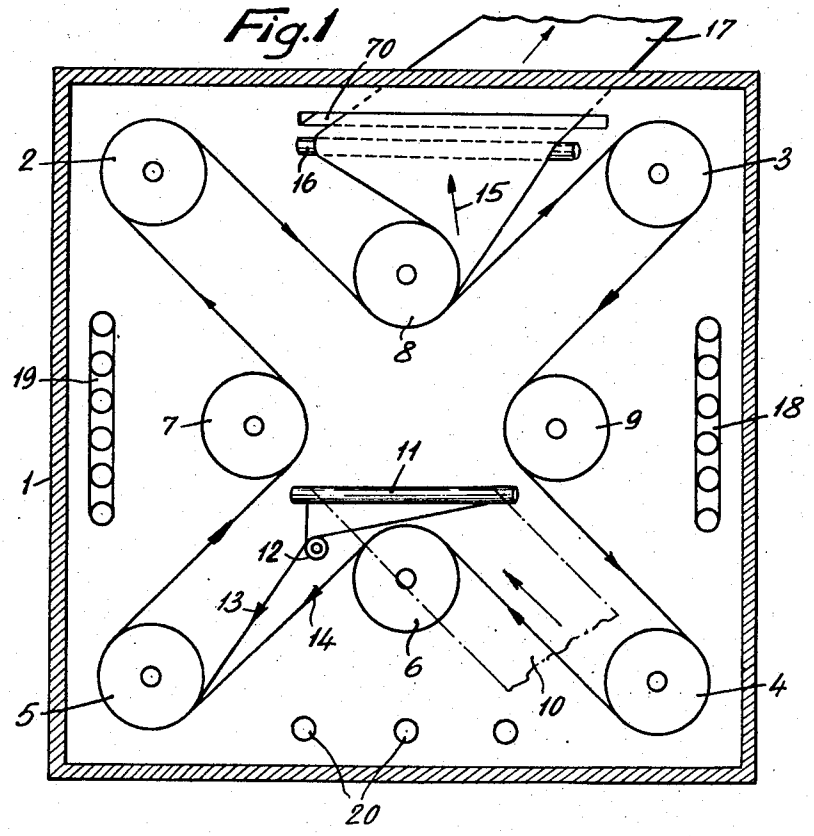
March 17, 1959 J. DUNGLER 2,877,636

ENCLOSURE FOR TREATING WEB MATERIAL

Filed March 30, 1955 4 Sheets-Sheet 1

Fig. 1



INVENTOR:
JULIEN DUNGLER
BY Leon M. Strauss
ATT.

