 Sheets-Sheet 3

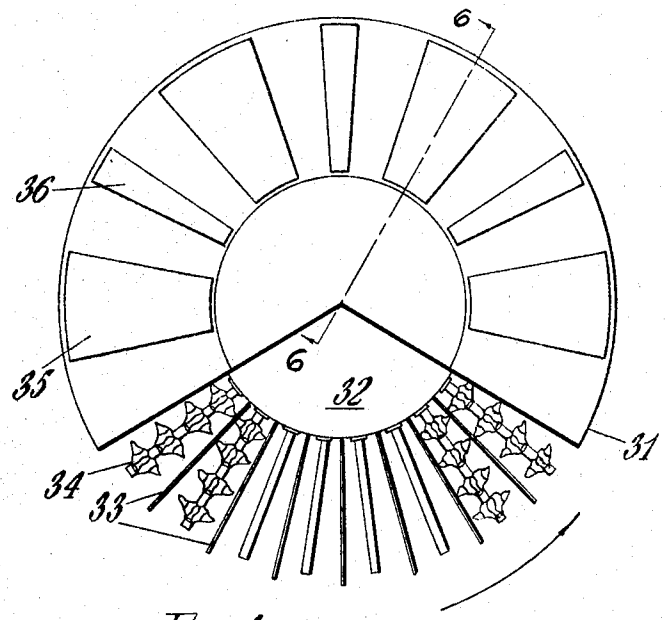

Fig. 4

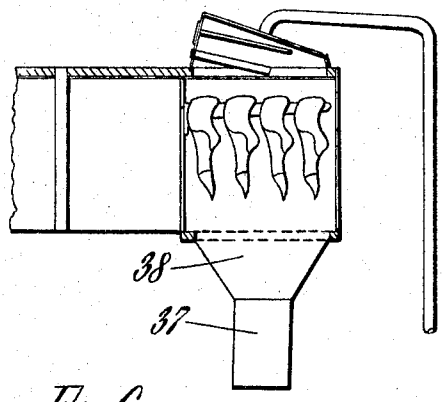

Fig. 6

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LEATHER MULLING APPARATUS

Filed Aug. 6, 1963 4 Sheets-Sheet 4

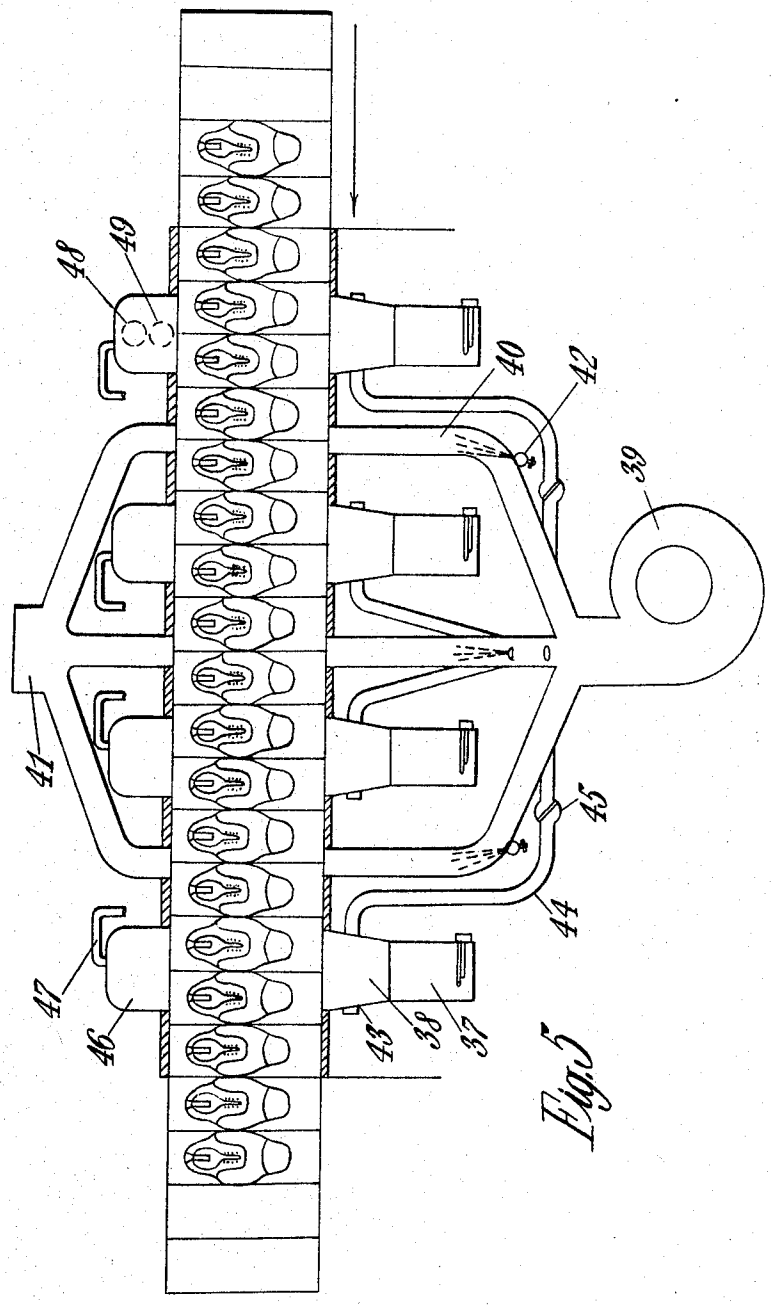

Fig. 5

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LEATHER MULLING APPARATUS

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12 Claims. (Cl. 12—1)

This invention relates broadly to the treatment of leather and other materials, especially parts involved in the assembly of footwear, with moisture and/or air under appropriate conditions to cause desired changes in their state and properties. Such treatments may, for example, include the following singly or in combination: air at ambient temperature, heated air, or cooled air, in each case with or without added moisture in the form of condensed steam, fine droplets (e.g. from a spray), or water vapour. The moisture and/or air may be required to pass over the parts at different velocities appropriate to the particular treatment. In particular, the invention relates to apparatus for accomplishing such treatments

The operation of placing shoe uppers in a warm steamy atmosphere in order to condition the leather, this operation being known as mulling, is well established and there are many designs of cabinet available for this purpose. In some cases, the articles to be mulled are simply hung in what is in fact a steam chest and subsequently taken out; in other cases, the chamber houses a rotary system of upright vanes which subdivide the cabinet into sectors each sector, between adjacent vanes, incorporating means such as hooks or a pillar for carrying the articles to be mulled. Heat setting processes are another example of treatments to which this invention could relate, and which are at present often performed by passing lasted uppers through or round heated tunnels or chambers with one or more openings for loading and unloading.

The present invention consists in apparatus for the treatment of leather or other materials, comprising a cabinet housing an assembly of vanes dividing the cabinet into sectors, the cabinet incorporating an opening defining a loading station, the cabinet further being furnished with means for admitting a desired atmosphere selectively to parts of the cabinet to be traversed by the sectors so that such atmosphere is not supplied to any substantial extent to the loading station. In order to avoid or lessen the escape of said desired atmosphere out of the apparatus by way of said opening, said parts of the cabinet to which the desired atmosphere can be admitted are preferably spaced from said opening by a distance of at least that corresponding to one of said sectors, to provide a sealing zone, though if the speed of the rotor and the desired atmospheres are such that losses will not be excessive, the distance between openings can be reduced; the edge portions of said vanes can be arranged to make a sliding seal with the interior of the cabinet wall. Said opening will normally act as an unloading station as well as a loading station. The opening which defines the loading station will normally afford access for loading in a radial direction, and will generally have a width at least equal to that of the opening between successive vanes.

