Feb. 12, 1957 F. W. SANBORN ET AL 2,780,878

WEB TREATING APPARATUS

Filed Oct. 3, 1955 3 Sheets-Sheet 1

FIG. 1

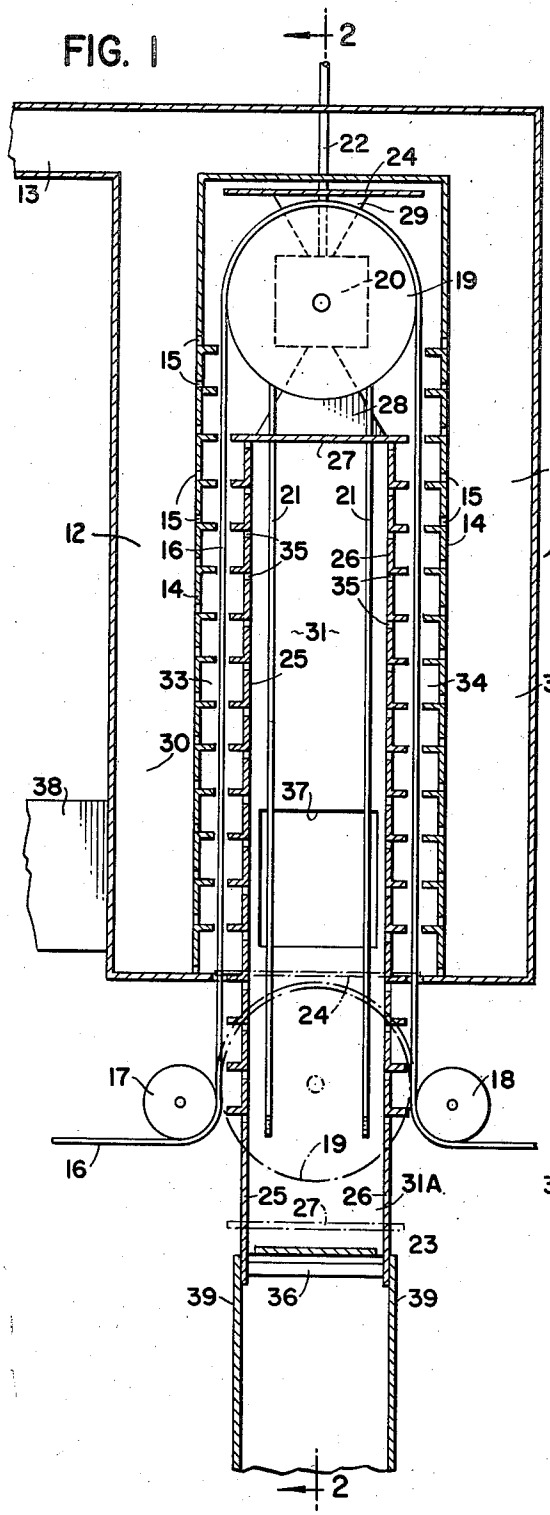
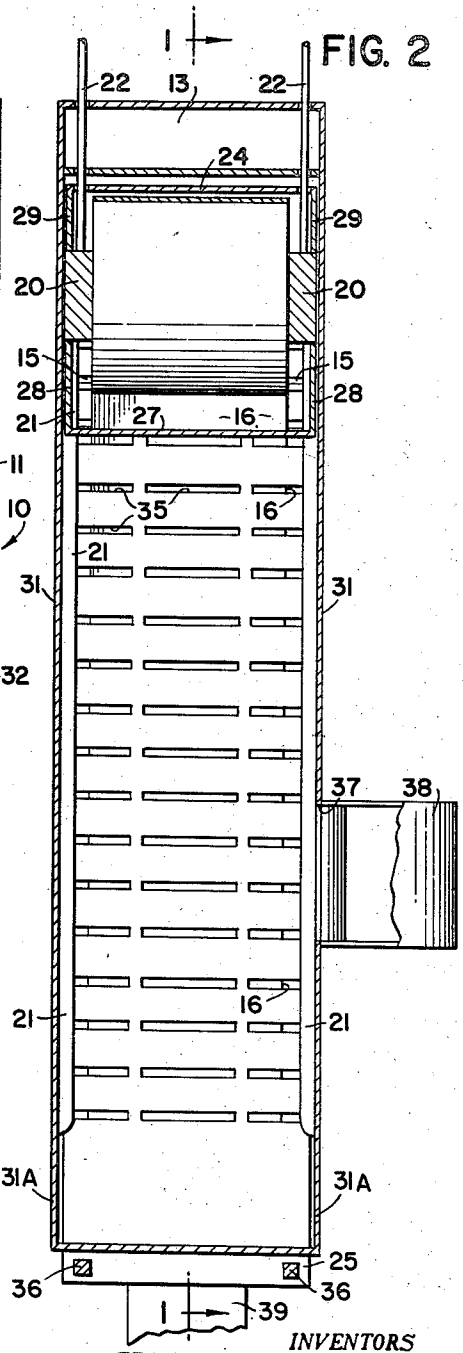