March 17, 1959 J. DUNGLER 2,877,636

ENCLOSURE FOR TREATING WEB MATERIAL

Filed March 30, 1955 4 Sheets-Sheet 2

Fig. 3

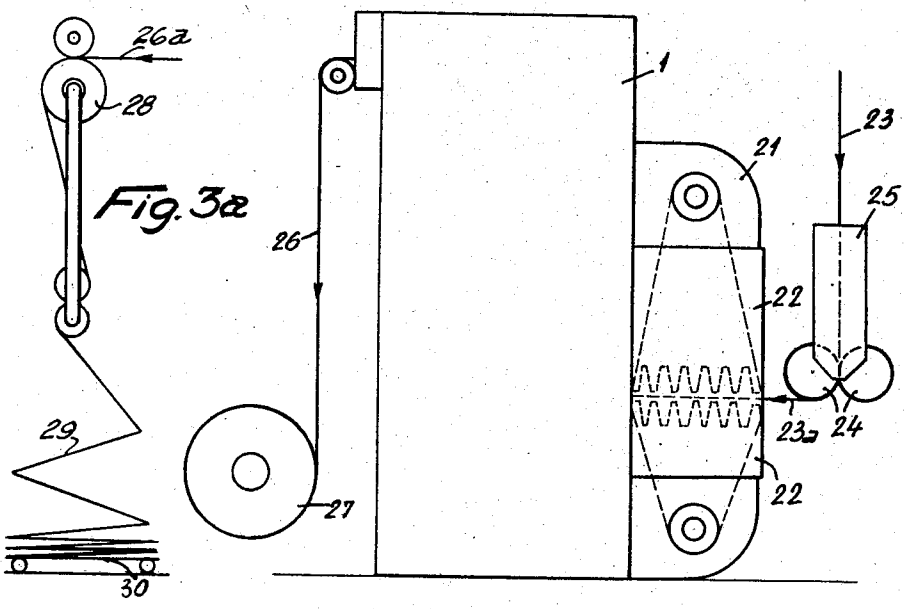
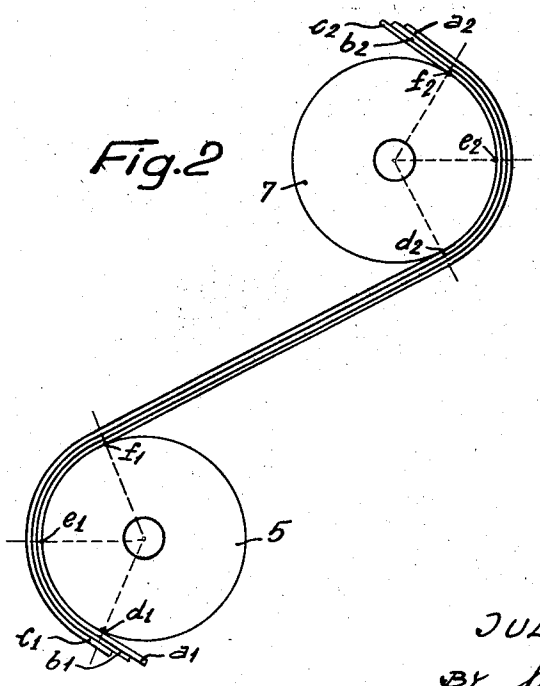


Fig. 3a

Fig. 2



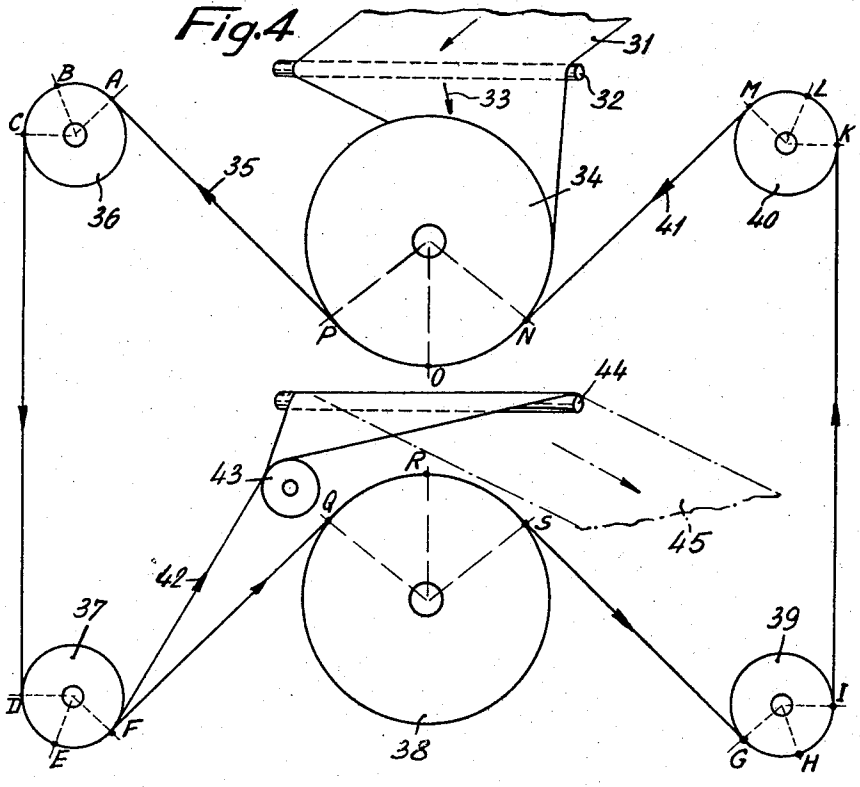
INVENTOR:
JULIEN DUNGLER
BY Leon M. Strauch
AGT.

