Sept. 17, 1940. H. H. BELCHER 2,215,418

APRON CONVEYER

Filed March 17, 1938 6 Sheets-Sheet 1

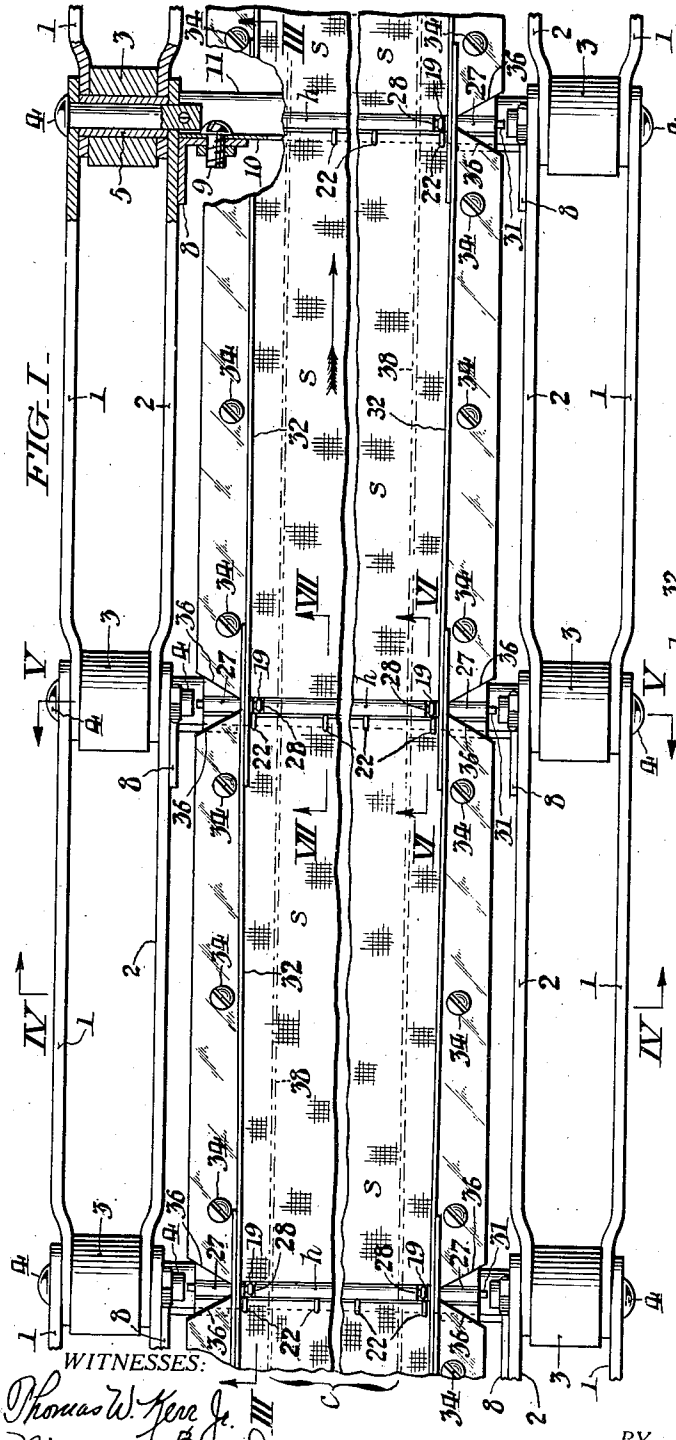


FIG. I.

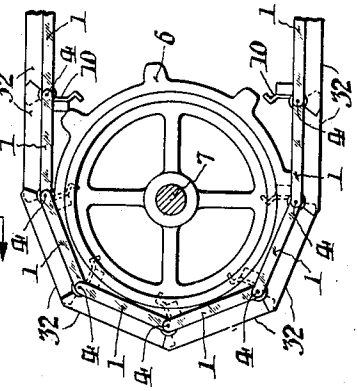


FIG. VIII.