FIG. 2



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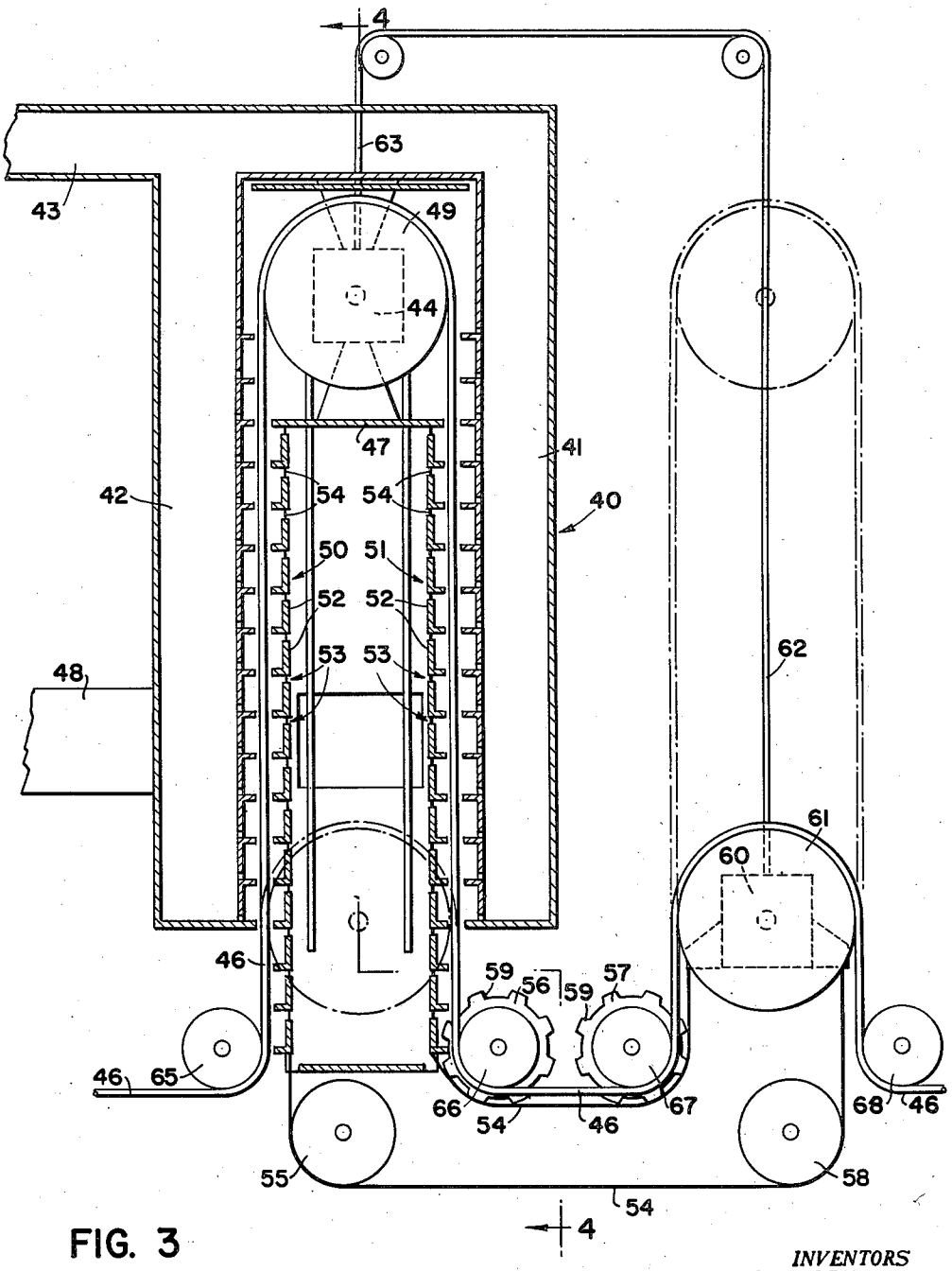