March 17, 1959 J. DUNGLER 2,877,636

ENCLOSURE FOR TREATING WEB MATERIAL

Filed March 30, 1955 4 Sheets-Sheet 3

Fig. 4



INVENTOR:
JULIEN DUNGLER
BY Leon M. Strauss
AGT

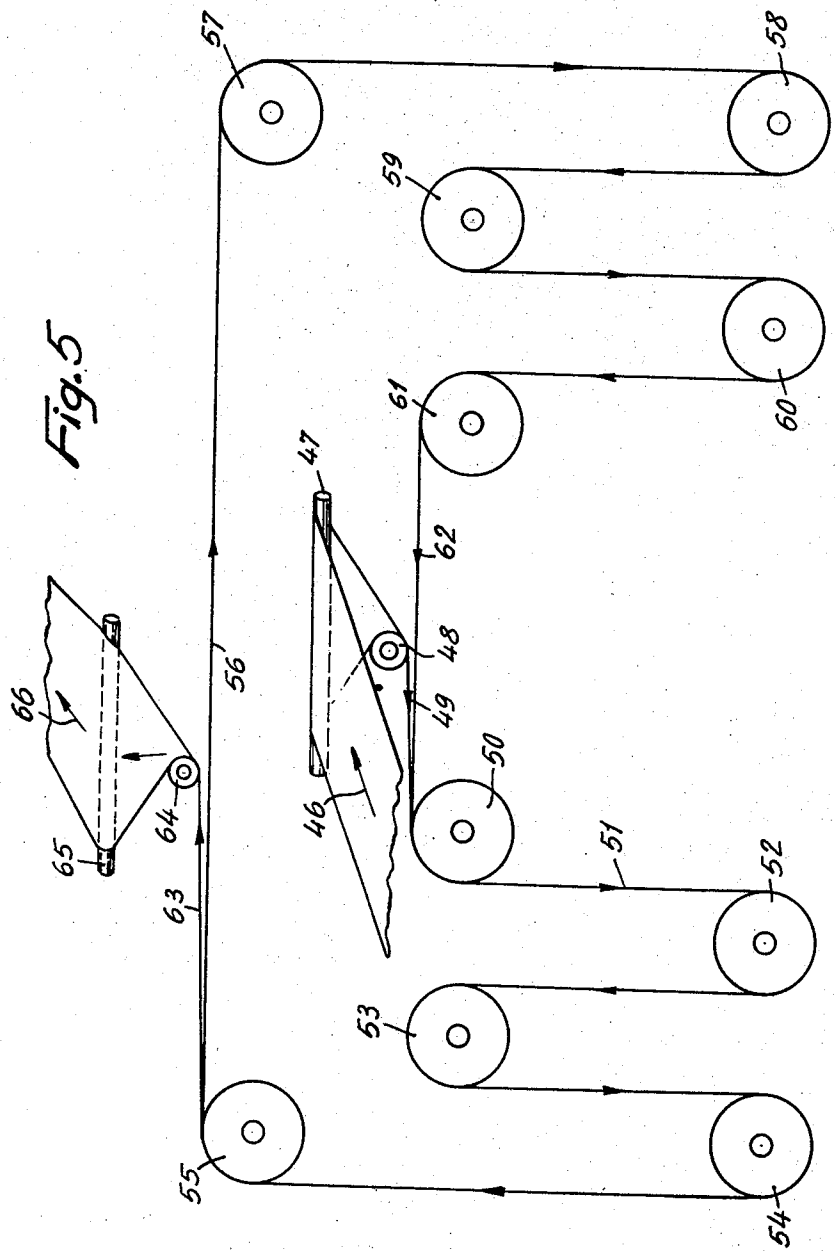
March 17, 1959 J. DUNGLER 2,877,636

ENCLOSURE FOR TREATING WEB MATERIAL

Filed March 30, 1955

4 Sheets-Sheet 4

Fig. 5



INVENTOR:
JULIEN DUNGLER
BY Leon M. Strauss
AGT.

United States Patent Office 2,877,636
Patented Mar. 17, 1959

2,877,636

ENCLOSURE FOR TREATING WEB MATERIAL

Julien Dungler, Basel, Switzerland

Application March 30, 1955, Serial No. 498,020
Claims priority, application France April 9, 1954
7 Claims. (Cl. 68—5)

This invention relates to an apparatus for the treatment of lengthy web materials, such as fabrics and the like.

Many processes for the thermal treatment of textile fabrics require a relatively long time consuming treatment.