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Sept. 17, 1940. H. H. BELCHER 2,215,418

APRON CONVEYER

Filed March 17, 1938 6 Sheets-Sheet 2

FIG. II.

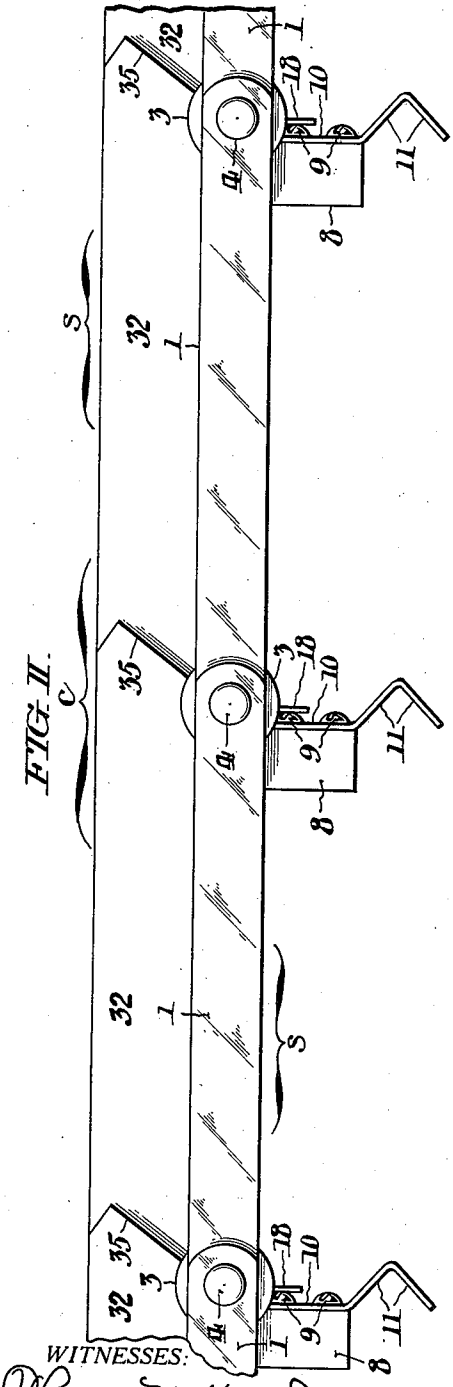
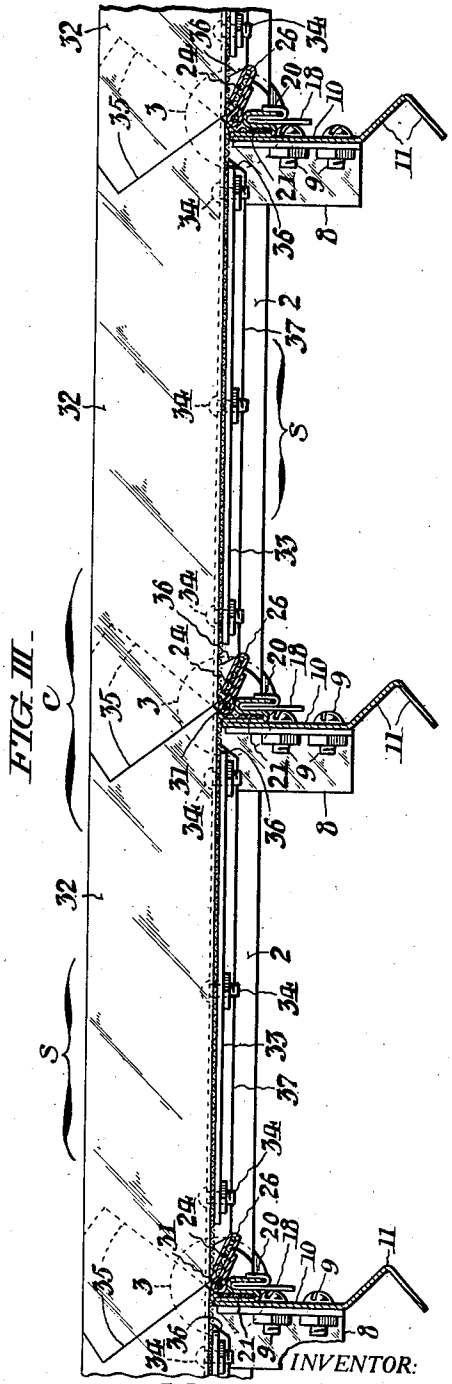


FIG. III.



