May 22, 1934. J. ROBERTS 1,960,123

CHEMICAL DRIER

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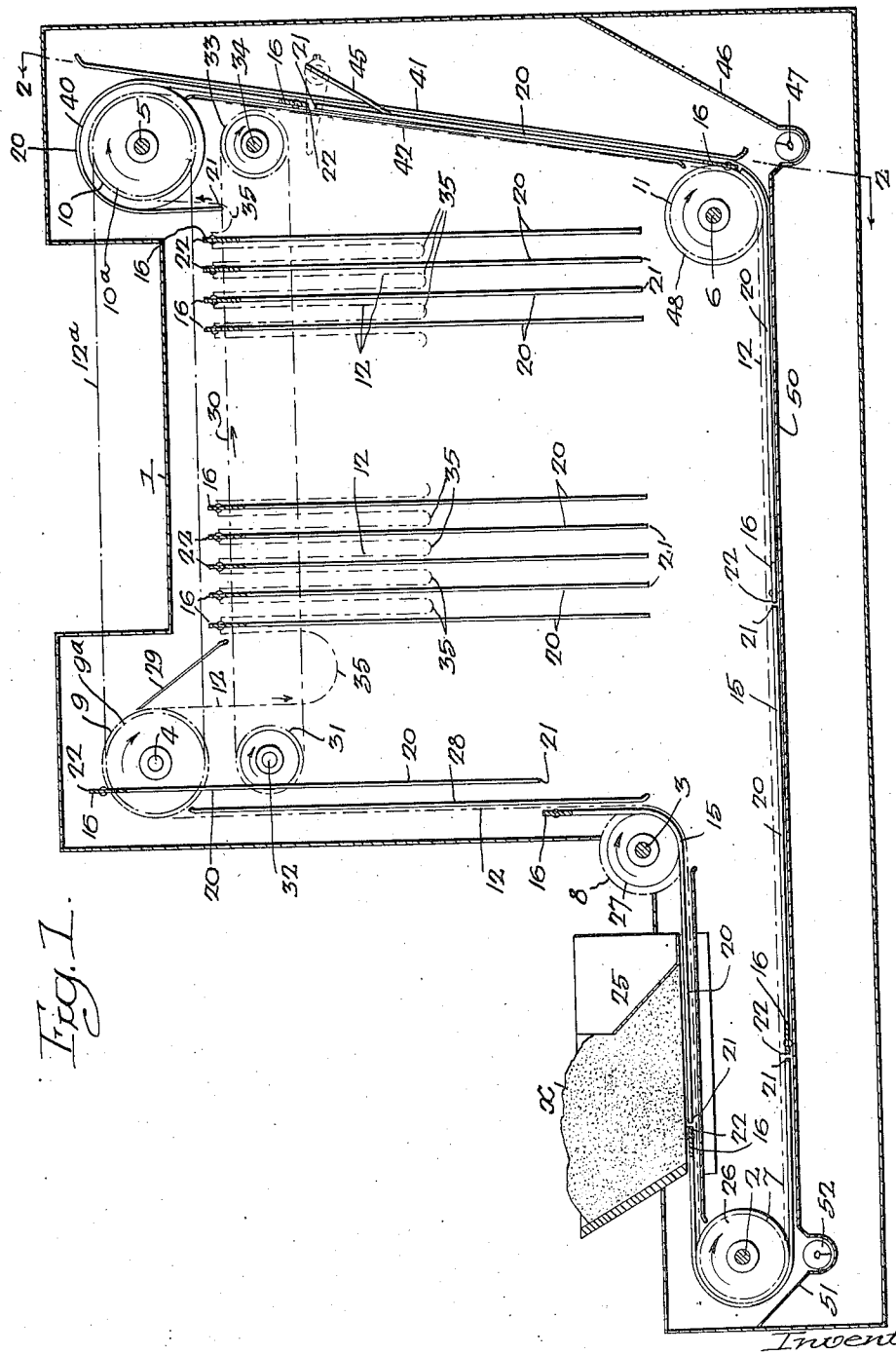


Fig. 1.

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Fig. 2.