Furthermore, there is a trend to effectuate various operations in a continuous manner and at full width of the fabric. Among these thermal treatments, may be cited the steaming of the fabrics after dyeing or printing, polymerisation, carbonizing of wool, desizing, boiling, bleaching, and so on.

Various kinds of enclosures are already known, for instance the hot-flues and the vertically undulated course enclosures or loop driers. However, these devices are bulky, they require either a complicated mechanism or a great number of rolls and they are liable to cause the fabric to get crumpled while being treated. Another known process used for steaming dyed fabrics consists in reeling the fabric on rolls in a steaming chamber. However, this process cannot be considered as operating in a continuous manner because, when the fabric roll has reached its maximum diameter, it should be changed and taken out of the chamber. Hence, there occurs an air ingress which is detrimental to resuming the treatment immediately.

The object of the present invention is to remove the drawbacks of the known devices and to provide a treating enclosure adapted to receive, in a continuous manner, a great length of fabric within a small volume.

Another object of the invention is to provide means affording a treating enclosure of the above character in which the length of fabric contained therein may be varied at will.

For this purpose, the enclosure according to the invention is characterized in that the number and arrangement of the rolls are such that the web material may be run several times over the whole series of rolls, each time forming on some predetermined rolls outer layers on top of layers previously formed and, on other rolls, inner layers under layers previously formed, and that the sum of the lengths embraced by the web material over the individual rolls on which it forms layers on top of the layers previously formed be substantially equal to the sum of the arcs embraced by the web over the individual rolls on which it forms layers under the layers previously formed.

According to another feature of the invention, all the rolls are equal in diameter and the arcs embraced by the web around the individual rolls have the same angular extent.

According to another feature of the invention, the arrangement of the rolls is adapted for the web to pass around the successive rolls alternately forming an upper outer layer and an under inner layer.

The enclosure may also comprise accesory elements,

for instance for heating, distributing a treating medium, etc.

Other and further objects and advantages of the invention will be apparent to those skilled in the art, from a consideration of the following description of a few embodiments of the invention, shown by way of example, in the accompanying drawings, in which:

Fig. 1 is a section of an enclosure embodying the invention,

Fig. 2 shows, on a larger scale, two consecutive rolls of this enclosure illustrating the principle of the invention.

Fig. 3 represents the enclosure in connection with a dyeing installation,

Fig. 3*a* shows an alternate structure for depositing the fabric leaving the enclosure of Fig. 3,

Fig. 4 is a view similar to that of Fig. 1, and shows a modification in the arrangement of the rolls, and

Fig. 5 shows, quite diagrammatically, another modification of the arrangement of the rolls.

The enclosure **1** illustrated in Fig. 1, comprises a first set of outer deviation and accumulation rolls **2, 3, 4, 5,** lines joining the axes of which form an outer polygon and a second set of inner deviation and accumulation rolls **6, 7, 8, 9,** the outer peripheral tangents of which form an inner polygon. The rolls have all the same diameter and rotate at the same speed and their axes are parallel with one another.

The fabric **10** entering the enclosure through a slot (not shown), passes on a bar **11** within the inner polygon oriented substantially at right angles with respect to the axes of the rolls **2** to **9,** and then on a bar **12** within the inner polygon oriented substantially parallel with said axes. The fabric, which has just been brought into suitable position with respect to the rolls reaches, while travelling along a path of feed in the direction of the arrow **13,** the roll **5** which it embraces over a certain arc and, then, passes along a path of travel successively around the rolls **7—2—8—3—9—4—6** while embracing them substantially over an arc of the same extent.

After having effected this complete turn or circuit within the enclosure, the fabric arrives in the direction of the arrow **14** converging with the direction of arrow **13** back at the first roll **5** around which it passes while forming a new layer. Then, the fabric again passes successively on the rolls **7—2—8—3—9—4—6** so as to accomplish a second complete circuit within the enclosure.

In this manner, it is possible to cause the fabric to travel any number of circuits corresponding to the length of time during which the fabric should dwell within the enclosure.