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Sept. 17, 1940. H. H. BELCHER 2,215,418

APRON CONVEYER

Filed March 17, 1938 6 Sheets-Sheet 3

FIG. IV.

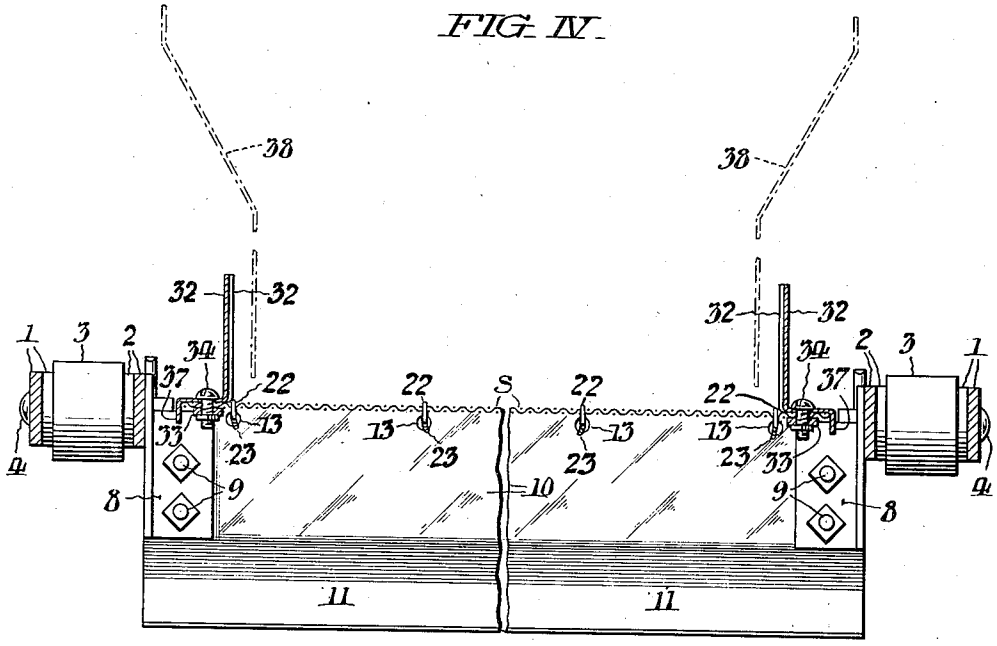
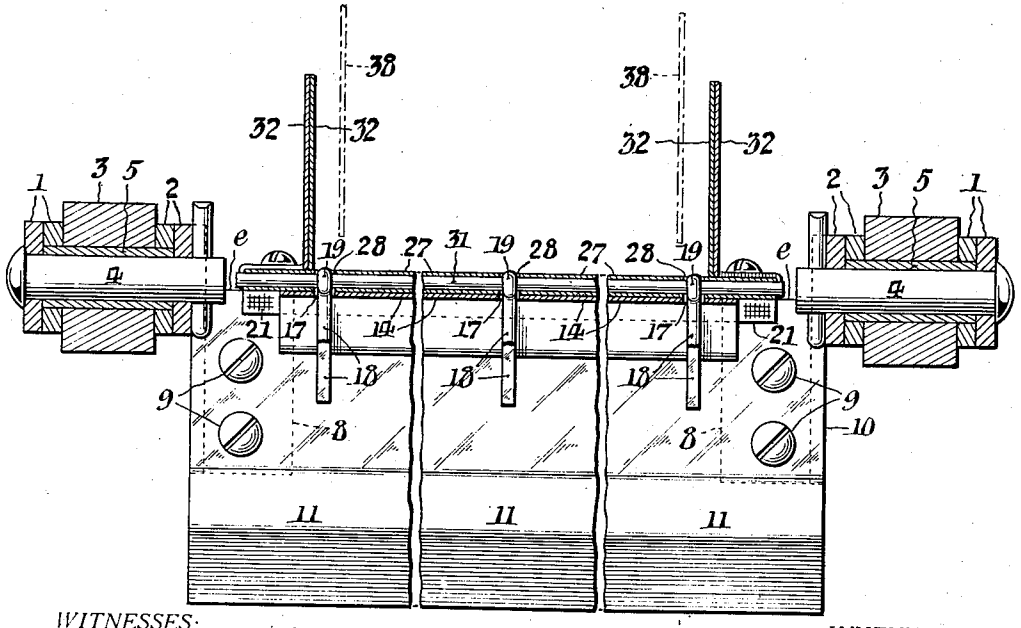