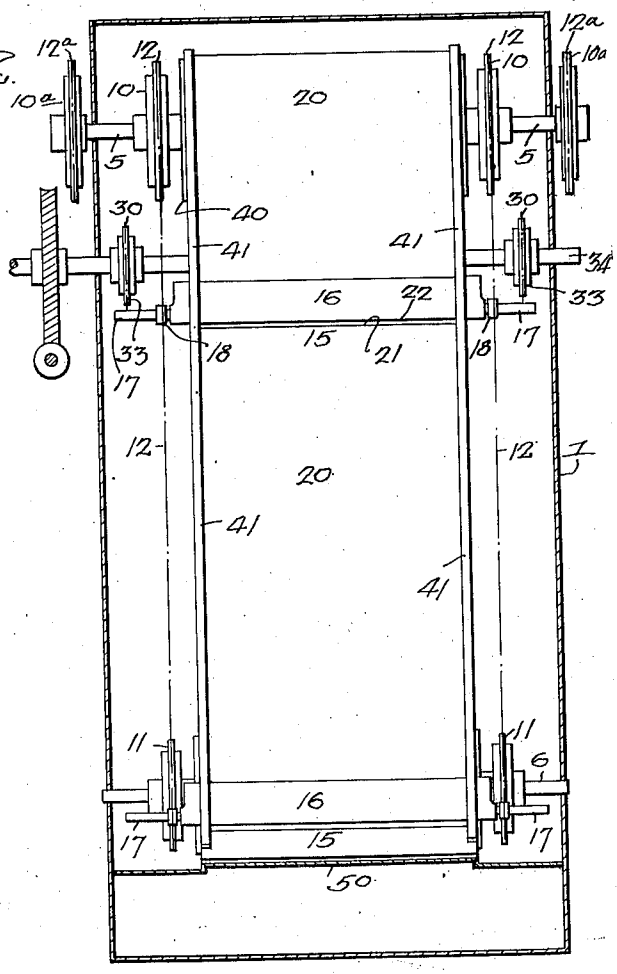
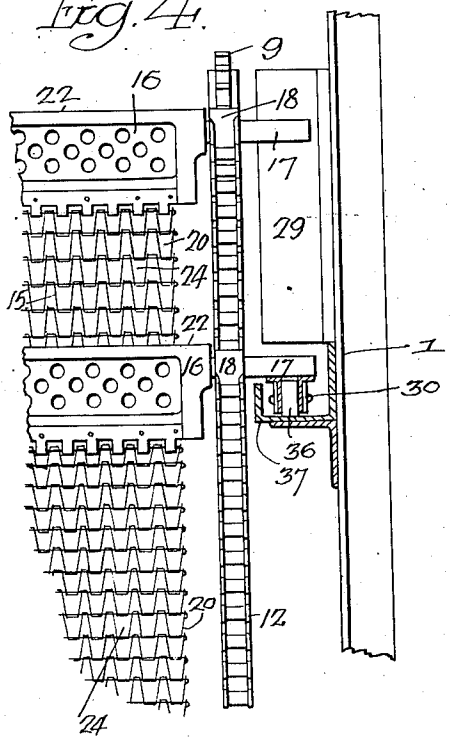


Fig. 4.