FIG. 3

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WEB TREATING APPARATUS

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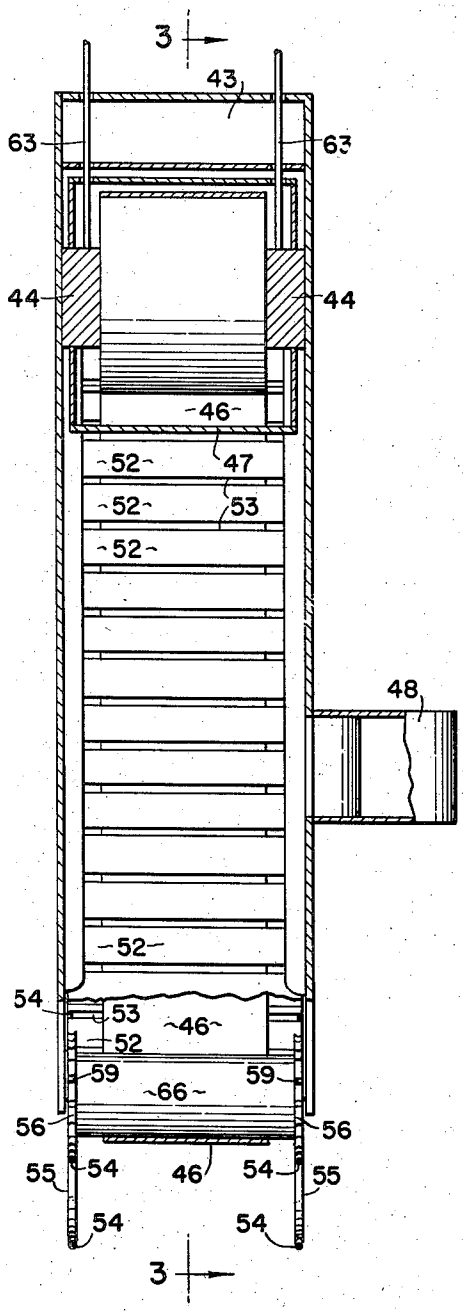