In one arrangement, a single desired atmosphere is

supplied to the cabinet from a floor, wall or roof portion around a major sector so that articles loaded between a given pair of vanes at the loading station will by continued rotation of the vanes traverse first a sealing zone as defined above, then the desired atmosphere and then a further sealing zone before reaching the loading station again, at which time they may be unloaded and replaced by a fresh charge. In another arrangement, an atmosphere can be applied as aforesaid, but to a lesser sector of the cabinet whilst a second desired atmosphere can be supplied to a succeeding sector of the cabinet, considered in the direction of vane rotation, with a sealing zone preferably separating these two sectors. In this way, articles loaded into the cabinet at the loading station can be swept through two or more successive, different atmospheres for example through hot moist steam and through hot dry air.

The supply of predetermined atmospheres is conveniently effected by a conduit supplying the same to a perforated base, wall or roof portion of the cabinet. By suitably dividing the base, wall or roof portion, and/or by providing the perforation only on selected portions of the base, wall and/or roof portion, the desired distribution of the steam, hot air or other atmosphere can be achieved. It will be understood that the expression "perforated" may signify a single large or small opening as well as a plurality of small openings.

It is a particular advantage of the apparatus in accordance with the invention, that clouds of steam or large quantities of hot air are not lost at the points of entry and exit of the work into and from the cabinet. It is a further advantage that, if desired, the loading station may be left permanently open and may indeed be free of any door or other closing device.

The rotation of the vanes may be effected continuously. Alternatively, it may be stepwise, the vanes being symmetrically distributed and advanced through an angle corresponding to the angle contained between successive vanes. For a given total time of rotation, stepwise movement is more rapid and reduces losses in the event of successive openings being separated by less than the distance between successive vanes. Stepwise movement may also be more convenient for loading and unloading.

Means may be provided, for example, resilient strips along the edges of the vanes, for confining the predetermined atmosphere to the region between the vanes.

The cabinet is preferably cylindrical in form with its axis vertical, the vanes being carried by a coaxial shaft.

In one convenient arrangement, provision is made for the admission of steam between adjacent sectors after they leave the loading station, and for the admission of hot air between the same sectors during the further course of their travel, whilst at an intermediate position the space between these sectors is isolated from the supply both of steam and of hot air to provide a sealing zone. In this way, cross circulation is avoided.

Generally, the cylindrical cabinet will have a base and a ceiling or roof portion one or more of which is perforated over a selected area or areas, each such area being associated with means for circulating a predetermined atmosphere through a respective sector of the cabinet.

The apparatus lends itself to various operations such as the mulling of leather, or heat setting, or the drying of

shoes or of components for shoes, adhesives and the like.

The invention will be described further with reference to the accompanying drawings, of which:

FIGURE 1 is a plan view of an apparatus for treating lasted uppers;

FIGURE 2 is a sectional view on the line 2—2 of FIGURE 1;

FIGURE 3 is a sectional view on the line B—B of FIGURE 1;

FIGURE 4 is a plan view of a second form of apparatus for treating uppers;

FIGURE 5 is a developed section of the path of the uppers through the apparatus of FIGURE 4; and

FIGURE 6 is a sectional view on the line 6—6 of FIGURE 4.

The apparatus of FIGURES 1 to 3 comprises a shallow cylindrical cabinet having spaced parallel planar walls defining a roof portion **1**, and a base portion **2**, and a peripheral or side wall portion **3**, extending about a major sector to leave a front sector shaped opening generally indicated by the numeral **4**. A drive spindle **5** extends through an opening in the base **2**, and carries a sprocket wheel **6** mounted on a slipping clutch arrangement **7** for the transmission of rotary drive by way of a chain **8** extending from a sprocket **9** driven in turn by a gear box **10**. Within the cabinet the spindle **5** supports a carrier having a central support or hub **11** and circumferentially spaced, radially extending vanes **12**, each adjacent pair of vanes forming an article treating chamber. Mounted on the hub **11**, and between each pair of adjacent vanes **12**, is a bracket **13** carrying an upper and a lower peg **14** adapted to support a last. The vanes **12** are of such a size that their margins sweep close to the respective walls of the cabinet, and to improve the seal thereagainst, these margins may be fitted with rubber or other resilient material blades which effect a sliding seal with the cabinet walls to atmospherically isolate the chambers.