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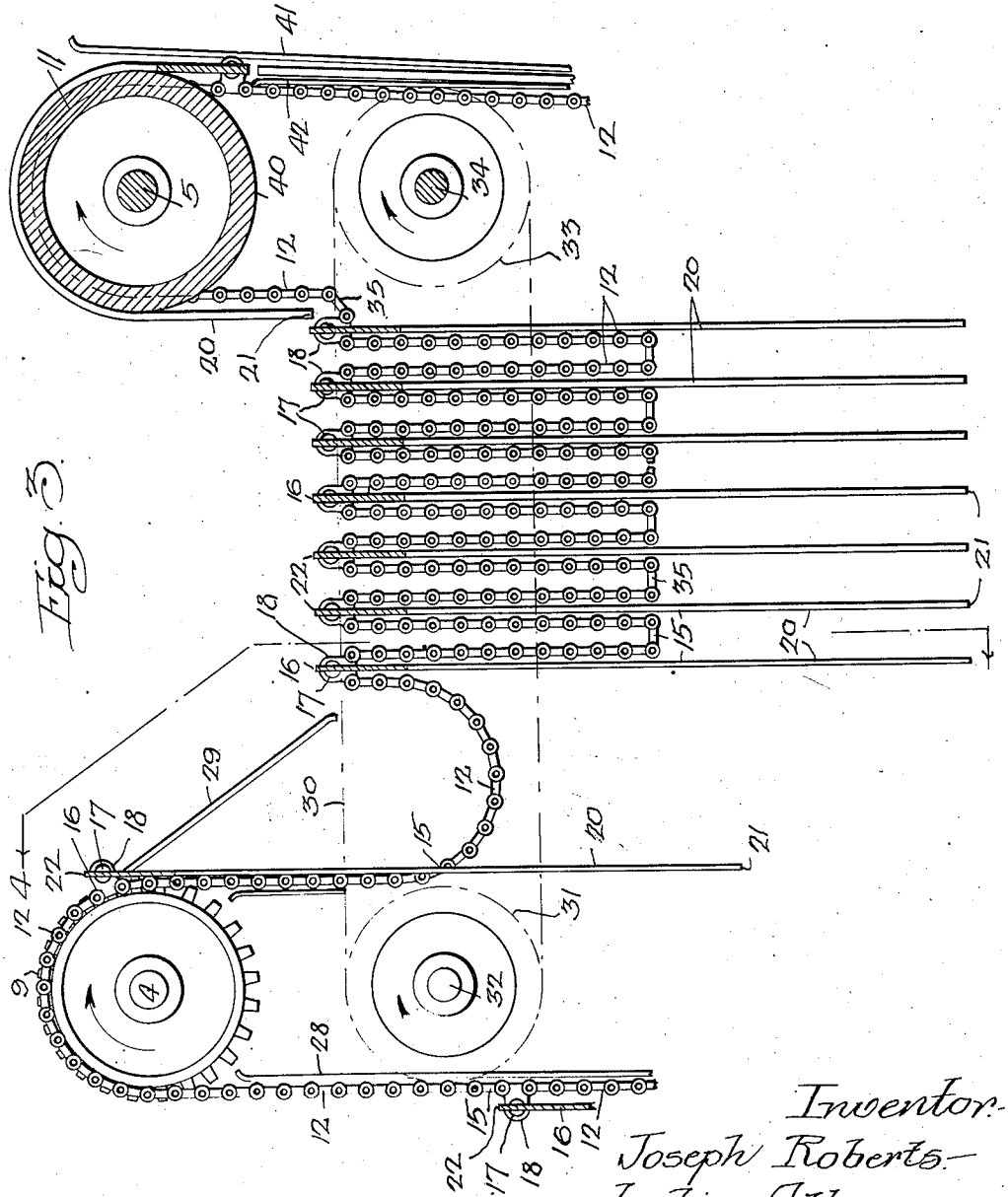


Fig. 3.

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Patented May 22, 1934 1,960,123

UNITED STATES PATENT OFFICE

1,960,123

CHEMICAL DRIER

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Application March 25, 1930, Serial No. 438,876

10 Claims. (Cl. 34—12)

This invention relates to apparatus for drying or otherwise treating plastic materials such as paints, pigments, chemicals, etc.

The apparatus in general is similar to that shown and described in the co-pending application of Alpheus O. Hurxthal, Serial No. 370,662, filed June 13, 1929, in which the material to be treated is pressed into the openings of an endless foraminous conveyer apron, which is provided with girts extending beyond the longitudinal side edges of the conveyer in order that the apron may be formed into loops, the loops being suspended from the girts which rest on relatively slow moving horizontally extending supports disposed adjacent the opposite side edges of the apron.

The girts are of necessity spaced relatively far apart to avoid sharp bends in the apron or to prevent undue flexing of the apron in producing the loops, such sharp flexing of the apron, with some kinds of material, having a tendency to loosen the material to such an extent that it falls from the conveyer apron. The relatively wide spacing of the girts on the movable supports requires a relatively large chamber for treating a given amount of material at one time.

The object of the present invention is to minimize the flexing of the apron and to conserve space in the treating chamber.

These objects are attained by forming the apron of a series of independent sections, each being of a suitable length, and permanently attaching one end of each section to a carrying pole, or girt, by which the sections of the apron may be each supported in a vertical position and in relatively close relation to each other, the carrying girts extending transversely of the apron and being mounted at their opposite ends on endless side chains respectively, the length of each of the side chains being substantially equal to the sum of the lengths of the apron sections. These side chains are adapted to run substantially parallel to each other throughout the apparatus for drawing the apron sections through the apparatus.