FIG. 4

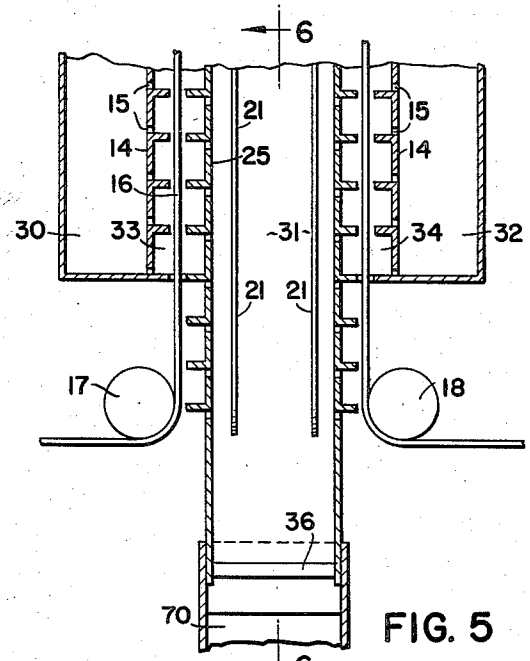


FIG. 5

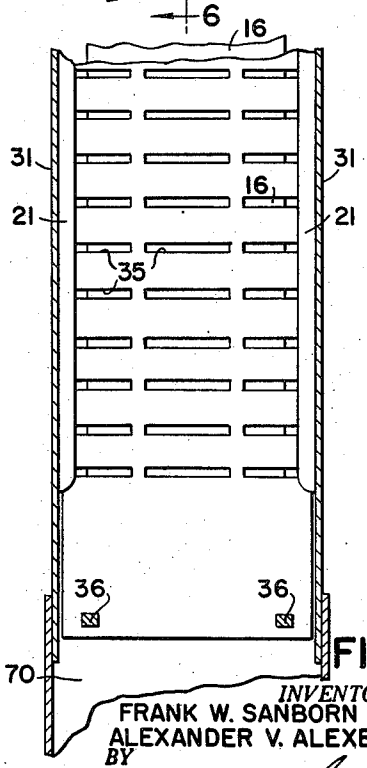


FIG. 6

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WEB TREATING APPARATUS

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Application October 3, 1955, Serial No. 538,072

12 Claims. (Cl. 34—159)

The present invention relates to apparatus for heat treatment of webs of fabric or sheet material wherein the web is subjected to heated air or other fluid for drying, "hot-stretching," baking or other treatment involving the application of heat.

We have provided apparatus for heat treatment of web material wherein the length of web subjected to heat treatment may be varied throughout a considerable range, which may start at zero if desired, while at the same time both sides of the web may be subjected to treatment under similar conditions even where such treatment involves application of heat to the web in confronting relation (such as, for example, by circulation of heating fluids within or through the heating station) rather than depending merely on the maintenance of static heated conditions within an oven.

Apparatus which provides for variation of the length of web material subject to heat treatment is advantageous in that sensitive and highly responsive temperature control is possible. It also lends itself to the provision of drop-out means whereby upon overheating or other emergency conditions all web material can be quickly removed from heated zones, automatically if desired. The present invention exploits such advantages even where heating treatment involves use of heating means which supplies heat to the web in a confronting relation so that the facing side of the web and the reverse side of the web receive diverse treatment. Heating means such as arrays of baking lamps, heating coils, flames or hot-fluid-circulating heating chambers all involve the conditions where one side of the web is favored unless the heating means is duplicated on each side of the web. The general object of the invention is to provide such duplication in a way to make it feasible to correspondingly and simultaneously vary the length of web material subjected to heat treatment on each side of a given web.

We attain this general object of the invention by providing a roll or equivalent web guide means which may be translated laterally any desired distance into a treating zone in which the outer side of a web carried by such roll is exposed to treatment, the roll having entrained therewith an inner flow defining means which itself moves to change effective length as the roll is translated within the treating zone, so that the inner side of the web is also exposed to the desired treatment.

The general object of the invention and the means by which this object is achieved will be more readily understood from the following description of embodiments of the invention, which embodiments are set forth by way of example. The embodiments which are specifically described generally relate to applications in which circulating fluid such as air is employed as a heating medium, but it will become clear that in broader aspects the invention is applicable to applications using other methods of applying heat, such as heating lamps and hot coils or flames.

In the drawings:

Figure 1 is an elevational sectional view taken on line 1—1 in Figure 2 and illustrating an embodiment of the invention.

Figure 2 is a view taken on line 2—2 in Figure 1.

Figure 3 is an elevational sectional view taken on line 3—3 in Figure 4 and illustrating another embodiment of the invention.