The base **2** of the cabinet is formed with two circumferentially spaced openings below the region to be swept by the vanes **12**. Considered in the direction of travel of these vanes, the first opening or perforation **15** communicates directly with any suitable steam generating means such as a water kettle **16** in which are mounted electrical heating elements **17** and which is also associated with a constant level water feed device (not shown). This arrangement is best seen in FIGURE 3. A thermostat element **18** is mounted in a recess in the top **1** of the cabinet, the thermostat element and the electrical elements for the kettle **16** being associated with suitable circuitry so that a hot moist atmosphere is generated between the vanes **12** above the perforation **15**.

The opening **15** is spaced inwardly from the front opening **4** by a circumferential extent at least equal to the distance between successive vanes **12** (the vanes being equally spaced) to prevent loss of steam. The second opening, **19**, in the base **2** of the cabinet, which is considerably greater in circumferential extent than is the first opening **15**, is spaced from the last-mentioned opening in the direction of rotation of the vanes **12**, also by a distance at least equal to the distance between these vanes, so that these two openings are always sealed from one another by at least one vane. As can be seen from FIGURES 1 and 2, provision is made for circulating hot air between the vanes **12** whilst they are located above the opening **19** in the course of traversing the cabinet **1, 2, 3**. Opposite the opening **19**, an opening **20** is provided in the roof **1** of the cabinet, and a hood **21** mounted over this opening collects air which has been forced upwardly by a blower **22**, and returns it by way of a duct **23** to the blower **22**. An electrical heater **24** is mounted directly over the blower **22**, for the purpose of heating the expelled air, and a short fan-shaped duct **25** conveys the air from the heater **24** to the opening **19**. In the hood **21** is mounted a second thermostat element **26** as well as a thermometer **27**. The heater elements of the heater **24** and the thermostat element **26** are connected by suitable circuitry for maintaining the desired temperature of air between the respective vanes **12**. Again, the perforation or opening **19** stops short of the adjacent opening **4** by a distance at least equal to the distance between the successive vanes **12** to prevent loss of hot air.

To drive the apparatus, a suitable electric motor **28** is provided, connected to a gear box **29** by a belt drive (not shown) and thence to the gear box **10**. The blower **22** is driven directly by an electric motor **30**.

One very convenient feature of the apparatus shown in FIGURES 1 to 3 is that the accommodation between the vanes passing through the front opening **4** provides for a substantial article loading and unloading station. The hub **11** may describe a complete revolution in for example about 10 minutes so that a lasted upper may be over the boiler **16** for say about a minute and may be subjected to the circulated hot but comparatively dry air over the opening **19** for about 3 or 4 minutes.

The various surfaces of the cabinet, that is to say the roof or top, the part cylindrical side wall and the base or floor, may be provided with thermal insulation and may be lined internally with metal, preferably stainless steel. The seals along the edges of the radial vanes should be of a heat resistant rubber such as neoprene.

If desired, provision may be made for blowing a separate stream of air through the "blanking" section of the cabinet located between apertures **15** and **19**, for the purpose of removing steam-laden air. In this way the drying action of the hot air circulated through the succeeding section of the cabinet may be enhanced. In this case the circumferential length of the blanking section referred to may be increased, so that the separate air stream therethrough remains substantially sealed from the preceding steaming section of the cabinet.