The last circuit is completed around the roll **8** whence the fabric passes, in the direction of the arrow **15,** onto a bar **16** outwardly of the outer polygon and then leaves the enclosure as indicated at **17** through a slot **70.**

It should be noted that, in its path in the interior of the enclosure, the fabric forms on the individual rolls, layers positioned alternately above and under the layer precedingly formed on the same rolls so that the length of each circuit involving all the rolls, or at least all the rolls arranged between the entrance to and the exit from the enclosure, is substantially uniform.

This essential feature of the invention is represented more in detail in Fig. 2 which diagrammatically shows three fabric layers on the rolls **5** and **7.** The first layer arriving in the direction of the arrow **13** of Fig. 1, is represented as at a_1. It embraces the roll **5** over an arc $d_1—e_1—f_1$ and, then, forms on the roll **7** the layer a_2 which embraces this roll over an arc $d_2—e_2—f_2$.

Then the fabric passes successively around the rolls 2—8—3—9—4—6 (Fig. 1) and returns in the direction of the arrow 14 back to the roll 5 on which it forms a second layer b_1 positioned on top of the layer a_1 previously formed. After having embraced the roll 5 over the same arc d_1—e_1—f_1, the fabric passes around the roll 7 but in such manner that the layer b_2, which it forms on this roll and which also extends over the arc d_2—e_2—f_2 is positioned underneath the layer a_2 previously formed.

After a few complete circuit in the enclosure, the fabric again returns to the roll 5 on which it forms the third layer c_1 positioned on top of the previous layers b_1 and a_1. Then, it passes around the roll 7 while forming on the latter the layer c_2 positioned underneath the layers b_2 and a_2 previously formed.

From the above, it will be seen that the fabric is positioned, during its travel within the enclosure, on the individual rolls alternately in positions or layers symmetrically arranged either above or under a mean position or layer. Consequently, if the number of the rolls as well as their arrangement and their dimensions are suitably predetermined, all the individual circuits travelled by the fabric within the enclosure will have substantially the same length.

In the device of Fig. 1, this result is obtained by using eight rolls of the same diameter arranged in such manner that the fabric forms thereon, upon each circuit travelled around all the rolls, layers passing under the layers previously formed on four rolls and layers passing above the layers previously formed on the other four rolls, while all the layers embrace the particular roll substantially over an arc of uniform angular extent.

As hereinabove set forth, since all the paths travelled by the fabric within the enclosure have substantially the same length, it is possible to have the fabric repeatedly travel as many circuits as desired without being subjected to any material tension.

Inside the enclosure 1 may be arranged accessory devices, according to the treatment contemplated. Thus, for instance, when the enclosure is intended to receive a fabric undergoing a steaming treatment, heat exchangers 18 and 19 as well as foraminous pipes 20 for directly discharging steam may be arranged within said enclosure.

Fig. 3 diagrammatically shows an enclosure according to the invention incorporated in a dyeing installation. The fabric fed as at 23 is first impregnated in a vat 25 with a suitable dyeing liquid and then squeezed between squeeze rolls 24. The squeezed fabric 23*a*, then, is passed through a treating machine 21 of known construction in which it is exposed by nozzle assemblies 22 to the action of a treating fluid, such as superheated or saturated steam, hot air or other. From the machine 21 the fabric directly enters the enclosure 1 constructed according to the invention as hereinabove referred to in Fig. 1 in which it effects the required number of circuits, corresponding to the length of time the fabric should stay in the enclosure.

Now, the fabric which leaves the enclosure in the direction indicated at 26 to be reeled on a roll 27. Alternatively, the fabric leaving the enclosure can be passed in direction 26*a* where by means of mechanical folder 28 it is deposited in folds 29 on a carriage 30, as shown in Fig. 3*a*.

Fig. 4 diagrammatically shows a modification wherein the rolls on which the fabric forms layers under layers previously formed are different, in their number and in their dimensions, from the rolls on which the fabric forms layers above layers previously formed. Thus, the fabric 31 passes on a bar 32 and reaches, in the direction of the arrow 33 onto a roll 34 which it embraces over the arc NOP and then passes in the direction of the arrow 35 around a roll 36 which is embraces over the arc ABC. Then, the fabric passes successively around the rolls 37, 38, 39, 40 which it embraces over the arcs DEF, QRS, GHI, and KLM respectively.