The girts are secured to the endless side chains at spaced intervals substantially equal to the length of one of the sections of the apron and extend beyond the side chains in a manner to be brought to rest on a pair of horizontally movable supports disposed outside the side chains, whereby the sections of the apron will be suspended in vertical relation to each other, as above noted, at which time the side chains will hang in loops, extending from one girt to the next, all as will be fully disclosed hereinafter, reference being had to the accompanying drawings, of which:

Fig. 1 is a diagrammatic longitudinal sectional elevation of an apparatus for treating plastic materials and showing my invention as applied thereto;

Fig. 2 is a diagrammatic transverse sectional elevation taken on the line 2—2, Fig. 1;

Fig. 3 is an enlarged sectional elevation showing the relation existing between the side chains and the sections of the apron when the sections are hanging in vertical parallel relation to each other; and

Fig. 4 is a fragmentary sectional elevation taken on the line 4—4, Fig. 3.

In the drawings, a suitable casing is diagrammatically illustrated at 1. Rotatably mounted within the casing 1 and extending transversely thereof is a plurality of shafts 2, 3, 5 and 6. Also mounted in each side of the casing and in axial alignment with each other is a pair of short shafts 4, 4. On the opposite ends of each of the through shafts 2, 3, 5 and 6 are secured sprockets 7, 8, 10 and 11 respectively, and on the short shafts 4, 4 at the opposite sides of the casing 1 are sprockets 9, 9 respectively. Passing around the sprockets at each side of the casing is a side chain 12 of a foraminous material-carrying apron 15 which, together with the side chains 12, 12, comprises a series of girts 16, 16 having trunnions 17, 17 at their respective opposite ends. The trunnions 17, 17 are rotatably mounted in suitable bearings 18, 18 carried by the side chains 12, 12 respectively.

Secured to each of the girts 16 is one end of a flexible foraminous apron section 20, the body portion of which is similar in construction to the foraminous conveyor shown and described in a co-pending application of Alpheus O. Hurxthal, Serial No. 305,589, filed September 12, 1928.

As above noted, the sum of the lengths of the sections 20 of the material-carrying apron 15 is substantially equal to the total length of each of the side chains 12, 12, so that the side chains 12, 12 and the apron sections 20, 20 carried therebetween will move through a portion of the apparatus the same as a continuous flat conveyer, the free back end 21 of each apron section 20 occupying a position immediately adjacent the forward edge 22 of the girt 16 of the next successive apron section 20.

The empty apron sections 20, of the conveyer 15, are adapted to be carried successively around and over the top of a roller 26, which is mounted on the shaft 2, while the side chains

12, 12 of the conveyer pass around the sprockets 7, 7 on the said shaft.

The apron sections 20 are then passed in a substantially horizontal plane through a suitable pasting mechanism 25, where the material *x*, in a plastic state, is pressed into the openings 24 (see Fig. 4) of each of the successively presented apron sections 20.

After the material to be treated has been pressed into the conveyer sections 20 the said loaded sections pass under and partly around a roller 27, which is mounted on the shaft 3 between the sprockets 8, 8, thereon, while the side chains 12, 12 pass around the sprockets 8, 8, on the said shaft.

Each apron section 20, after passing under the roller 27, assumes a substantially vertical plane and is supported therein by its girt 16, which in turn is supported and carried by the side chains 12, 12. The chains 12, 12 at this time lie against vertically disposed guides 28 located at opposite sides of and in one end of the casing 1.

The girts 16 are successively raised in this vertical plane until the rear end 21 of the conveyer section 20 carried by each girt has passed completely from under the roller 27, whereupon the girt 16 is carried over the top of the sprocket wheels 9, 9 on the short shafts 4, 4.

As each girt 16 passes around the upper side of the sprockets 9, 9 the loaded apron section 20 supported thereby is maintained in a vertical plane and while in this position the apron section is transferred bodily in a direction substantially longitudinal of the casing 1, from one side of the axis of rotation of the sprockets 9, 9 to a position at the opposite side of said axis, the chain guides 28, 28 disposed respectively at opposite sides of the casing 1 and the short shafts 4, 4 being spaced a sufficient distance apart to permit the apron section 20 to pass therebetween.