FIG. V.



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Sept. 17, 1940. H. H. BELCHER 2,215,418

APRON CONVEYER

Filed March 17, 1938 6 Sheets-Sheet 4

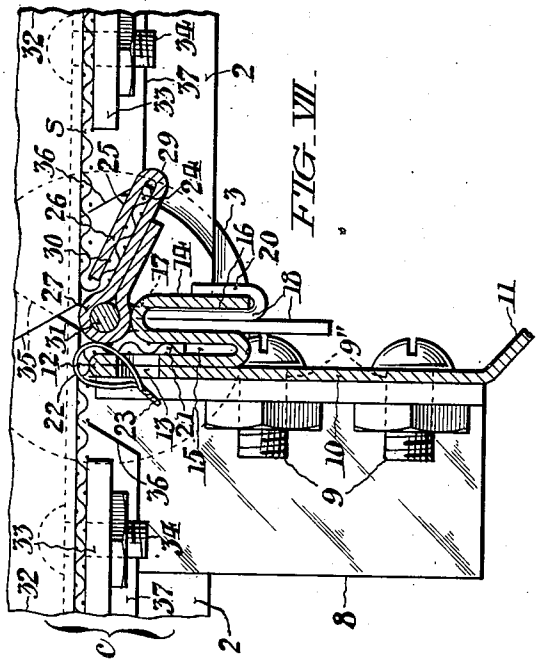


FIG. VII.

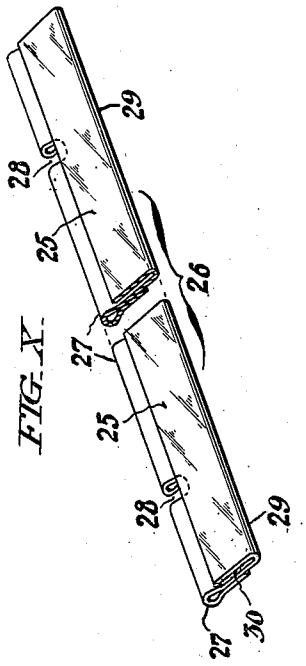


FIG. X.

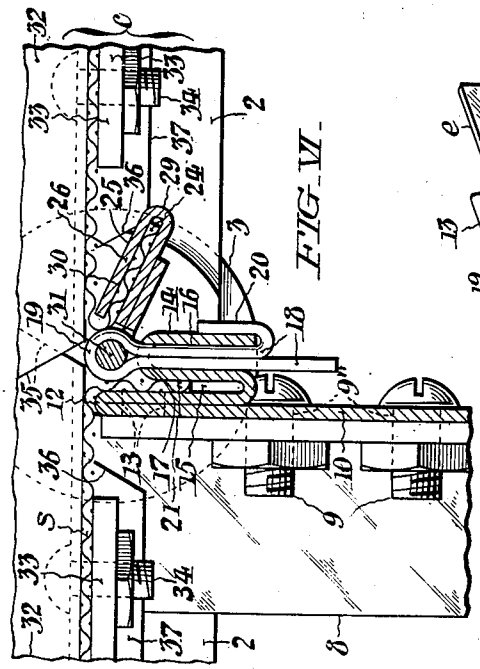


FIG. VI.