Figure 4 is a view taken on line 4—4 in Figure 3.

Figure 5 is a fragmentary sectional view of still another embodiment of the invention.

Figure 6 is a view taken on line 6—6 in Figure 5.

Shown in Figure 1 is a heating chamber generally indicated at 10 which comprises a pair of ducts 11 and 12 leading from a common input duct 13. The inner walls 14 of the ducts 11 and 12 are slotted as at 15 along their lengths, and through these slots heated air is ejected toward the surface of a web 16 which is to receive heat treatment. The web 16 passes over an input guide roll 17 and an outgoing guide roll 18; between these guide rolls it is carried by a dancer roll 19. The dancer roll 19 is thus at the apex of a single festoon of the web. The dancer roll is carried on pillow blocks 20 which are reciprocable along guideways 21 so that the dancer roll 19 may be adjustably positioned either in the solid line position shown in Figure 1 or in the phantom position shown in Figure 1 or at any position therebetween. The pillow blocks 20 are supported and adjusted in position through the agency of a cable 22 which leads to a powered winch or other take-up control means (not shown).

A central chute defined by the slotted walls 25 and 26 is supported at its upper closed end 27 from the pillow blocks 20 by suitable members such as the straps 23. The side walls of the heating chamber 10 include wall portions 30, 31 and 32. Between the wall portions 30 and 31 is a gap 33; between the wall portions 31 and 32 is a gap 34.

The side walls 25 and 26 of the central chute are provided with slots 35, equivalent to the slots 15, in a manner which will be apparent in the drawing. Provided in one side wall portion 31 is a port 37 which communicates with an air input duct 38.

As the dancer roll 19 is shifted upwardly between the ducts 11 and 12 of the heating chamber 10, it carries with it in entrained relationship the central duct. As more and more of the outer web surface is operatively confronted by the heat applying means, including the ducts 11 and 12 and the slots 15, the inner web surface is simultaneously operatively confronted by more and more of the inner heating means comprising the central duct and the slots 35. The air which is applied to the inner and outer surfaces of the web escapes through the openings or gaps 33 or 34 and may be recaptured for recirculation by additional laterally located ducting (not shown).

The lower end of the central duct may be guided by suitable guide straps 39, and the lower ends of the walls 25 and 26 of the central chute may be supported in properly spaced relation by cross members 36.

The side wall portions 31 extend below the side wall portions 30 and 32, as at 31A. Extending transversely through the central chute and between the side wall portions 31A is a fixed closure wall 23. Accordingly, in any position of the central chute, substantially all air introduced thereinto through the duct 38 is forced to exhaust through the slots 35. An additional transverse wall 24 may be provided which is carried on the pillow blocks 20 by members 29 and is therefore mounted for movement with the dancer roll 19. Thus, at the lowermost position of the dancer roll, illustrated in phantom view in Figure 1, the web 16 will be entirely isolated from incoming air admitted through the duct 38 in addi-

tion to being isolated, of course, from air admitted through the ducts **11** and **12**.