After the girt 16 passes over the top of the sprockets 9, 9 the outer ends of the trunnions 17, 17 of the girt, which extends beyond the side chains 12, 12, engage inclined guides 29, 29 disposed respectively at the opposite sides of the casing 1, and as the side chains 12, 12 are fed forward by the sprockets 9, 9 the girt 16 is permitted to slide easily down the inclined guides 29, 29, until the outer ends of the trunnion 17, 17 of the girt come to rest on relatively slow moving supports 30, 30 disposed respectively at opposite sides of the casing 1. These slowly moving supports 30, 30 in the present instance comprise sprocket chains which pass around sprocket wheels 31, 31 mounted respectively on studs 32, 32, located at opposite sides and at one end of the casing 1, the chains 30, 30 passing also around sprockets 33, 33 mounted on a transversely extending through shaft 34 disposed at the opposite end of the casing 1.

The shaft 34 is adapted to be driven by any suitable means and at any perdetermined rate of speed relative to the rate of speed of travel of the conveyer 15 in passing through the pasting mechanism 25, the relation of the speed of travel of the conveyer 15 and that of the chains 30, 30 determining the relative spacing of the apron sections 20, 20 on the moving supports 30, 30.

After the trunnions 17, 17 of a girt 16 have been deposited on the movable supports 30, 30 the portion of each side chain 12 disposed between the deposited girt 16 and the next successive girt 16 is formed into a loop 35, as clearly shown in Figs. 1 and 3. The supporting chains 30, as shown in Fig. 4, are provided with rollers 36 which ride on suitable supporting rails 37, carried by the framework of the casing 1.

Obviously, the movable supports 30 may be in the form of longitudinally extending feed screws into the grooves of which the ends of the trunnion 17 may be deposited and carried longitudinally of the casing 1, if desired, or any other suitable form of movable support may be provided which will carry the sections 20 of the conveyer 15 in spaced relation to each other through the casing 1.

As the leading section 20 approaches the delivery end of the casing 1 the side chains 12, 12 of the conveyer by passing around the sprockets 10, 10 on the shaft 5, are drawn out of the leading loops 35, 35 at the opposite sides of the casing respectively until the said side chains become taut between the sprockets 10, 10 and the leading girt 16, whereupon the said leading girt is raised from the said movable supports 30, 30 and carried upwardly and around the sprockets 10, 10, the apron section 20 supported by the said girt passing around and over a roller 40 which is mounted on the shaft 5 between the sprockets 10, 10 thereon.

During the passage of the conveyer sections 20 through the casing 1 the material carried by the said sections is subjected to a drying or other suitable treatment or processing and is thereby made ready to be removed from the conveyer 15.

After passing over the sprockets 10, 10 the girt 16 is fed downwardly in the casing, between a pair of substantially vertically disposed guides 41 and 42, there being a pair of such guides adjacent each of the opposite sides of the casing 1, these guides being so positioned with respect to the conveyer 15 that they engage the various conveyer sections 20 inwardly of and immediately adjacent the longitudinal side edges thereof, as shown in Fig. 2, so that as each conveyer section 20 moves downwardly in the casing 1 with the girt 16 thereof leading the section 20 to which the particular girt is attached. The said conveyer section will be supported in a substantially vertical plane, preventing the section from collapsing and falling into a heap at the bottom of the casing.

While in position between the girts 41 and 42 the conveyer section 20 is subjected to a tapping or beating operation effected by a suitable beater 45 which is adapted to be intermittently moved away from the conveyer section and then permitted to strike the said conveyer section a sharp blow, in order to beat the material out of the openings of the conveyer section, the material falling into a suitable hopper 46 at the bottom of the casing, the hopper being provided with a feed screw 47 which is adapted to remove the material from the casing 1.

Adjacent the lower end of the casing the side chains 12, 12 pass around the sprockets 11, 11 on the shaft 6 thereby carrying the girt 16 around said sprockets and around a roller 48 mounted on the shaft 6 intermediate the sprockets 11, 11, the body of the apron section 20 attached to the girt 16 being drawn by the girt 16 around the roller 48 and onto a horizontally disposed platform or partition 50, located in the casing 1 near the bottom thereof.