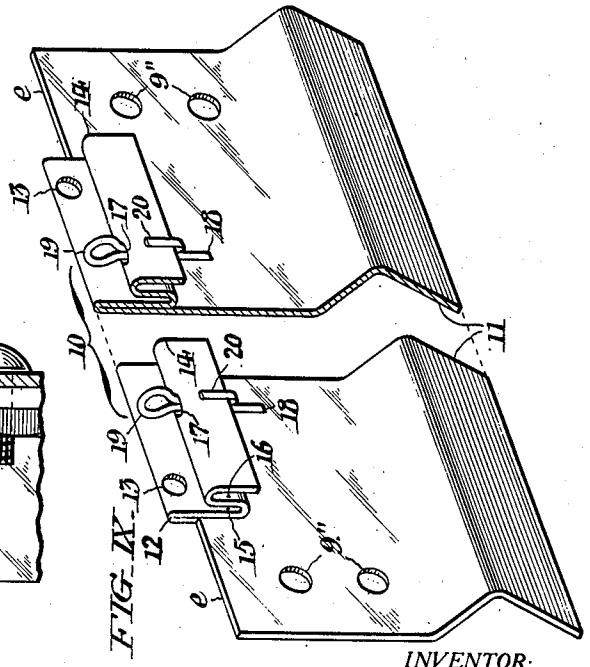


FIG. IX.

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Sept. 17, 1940. H. H. BELCHER 2,215,418

APRON CONVEYER

Filed March 17, 1938 6 Sheets-Sheet 5

FIG. XI.

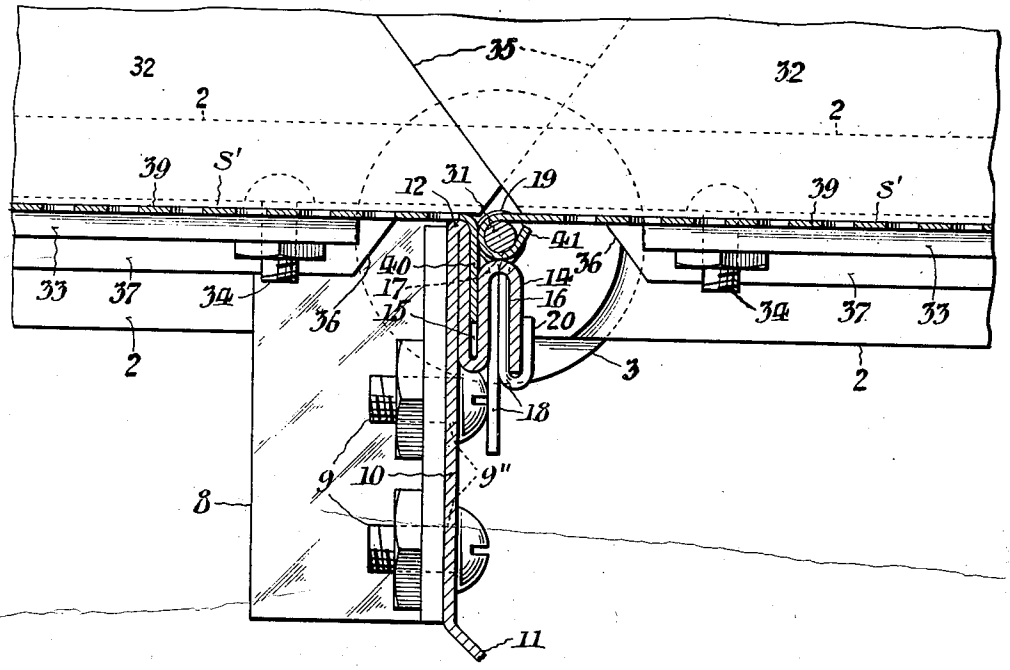
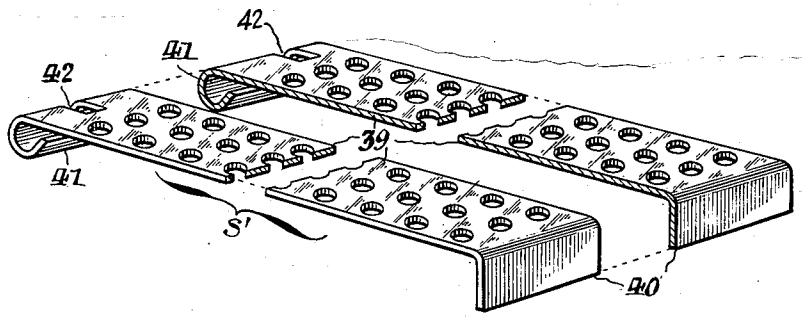