In the embodiment shown in Figures 3 and 4, a heating chamber **40** and ducts **41**, **42**, **43** and **48** are provided which are similar generally to the heating chamber **10** and ducts **11**, **12**, **13** and **18**. In this embodiment, however, the central duct comprises a pair of flexible walls **50** and **51**, each consisting of a plurality of transversely extending bars **52** spaced from each other by the slots **53** and entrained with each other and with the top end plate **47** of the central chute by cables **54**. The top end plate **47** of the chute is supported from the pillow blocks **44** for movement with the dancer roll **49** in a manner similar to that described in connection with the embodiment of Figures 1 and 2. The cables **54** pass around sheaves **55**, **56**, **57** and **58**, as do also the central chute elements **52**, when the dancer roll **49** is in restricted position. The sheaves **56** and **57** may be notched as shown at **59** in order to accommodate the ribs or flanges on the members **52**, in a manner which will be apparent from the drawings. The ends of the cables **54** opposite to the wall **47** are supported on pillow blocks **60** associated with a dancer roll **61**. The dancer roll **61** is mounted by suitable means for translation in a path outside the heating chamber **40** between the positions shown in solid line view and in phantom line view in Figure 3. The cables **62** supporting the dancer roll **61** may form common linkages with the cables **63** which support the dancer roll **49** so that these rolls counterbalance each other against web tension, and their translation may be achieved with little power applied, as by a winch (not shown), in any suitable place along the common cable lengths **62** and **63**. In this connection, of course, it is to be noted that the web **46** passes around the guide roll **65**, then around the dancer roll **49**, then around a guide roll **66** mounted between and coaxially with the sheaves **56**, then around a guide roll **67** mounted between and coaxially with the sheaves **57**, then around the dancer roll **61** and finally (so far as the particular illustration) around the guide roll **68**. It will thus be apparent that dancer rolls **49** and **61**, when they are simultaneously translated, move in opposite senses with respect to web accumulation.

The movement of heating air in the embodiment shown in Figures 3 and 4 is similar to that in the embodiment shown in Figures 1 and 2, and it is not believed necessary to repeat this description. However, it is to be observed that the provision of a flexible central chute affords the advantage of considerable space savings. This is the case whether the heating oven is horizontal, in which case a non-flexible chute occupies considerable floor space, or whether the heating chamber is vertical, in which case the central non-flexible chute necessitates either a deep pit or an extremely high oven structure.

The embodiment shown in Figures 5 and 6 is similar in all respects to that shown in Figures 1 and 2 with the exception that the chute **38** and port **37** of Figures 1 and 2 are eliminated and a lower guiding and input duct **70** is provided which replaces the duct **38** and also the guideways **39**. Also, of course, the lower closure wall **23** of Figure 1 is eliminated. It will be apparent that the duct **70** guides the central duct, and that incoming air is supplied through the duct **70** upwardly through the length of the central duct. This embodiment is somewhat unwieldy from the structural standpoint but will demonstrate that the teaching of the invention may be embodied in structure which varies widely in detail, even when the use of only one type of heating means is considered. As previously mentioned, the invention is equally applicable to heat treatment applications where the heating means consists of hot coils, flames or similar heat applicators other than the exemplified recirculating hot air system.

Accordingly, the invention is not to be restricted to details of the above described embodiments, which are given merely by way of illustration. The scope of the invention is to be defined by the following claims.

What is claimed is:

1. Heat treating apparatus comprising a dancer roll in supporting relationship with a web to be treated at the apex of a festoon of said web, means to translate said dancer roll laterally with regard to itself back and forth along a given path to correspondingly extend said festoon less or more forwardly along said given path, first heat applying means extending along said path in surrounding relationship therewith to operatively confront lesser or greater web lengths along the outer side of said festoon as said festoon extends less or more forwardly along said given path, second heat applying means extending within said festoon and in entrained relationship with said roll to be translated therewith along said path to operatively confront greater or lesser web lengths along the inner sides of said festoon as said festoon extends less or more forwardly along said given path.

2. Heat treating apparatus comprising a dancer roll in supporting relationship with a web to be treated at the apex of a festoon of said web, means to translate said dancer roll laterally with respect to itself along a given path to correspondingly extend said festoon less or more forwardly along said given path, first means extending along said path in surrounding relationship therewith and including first heat exhausting means operatively confronting lesser or greater web lengths along the outer sides of said festoon as said festoon extends less or more forwardly along said given path, second means extensibly extending within said festoon in entrained relationship with said dancer roll for extension therewith along said path, said second means having operative heat exhausting means over a portion of its length along said path from said dancer roll, which portion varies directly with the degree of extension of said second means.