After having thus travelled a complete circuit in the enclosure, the fabric again passes around the roll 34 in the direction of the arrow 41, and then around the rolls 36, 37, 38, 39, 40 as many times as it is desired. Finally, the fabric passes from the roller 37, in the direction of the arrow 42, onto a roll 43 the axis of which is positioned substantially parallel with the axis of the rolls and then on a bar 44 arranged in an oblique direction with respect to the axis of the rolls and leaves the enclosure in the direction of the arrow 45.

As will be seen from Fig. 4, the fabric passes around the rolls 34 and 38, on top of layers previously formed, whereas it passes on the rolls 36, 37, 39, 40 underneath the respective layers previously formed.

It will be further seen, that the number as well as the diameters of the rolls on which the fabric forms layers under layers previously formed are different from those of the rolls on which the fabric forms layers on top of layers previously formed. In order to provide the essential feature of the invention, namely the uniform length of all the paths, it is necessary that the sum of the arcs embraced on the rolls where the fabric forms layers under the previous layers be equal to the sum of the arcs embraced on the rolls where the fabric forms layers on top of the previous layers. In other words, the rolls should be dimensioned and arranged in such manner that there is obtained:

$$ABC+DEF+GHI+KLM=NOP+QRS$$

Fig. 5 shows a further modification with an asymmetrical arrangement of the rolls on which the fabric forms layers above and underneath the respective layers previously formed.

The fabric is run in the direction of the arrow 46 and passes on the deviation bars 47 and 48 which impart thereto a suitable ingress direction which enables it to pass around the first accumulation roll 50 in the direction of the arrow 49. After having embraced the roll 50 over a certain arc, the fabric passes in the direction of the arrow 51 successively around the rolls 52, 53, 54, 55. From the roll 55, the fabric passes in the direction of the arrow 56 successively around the rolls 57, 58, 59, 60 and 61. After having thus effected a complete circuit within the enclosure, the fabric runs, in the direction of the arrow 62 around the roll 50 and travels a new circuit within the enclosure. This process may take place repeatedly as many times as it is desired.

When the total length of travel, which corresponds to the length of time the fabric stays within the enclosure, is reached, said fabric leaves the enclosure from the roll 55, in the direction of the arrow 63, passes around the deviation bars 64 and 65 in order ultimately to run out of the enclosure in the direction of the arrow 66.

In the arrangement of this Fig. 5, the fabric forms, in the course of its multiple travels within the enclosure, layers on top of the layers previously formed on the rolls 52, 54, 55, 57, 58 and 60, and layers underneath the layers previously formed on the rolls 50, 53, 59 and 61.

According to the invention, here again the arrangement is such that the sum of the arcs embraced by the fabric over the rolls 52, 54, 55, 57, 58, 60 is equal to the sum of the arcs embraced over the rolls 50, 53, 59, 61. Furthermore, the sum of the arcs embraced over the rolls 52, 54, 55, is equal to that of the arcs embraced over the rolls 50, 53. This condition is concerned with the partial travel between entrance and exit for the fabric.

It should be noted that these requirements may be fullfilled, regardless of the difference in the diameters of the rolls and regardless of the asymmetrical character of their arrangement.

As many changes could be made in the above construction, and many apparently, widely, different embodiments of this invention could be made without departing from the scope of the claims, it is intended that all matters contained in the above description or shown in the ac-

companying drawings shall be interpreted as illustrative and not in a limiting sense. Thus, one or more rolls may be provided with means for regulating the tension of the fabric.

Furthermore, the enclosure according to the invention may be utilized for receiving fabric subjected to any treatment, during any length of time. It may also be combined wtih other treating machines and provided with any accessory devices corresponding to the particular treatment involved.

As it appears from the above, the enclosure embodying the invention has among others, the following advantages:

It is able to receive a great length of fabric within small overall dimensions and during any length of time;

The fabric may be accumulated in open width and without material tension;

The accumulation of fabric is carried out in a continuous manner which makes it possible readily to combine the enclosure with treating machines operating in a continuous manner.