FIG. XII.



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APRON CONVEYER

Filed March 17, 1938 6 Sheets-Sheet 6

FIG. XIV.

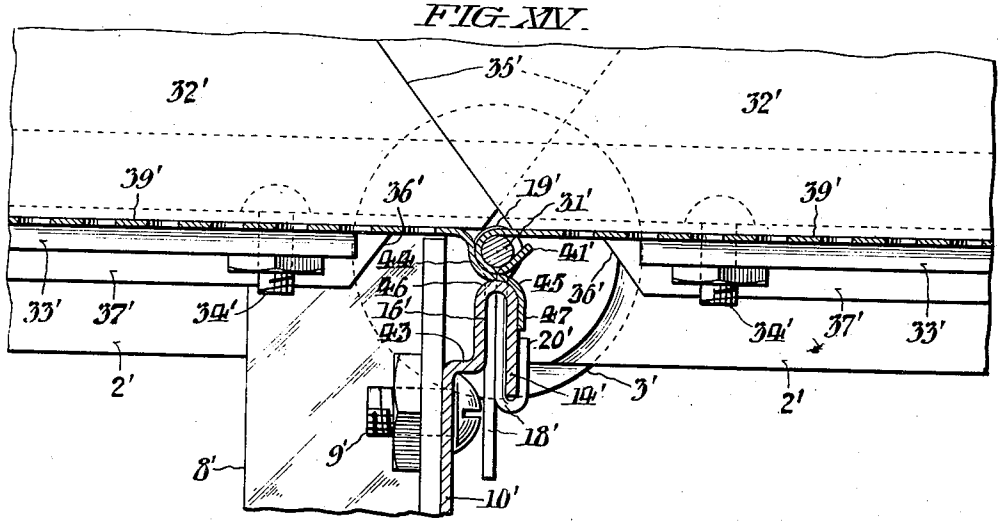


FIG. XIII.