3. Heat treating apparatus comprising a dancer roll in supporting relationship with a web to be treated at the apex of a festoon of said web, means to translate said dancer roll laterally with respect to itself along a given path to correspondingly extend said festoon less or more forwardly along said given path, first means extending along said path in surrounding relationship therewith and including first heat exhausting means operatively confronting lesser or greater web lengths along the outer sides of said festoon as said festoon extends less or more forwardly along said given path, second means extensibly extending within said festoon in entrained relationship with said dancer roll for extension therewith along said path, said second means having operative heat exhausting means over a portion of its length along said path from said dancer roll, which portion varies directly with the degree of confrontation between the outer sides of said festoon and said first heat exhausting means.

4. Heat treating apparatus comprising a dancer roll in supporting relationship with a web to be treated at the apex of a festoon of said web, means to translate said dancer roll laterally with respect to itself back and forth along a given path to correspondingly extend said festoon less or more forwardly along said given path, first heat applying duct means located alongside said path to operatively confront lesser or greater web lengths along the outer sides of said festoon as said festoon extends less or more forwardly along said given path, at least two second roll means defining the end of said festoon opposite said apex and guiding said web to and away from said festoon in paths divergent to the direction of said given path second inner heat applying duct means extending between said at least two second roll means and within said festoon and being in entrained relationship with said dancer roll to be translated therewith along said path and between said at least two second roll means to operatively confront greater or lesser web lengths along the inner sides of said festoon as said festoon extends more or less forwardly along said given path.

5. Heat treating apparatus comprising a dancer roll in supporting relationship with a web to be treated at the apex of a festoon of said web, means to translate said dancer roll laterally with respect to itself back and forth along a given path to correspondingly extend said festoon less or more forwardly along said given path, first heat applying duct means located alongside said path to operatively confront lesser or greater web lengths along the outer sides of said festoon as said festoon extends less or more forwardly along said given path, at least two second roll means defining the end of said festoon opposite said apex and guiding said web to and away said festoon in paths divergent to the direction of said given path, second inner heat applying duct means extending between said at least two second roll means and within said festoon and being in entrained relationship with said dancer roll to be translated therewith along said path and between said at least two second roll means to operatively confront greater or lesser web lengths along the inner sides of said festoon as the degree of confrontation between the outer sides of said festoon and said first heat applying duct means increases or diminishes.

6. Heat treating apparatus comprising a dancer roll in supporting relationship with a web to be treated at the apex of a festoon of said web, means to translate said dancer roll laterally with respect to itself back and forth along a given path toward and away from one end thereof to correspondingly extend said festoon less or more forwardly along said given path, first heat applying duct means located alongside said path to operatively confront lesser or greater web lengths along the outer sides of said festoon as said festoon extends less or more forwardly along said given path, second inner heat applying duct means extending within said festoon and being in entrained relationship with said dancer roll to be translated therewith along said path, relatively fixed closure wall means extending transversely across the interior of said inner heat applying duct means in the vicinity of said one end of said given path and a heat input port communicating with said inner heat applying duct means at a location between said closure wall means and the end of said given path opposite to said one end for causing said inner heat applying duct means to operatively confront greater or lesser web lengths along the inner sides of said festoon as said festoon extends more or less forwardly along said given path.

7. Heat treating apparatus comprising a dancer roll in supporting relationship with a web to be treated at the apex of a festoon of said web, means to translate said dancer roll laterally with respect to itself back and forth along a given path toward and away from one end thereof to correspondingly extend said festoon less or more forwardly along said given path, first heat applying duct means located alongside said path to operatively confront lesser or greater web lengths along the outer sides of said festoon as said festoon extends less or more forwardly along said given path, second inner heat applying duct means extending within said festoon and being in entrained relationship with said dancer roll to be translated therewith along said path, relatively fixed closure wall means extending transversely across the interior of said inner heat applying duct means in the vicinity of said one end of said given path and a heat input port communicating with said inner heat applying duct means at a location between said closure wall means and the end of said given path opposite to said one end for causing said inner heat applying duct means to operatively confront greater or lesser web lengths along the inner sides of said festoon as the degree of confrontation between the outer sides of said festoon and said first heat applying duct means increases or diminishes.