The apparatus of FIGURES 4 to 6 comprises a shallow cylinder **31** with a flat top and bottom and, in the embodiment shown, having a sector cut away corresponding to about one third of the circumference of the complete circle. A radial hub **32** is mounted in the cylinder, supporting vanes **33** to form, with the hub **32**, a sort of paddle wheel. Shoe upper or like components **34** are supported on rods attached to the hub **32**. In the embodiment shown there are **24** vanes and each sector defined between the adjacent vanes accommodates 4 shoe uppers. The cut-away part of the cylinder represents a loading and unloading station and the number of rods which are not carrying uppers will therefore vary during the operation of the apparatus.

Ports **35** are formed in the top and bottom of the cylinder through which warm wet air can flow into or out of those sectors between the vanes **33**, that are in connection with the ports **35**. Similarly, ports **36** are formed in the top and bottom of the cylinder **31** through which cold wet air can flow into and out of those sectors that are in communication with these ports. In the embodiment shown, there are 4 sets of ports for warm wet air and 3 sets of ports for cold wet air. Kettles **37** supplied with water from a suitable constant level tank (not shown) are fitted with immersion heaters and are connected to the ports **35** in the bottom of the cylinder **31** by means of ducts **38**. For the ports **36**, an air blower **39** is connected by ducting **40**, and corresponding exhaust ducting **41** runs from the corresponding ports **36** in the top of the cylinder and connects to an exhaust pipe which can, if desired, discharge outside the building which accommodates the apparatus. Spray guns **42** inject a cold water mist into the ducting **40**.

In operation the rotor **32, 33** revolves at a suitable speed, say 1 rev. per 12 mins., and shoe uppers loaded onto the rods are thus carried round the cylinder and receive alternate treatments by warm wet air and cold wet

air. Between successive treatments the uppers pass through sealing sections so that there is no interconnection between the two atmospheres. The machine provides for 3½ cycles; the fourth cycle need not in practice be completed by a further cold treatment because the uppers will quickly cool and any moisture on the surface will quickly dry off as the uppers emerge from the cylinder and are unloaded.

With ports of the relative sizes shown in the drawings and a time of rotation of 12 mins., each sector is in connection with each warm port for approximately 49 secs. and is in connection with each cold port for approximately 31 secs. These times have been found to give very satisfactory results but are not necessarily the optimum and considerable variation is permissible. Likewise the number of cycles can be varied.

It is important that the temperature of the warm wet treatments should not exceed about 65° C. if the shoe uppers incorporate vegetable tanned leather components (e.g. quarter linings) and it is also important, if the moisture uptake is to be sufficient for effective mulling, that the atmosphere should be fully saturated with moisture and should contain a mist of condensed steam. In order to meet these humidity requirements without exceeding the permissible temperature it may be advantageous to introduce cold air or in some other convenient way increase the natural heat losses in the warm wet zones. The holes **43** in the steam ducts **38** are provided for this purpose; they are connected by annular manifolds and small diameter pipes **44** to the cold air blower, and manually operated control valves **45** are provided in order to allow adjustment of the cold air flow from the blower into the steam ducts. The corresponding ports in the top of the cylinder are fitted with domes **46** and these are connected by pipes **47** which discharge into a header tank supplying the constant level tank or into any convenient drain. Temperature indicators and thermostats controlling the immersion heaters are provided in the domes **46**. It will be understood that the flow of cold air to the holes **43** is very small compared with the high velocity flow of air required through the cold wet zones, where a rapid flow is necessary to cool the uppers quickly.

A temperature of 65° C. has been referred to, but lower or higher temperatures can be used according to the materials from which the shoes are made. Thus, for example, uppers made wholly from chrome tanned leathers could be treated at a considerably higher temperature, if desired.

It is to be understood that the embodiments of this invention described and illustrated are merely illustrative of the principles of the invention hereinabove discussed and that the invention is not to be limited to these embodiments, but rather is intended to all such modifications thereto and equivalents thereof as shall be deemed to be within the scope of the appended claims.