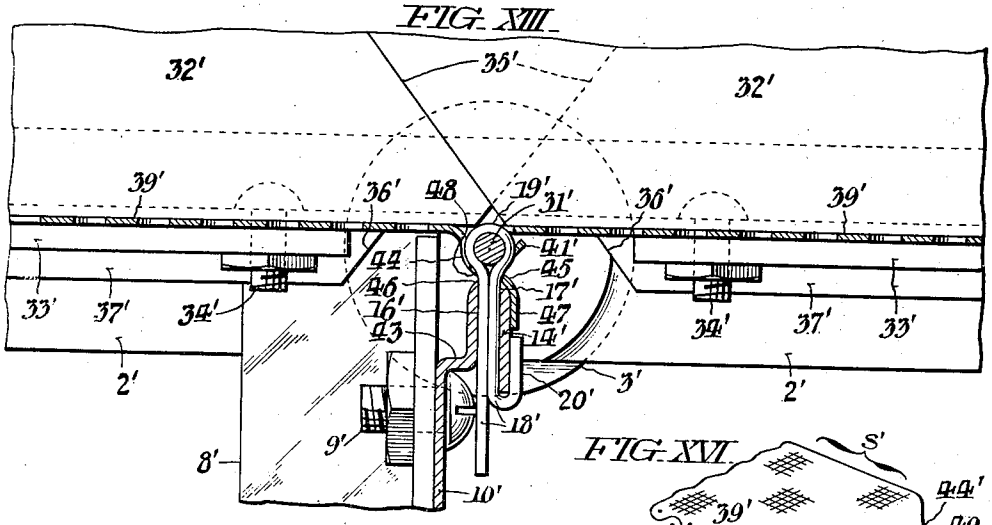


FIG. XVI.

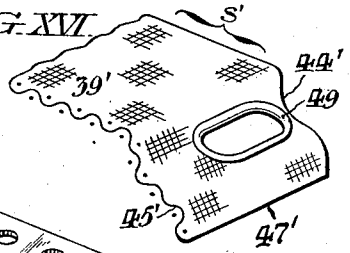
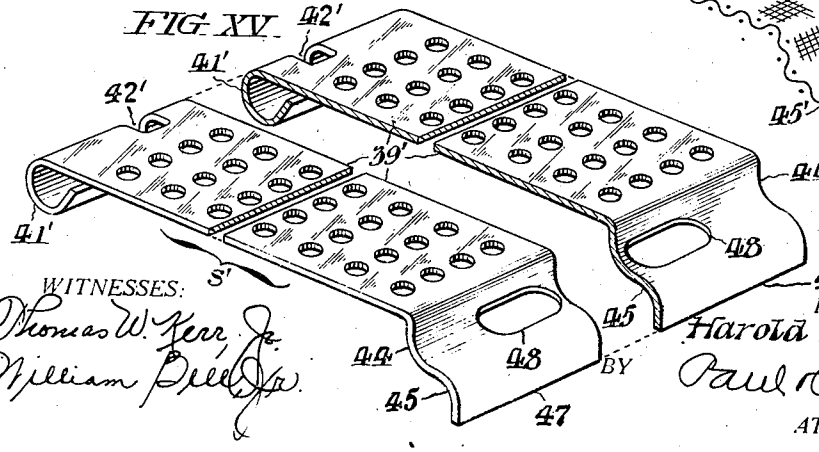


FIG. XV.



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Patented Sept. 17, 1940 2,215,418

UNITED STATES PATENT OFFICE

2,215,418

APRON CONVEYER

Harold H. Belcher, Philadelphia, Pa., assignor to Philadelphia Drying Machinery Company, Philadelphia, Pa., a corporation of Pennsylvania

Application March 17, 1938, Serial No. 196,308

15 Claims. (Cl. 198—194)

This invention relates to apron conveyers, and, more particularly, to those of the sectional type commonly used for transporting fibrous and analogous materials through drying machines in which heated air is circulated.

In most of the known types of driers using wire mesh or the like as the transporting medium, adjoining sections of such material have been pivoted together in differing manners. For example in one type of drier using mesh material, the wires along the confronting edges have been fashioned into loops, so that when the adjoining sections are brought together with the loops in alignment, a suitable rod has been passed through said loops to provide the desired hinge connection. This construction, in practice, has been found fairly satisfactory where the mesh of the material is coarse and the wires correspondingly heavy, but in the case of fine mesh conveyer sections, the gage of the wire is invariably so small that there is not enough material to withstand normal wear and tear with the result that the use and life of such conveyers has been greatly reduced.

Again, in existing fine mesh screen conveyers of the type using belt lacing to connect the adjoining sections, the length of such sections must be made accurately to the pitch length of the chain components as there is very little, if any, freedom along the flight length of the conveyer with this type of hinge lacing. If the sections are made a trifle too long, the wire mesh must necessarily buckle to permit fastening the apron to the girt assemblies, with the belt lacing pins in line with the chain link pins. Similarly, if the sections should be a little short, the belt can be assembled only by straining the sections in order to bring the two halves of the belt lacing to a position where the pin can be inserted. Also, as wear takes place in the pivot pins and the side bars or links of the conveyer chain, so that the pitch thereof gradually increases, strains are set up in the conveyer sections which impose undue and detrimental loads on the section juncture or pivot pins.