As the side chains 12, 12 move horizontally

the conveyer sections 20 are drawn by their girts 16 along the partition or floor 50 and return to the feed end of the apparatus, at which the shaft 2 and roller 7 are located, any loose material lying on the floor 50 being carried along the said floor by the apron sections and deposited in a hopper 51 located at the feed end of the apparatus, the hopper 51 being provided with a transversely extending feed screw 52, by which such material is removed from the casing.

From the above description, it will be apparent that from the time the material is placed in the sections 20 of the conveyer 15 until the processed material is finally removed from such sections at the delivery end of the apparatus the said sections are subjected to but one flexing operation and this is effected over a roller having such a relatively large diameter, so that very little relative flexing between the components of the conveyer section occurs, consequently the tendency of the material to fall from the conveyer sections is reduced to a minimum. It will also be obvious from the above description that considerable space is saved in the drying chamber by my being able to arrange the sections of the conveyer relatively close to each other.

Any suitable driving means may be provided for advancing the side chains 12, 12 through the apparatus and for synchronizing the rotation of the sprockets 9, 9 and 10, 10 so that the side chains will be fed into the loops 35 by the sprockets 9, 9 at the same rate of speed at which they are removed from the loops by the sprockets 10, 10, and for the purpose of illustration I have diagrammatically illustrated each of the short shafts 4, 4 as being provided with a sprocket 9^a, of substantially the same pitch diameter as the sprocket 9 thereon and on the shaft 5 I have shown sprockets 10^a, 10^a having substantially the same pitch diameter as the sprockets 10, 10, and for operatively connecting the sprockets 9^a and 10^a on each side of the casing I have diagrammatically shown a sprocket chain 12^a.

I claim:

1. In an apparatus for treating plastic materials, a foraminous conveyer comprising a pair of endless side elements, girts carried by and between said side elements at substantially uniformly spaced intervals thereon, a conveyer section carried by and attached at one end only to each girt, each section being of a length substantially equal to the spacing of the girts, and means for supporting said sections in substantially parallel relatively close side by side relation to each other with the side elements looped between the sections.

2. In an apparatus for treating plastic materials, a foraminous conveyer comprising a pair of endless side elements, girts carried by and between said side elements at substantially uniformly spaced intervals thereon, a conveyer section carried by and attached at one end only to each girt, means for supporting the conveyer with the sections thereof in end to end relation with respect to each other, each section being of a length substantially equal to the spacing of the girts, means for supporting said sections in substantially parallel relatively close side by side relation to each other with the side elements looped between the sections, and means for transforming the conveyer sections from the said end to end relationship to the said side by side relationship with respect to each other.

3. In an apparatus for treating plastic materials, a foraminous conveyer comprising a pair of endless side elements, girts carried by and between said side elements at substantially uniformly spaced intervals thereon, a conveyer section carried by and attached at one end only to each girt, means for supporting the conveyer with the sections thereof in end to end relation with respect to each other, each section being of a length substantially equal to the spacing of the girts, means for supporting said sections in substantially parallel relatively close side by side relation to each other with the side elements looped between the sections, means for transforming the conveyer sections from the said end to end relationship to the said side by side relationship with respect to each other, means for bodily moving the conveyer sections while in said side by side relationship, and means for subsequently transforming the conveyer sections into said end to end relationship.

4. In an apparatus for treating plastic materials, a foraminous conveyer comprising a pair of endless side elements, girts carried by and between said side elements at substantially uniformly spaced intervals thereon a conveyer section carried by and attached at one end only to each girt, means for supporting the conveyer with the sections thereof in end to end relation with respect to each other, each section being of a length substantially equal to the spacing of the girts, means for supporting said sections in substantially parallel relatively close side by side relation to each other with the side elements looped between the sections, means for transforming the conveyer sections from the said end to end relationship to the said side by side relationship with respect to each other, means for bodily moving the conveyer sections while in said side by side relationship, means for subsequently transforming the conveyer sections into said end to end relationship, and means for loading the sections with the material to be treated while the sections are in said end to end relationship.