I claim:

1. Apparatus for the treatment of articles of leather or like materials comprising a substantially cylindrical cabinet having spaced parallel planar walls and a peripheral wall, said cabinet having a first opening formed therein for receiving articles therethrough and at least one additional opening spaced from said first opening for admitting a processing atmosphere to the interior of said cabinet, an article carrier rotatably mounted in said cabinet, said carrier comprising a rotatable central support and a plurality of radially extending, circumferentially spaced vanes mounted in fixed position on said support, said vanes being of a size sufficient to lie closely adjacent both said planar walls and said peripheral walls to define between said walls and each adjacent pair of vanes, a substantially atmospherically isolated article receiving and treating chamber, means for rotating said carrier to move each of said treating chambers successively into register with said first and additional openings, and means communicating with said additional opening for injecting a processing atmosphere through said additional opening and into said cabinet and a treating chamber registered therewith, said spacing between said first and additional openings being a distance not less than to the spacing between a pair of adjacent vanes thereby substantially preventing the escape of the processing atmosphere entering through said additional opening out through said first opening to the atmosphere.

2. Apparatus as set forth in claim **1** wherein said vanes are provided with marginal resilient sealing means disposed in sliding sealing contact with said planar and peripheral cabinet walls to further increase the atmospheric isolation of said chambers and prevent escape of the processing atmosphere through said first opening.

3. Apparatus as set forth in claim **1** wherein said first opening is defined by a minor sector of said planar and peripheral cabinet walls being omitted whereby said first opening is permanently open and constitutes a loading and unloading station for articles to be treated and which have been treated respectively.

4. Apparatus as set forth in claim **1** wherein said additional opening has a circumferential extent considerably in excess of the circumferential extent of each of said treating chambers whereby each of said treating chambers is exposed to said processing atmosphere for a prolonged period of time.

5. Apparatus as set forth in claim **1** wherein there are a plurality of said additional openings in said cabinet for admitting different processing atmospheres to the interior thereof, each of said additional openings being spaced from each other and from said first opening a distance at least equal to the spacing between a pair of adjacent vanes thereby substantially preventing the intermingling of the several atmospheres and the escape of any of them from said first opening.

6. Apparatus as set forth in claim **5** wherein said additional openings have different circumferential extents whereby each of said treating chambers is registered with said additional openings for varying periods of time to vary the time of article treatment in the several processing atmospheres.

7. Apparatus as set forth in claim **5** further including separate atmosphere generating means communicating with at least one of selected ones of each of said additional openings for injecting a different processing atmosphere into different portions of said cabinet and into the treating chambers registered with said selected additional openings.

8. Apparatus as set forth in claim **7** wherein one of said atmosphere generating means comprises steam generating means communicating with a first of said additional openings in the direction of rotation of said carrier for subjecting articles carried thereon to a warm moist atmosphere and another of said means comprises hot air generating means communicating with a second of said additional openings in the direction of rotation of said carrier for subjecting articles thereon to a warm dry atmosphere.

9. Apparatus as set forth in claim **8** wherein the second of said additional openings has a circumferential extent considerably in excess of that of said first additional opening whereby articles carried by said carrier are exposed to said warm dry atmosphere for a period of time longer than that during which they are exposed to said warm wet atmosphere.

10. Apparatus as set forth in claim **7** wherein one of said means comprises steam generating means communicating with alternate ones of said additional openings for subjecting articles on said carrier to a warm moist atmosphere and another of said means comprises means for generating cold moist air communicating with adjacent alternate ones of said additional openings for subjecting articles on said carrier to a cold moist atmosphere, the articles being thereby subjected to said warm and cold moist atmospheres alternately.

11. Apparatus as set forth in claim 10 in which said means for generating cold moist air comprises an air blower connected by first conduits to said adjacent alternate ones of said additional openings, and water spray means interposed in said first conduit means.

12. Apparatus as set forth in claim 11 further including means for controlling the temperature and moisture content of said warm moist atmosphere comprising second conduit means connecting said air blower with said alternate ones of said additional openings for admitting warm moist air, and control means in said second conduit means for controlling the amount of cold air admitted to said warm moist air admitting openings.

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