Various changes and modifications may be made without departing from the spirit and scope of the present invention and it is intended that such obvious changes and modifications be embraced by the annexed claims.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent, is:

1. A plant for treating a continuous web adapted to pass along at least a first and a second circuit in superposed position to each other; comprising a first set of rolls having a first set of spaced apart axes of rotation defining an outer polygon, a second set of rolls having a second set of spaced apart axes of rotation and having the outer peripheral tangents to said second set of rolls defining an inner polygen spaced inwardly of said first set of rolls, said axes of rotation of said first and second sets of rolls being parallel to each other, said first set of rolls being rotatable in a direction opposite to the direction of rotation of said second set of rolls, said web being adapted to be trained over both sets of said rolls thereby engaging successively at least one roll of said first set of rolls and then at least one roll of said second set of rolls, whereby said first circuit of web directly contacts a portion of the surface of said one roll of said first set of rolls and said second circuit of web directly contacts a portion of the surface of said one roll of said second set of rolls, means for feeding said web to said first and second sets of rolls, successively, and including a first bar located substantially within said inner polygon and having an axis substantially normal to said first set of axes and a second bar located substantially within said inner polygon and extending parallel to said second set of axes, the center of contact of the web with respect to said one roll of said first set of rolls being located at one side of the axis of rotation of the latter, the center of contact of said web with respect to said second set of rolls being disposed at an opposite side of the axis of rotation of said one roll of said second set of rolls, whereby said first circuit of web spaces the second circuit of web from at least said one roll of said first set of rolls and said second circuit spaces said first circuit from said one roll of said second set of rolls, so that said first set of rolls tensions said first circuit an extent subtantially equal to that of tension caused by said second circuit fed onto said second set of rolls, and delivery means including a third bar disposed outwardly of said outer polygon and extending substantially normal to said first set of axes.

2. A plant as defined in claim 1, wherein all of said rolls are equal in diameter.

3. A plant according to claim 1, including enclosure means for both said sets of rolls, and steam discharging means located in said enclosure means for steam treating said circuits of web.

4. A plant as defined in claim 1, comprising enclosure means accommodating said first and second sets of rolls, said web feeding means, and said web delivery means.

5. A plant for treating a continuous web adapted to pass along at least a first and a second circuit in superposed position to each other; comprising a first set of rolls having a first set of spaced apart axes of rotation defining an outer polygon, a second set of rolls having a second set of spaced apart axes of rotation spaced inwardly from said outer polygon, said axes of rotation of said first and second sets of rolls being parallel to each other, said first set of rolls being rotatable in a direction opposite to the direction of rotation of said second set of rolls, said web being adapted to be trained over both sets of said rolls thereby engaging successively at least one roll of said first set of rolls and then at least one roll of said second set of rolls, whereby said first circuit of web directly contacts a portion of the surface of said one roll of said first set of rolls and said second circuit of web directly contacts a portion of the surface of said one roll of said second set of rolls, means for feeding said web to said first and second sets of rolls, successively, and including a first bar located within said outer polygon and having an axis substantially normal to said first set of axes and a second bar located within said outer polygon and extending parallel to said second set of axes, the center of contact of the web with respect to said one roll of said first set of rolls being located at one side of the axis of rotation of the latter, the center of contact of said web with respect to said second set of rolls being disposed at an opposite side of the axis of rotation of said one roll of said second set of rolls, whereby said first circuit of web spaces the second circuit of web from at least said one roll of said first set of rolls and said second circuit spaces said first circuit from said one roll of said second set of rolls, so that said first set of rolls tensions said first circuit an extent substantially equal to that of tension caused by said second circuit fed onto said second set of rolls, and delivery means including a third bar disposed outwardly of said outer polygon and extending substantially normal to said first set of axes.

6. A plant as defined in claim 5, wherein the rolls about which the first circuit passes over the second circuit are different in diameter from the rolls about which the first web circuit passes below the second circuit.

7. A plant as defined in claim 5, said first set of rolls being of lesser diameter than that of said second set of rolls.

References Cited in the file of this patent

UNITED STATES PATENTS

1,626,439	Voegeli	Apr. 26, 1927
2,161,726	Sochor	June 6, 1939
2,344,942	Gessner	Mar. 28, 1944
2,366,100	Green	Dec. 26, 1944
2,505,657	Wentz	Apr. 25, 1950
2,545,075	Dungler	Mar. 13, 1951
2,590,407	Haas	Mar. 25, 1952

FOREIGN PATENTS

169,922	Germany	Apr. 23, 1906