5. In an apparatus for treating plastic materials, a foraminous conveyer comprising a pair of endless side elements, girts carried by and between said side elements at substantially uniformly spaced intervals thereon, a conveyer section carried by and attached at one end only to each girt, means for supporting the conveyer with the sections thereof in end to end relation with respect to each other, each section being of a length substantially equal to the spacing of the girts, means for supporting said sections in substantially parallel relatively close side by side relation to each other with the side elements looped between the sections, means for transforming the conveyer sections from the said end to end relationship to the said side by side relationship with respect to each other, means for bodily moving the conveyer sections while in said side by side relationship, means for subsequently transforming the conveyer sections into said end to end relationship, means for loading the sections with the material to be treated while the sections are in said end to end relationship, and means for removing the material from the conveyer sections subsequent to the treating of the material therein.

6. In an apparatus for treating plastic materials, a conveyer comprising a pair of laterally spaced endless side elements, girts extending transversely of the conveyer between and se-

cured adjacent their opposite ends to said side elements, a conveyer section attached at one of its ends to each girt, means for supporting the conveyer in a position with the conveyer sections in end to end relation to each other, means for directing said conveyer into a substantially vertical plane, a support for said conveyer sections extending laterally from said vertical plane, and means for bodily transferring each section of the conveyer, as it attains a full lineal position in said vertical plane, from the said attained position onto said laterally extending support.

7. In an apparatus for treating plastic materials, a conveyer comprising a pair of laterally spaced endless side elements, girts extending transversely of the conveyer between and secured adjacent their opposite ends to said side elements, a conveyer section attached at one of its ends to each girt, means for supporting the conveyer in a position with the conveyer sections in end to end relation to each other, means for directing said conveyer into a substantially vertical plane, a support for said conveyer sections extending laterally from said vertical plane, means for bodily transferring each section of the conveyer, as it attains a full lineal position in said vertical plane, from the said attained position onto said laterally extending support, said transferring means comprising a pair of wheels around which the said side elements respectively pass and whereby the girts are carried in the said vertical plane from one side of the axis of rotation of the wheels and deposited into said supports at the opposite side of said axis.

8. In an apparatus for treating plastic materials, a conveyer comprising a pair of laterally spaced endless side elements, girts extending transversely of the conveyer between and secured adjacent their opposite ends to said side elements, a conveyer section attached at one of its ends to each girt, means for supporting the conveyer in a position with the conveyer sections in end to end relation to each other, means for directing said conveyer into a substantially vertical plane, a support for said conveyer sections extending laterally from said vertical plane, means for bodily transferring each section of the conveyer, as it attains a full lineal position in said vertical plane, from the said attained position onto said laterally extending support, and means for moving the said conveyer sections along said support in spaced parallel side by side relation to each other, with the side elements of the conveyer formed in loops between the said conveyer sections.

9. In an apparatus for treating plastic materials, a conveyer comprising a pair of laterally spaced endless side elements, girts extending transversely of the conveyer between and secured adjacent their opposite ends to said side elements, a conveyer section attached at one of its ends to each girt, means for supporting the conveyer in a position with the conveyer sections in end to end relation to each other, means for directing said conveyer into a substantially vertical plane, a support for said conveyer sections extending laterally from said vertical plane, means for bodily transferring each section of the conveyer, as it attains a full lineal position in said vertical plane, from the said attained position onto said laterally extending support, means for moving the said conveyer sections along said support in spaced parallel side by side relation to each other, with the side elements of the conveyer formed in loops between the said conveyer sections, a pair of wheels at the opposite end of the support around which the said side elements pass, by which the said side elements are drawn out of said loops and the girts are raised from the said supports at one side of the axis of the wheels, a roller between said wheels around which the conveyer section is adapted to pass, and guides at the opposite side of the axis of the wheels adapted to receive the conveyer sections in end to end relation as they are successively passed over said roller.

10. In an apparatus for treating plastic materials, a foraminous conveyer comprising side elements, girts extending transversely of and permanently secured at their opposite ends to said side elements respectively and normally arranged in substantially uniform lateral spaced relation longitudinally of said side elements, a body portion composed of a plurality of individual sections each of a length substantially equal to the spacing of the girts and arranged in end to end relation in a common plane between said side elements, each section comprising a flat flexible element having a thickness sufficient to maintain said material in openings formed in and extending substantially perpendicular to the plane of the section, each section being permanently secured at one end only to one of said girts independent of the remaining sections and girts, means for supporting said sections in a substantially parallel face to face laterally spaced relation considerably less than the normal lateral spacing of said girts, and means for collapsing said side elements to effect the said reduced spacing of said body sections.

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