8. Heat treating apparatus comprising a dancer roll in supporting relationship with a web to be treated at the apex of a festoon of said web, means to translate said dancer roll laterally with respect to itself back and forth

along path toward and away from one end thereof to correspondingly extend said festoon less or more forwardly along said given path, first heat applying duct means located alongside said path to operatively confront lesser or greater web lengths along the outer sides of said festoon as said festoon extends less or more forwardly along said given path, at least two second roll means defining the end of said festoon opposite to said apex and guiding said web to and away from said festoon in paths divergent to the direction of said given path, second inner heat applying duct means extending between said at least two second roll means and within said festoon and being in entrained relationship with said dancer roll to be translated therewith along said path and between said at least two second roll means to operatively confront lesser or greater web lengths along the inner sides of said festoon as said festoon extends less or more forwardly along said given path, said inner heat applying duct means comprising opposed flexible walls, guide means adjacent said one end of said path to guide trailing portions of said flexible walls in paths divergent to the direction of said given path.

9. Heat treating apparatus comprising a dancer roll in supporting relationship with a web to be treated at the apex of a festoon of said web, means to translate said dancer roll laterally with respect to itself back and forth along a given path toward and away from one end thereof to correspondingly extend said festoon less or more forwardly along said given path, first heat applying duct means located alongside said path to operatively confront lesser or greater web lengths along the outer sides of said festoon as said festoon extends less or more forwardly along said given path second inner heat applying duct means extending within said festoon and being in entrained relationship with said dancer roll to be translated therewith along said path, relatively fixed closure wall means extending transversely across the interior of said inner heat applying duct means in the vicinity of said one end of said given path and a heat input port communicating with said inner heat applying duct means at a location between said closure wall means and the end of said given path opposite to said one end whereby said inner heat applying duct means operatively confronts lesser or greater web lengths along the inner sides of said festoon as said festoon extends less or more forwardly along said given path, said inner heat applying duct means comprising opposed flexible walls, guide means adjacent said one end of said path to guide trailing portions of said flexible walls in paths divergent to the direction of said given path.

10. In continuous and semi-continuous web treating apparatus, a heat treating station comprising a heating chamber having port means to receive and discharge web material to be treated first roll means including at least one roll mounted for translation with respect to itself within the chamber, roll means outside the chamber to guide web material into an incoming reach leading to said first roll means and away from an outgoing reach leading away from said first roll means, said at least one roll being translatable in a path to vary the length of web material within the heating chamber, and inner heating means entrained with said at least one roll for translation therewith, said inner heating means extending between said incoming and outgoing reaches and to and through said port means.

11. In continuous and semi-continuous web treating apparatus, a heat treating station comprising a heating chamber having port means to receive and discharge web material to be treated, first roll means including at least one roll mounted for translation with respect to itself within the chamber, roll means outside the chamber to guide web material into an incoming reach leading to said first roll means and away from an outgoing reach leading away from said first roll means, said at least one roll being translatable in a path to vary the length of

web material within the heating chamber, and inner heating means entrained with said at least one roll for translation therewith, said inner heating means extending between said incoming and outgoing reaches and to and through said port means and comprising a pair of opposed flexible walls mounted to be extendable at their trailing ends in directions other than the direction of translation of said at least one roll.

12. Web heat treating apparatus comprising a heating chamber having port means to receive and discharge web material to be treated first roll means including at least one roll mounted for translation with respect to itself within the chamber to vary the length of web material within the heating chamber, second roll means including at least one roll translatable with respect to itself without the heating chamber, means guiding said web material into said port means, over said first roll means, out of said port means and thence over said second roll means, control means to simultaneously translate said first and second roll means in opposite senses with respect to web accumulation, and inner heating means comprising flexible duct walls entrained with each of said first and second roll means and extending between the pairs of incoming and outgoing reaches of web material associated with each of said first and second roll means.

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