An important object of this invention is to obviate the above noted disadvantages by using a separate hinge element or connector, which is of a character that positively ensures the requisite amount of pivotal strength and durability at the wearing surface substantially across the width of the conveyer without introducing interacting strains between sections either at assembly or as a later result of chain wear.

Another object is the provision of a hinge construction for conveyers of the indicated type in which the hinge element is relieved of any load carrying stress or strain.

A further object of this invention is the provision of a sectional apron conveyer which is simple in construction, durable and efficient in use, and not liable to any misaligning tendency between the consecutive sections.

With the above recited objects, and incidental advantages, in view, this invention consists in the provision of an apron conveyer characterized by the fact that the respective sections are not hinged directly together; or, in which one transverse edge of each enters into engagement with the girt in definite angular relationship thereto with the confronting transverse section edge pivotally connected to said girt.

For a clearer understanding of the invention and its merits, as well as to acquire a knowledge of the details of construction and means for reducing it to practice, reference is to be had to the following descriptive disclosure, while the features of novelty involved are more tersely expressed in the concluding claims.

In the drawings:

Fig. I is a fragmentary plan view of a sectional conveyer embodying one form of the invention, with a portion in section to better illustrate certain details of construction.

Fig. II is an elevation of the same.

Fig. III is a longitudinal section on the plane III—III of Fig. I.

Fig. IV is a cross-section on the plane IV—IV of Fig. I, drawn to a larger scale.

Fig. V is a similar section on the plane V—V in the same view, but drawn to still further enlarged proportions.

Fig. VI is a detail section of the hinge-structure as viewed on the plane VI—VI of Fig. I, but drawn to a larger scale for purposes of clarity.

Fig. VII is a similar section on the plane VII—VII of the same figure.

Fig. VIII is a detail view illustrating how the improved conveyer of this invention passes around its supporting sprockets.

Fig. IX is a broken perspective view of a girt construction involved in the invention.

Fig. X is a similar view to the preceding of the hinge section.

Fig. XI is a detail section along the lines of Figs. VI and VII of a modified form of the invention.

Fig. XII is a broken perspective view of the conveyer component involved in the structure of Fig. XI.

Figs. XIII and XIV are views substantially cor-

responding with Figs. VI and VII, respectively, of a further modified form of the invention.

Fig. XV is a broken perspective view of the conveyer component involved in the structure of Figs. XIII and XIV; and,

Fig. XVI is a fragmentary perspective view showing a different type of grommeted slot or wire mesh conveyer section and hereinafter further explained.

Referring more in detail firstly to Figs. I–X, inclusive, the form of this invention illustrated thereby is one which may, preferably, be employed in driers for fibrous materials such as wool, cotton and the like. As shown, the apron conveyer *c* is formed of sections *s* of wire mesh, or other appropriate reticulate or foraminous material, said sections at their confronting edges being attached to a girt member, later described, one edge of the section being in direct engagement with the girt, and the other edge being attached to the girt by hinge means, comprehensively designated *h*, and later on described in detail. The conveyer *c* is preferably carried by side chains consisting of spaced outer and inner links 1, 2, respectively, with intervening rollers 3, freely rotative on pin-and-sleeve connections 4, 5 in accordance with known practice, said chain links 1, 2 being adapted for passage around sprockets 6 on shafts 7 in an obvious manner.

Integral with, or rigidly secured to the leading end of each inner link 2, proximate the associated pivot pin 4, is an angle bracket 8, affording attachment, as by stove-bolts 9, passed through holes 9'', for the chain spacing or cross girts 10, which are constructed to ensure the desired load carrying capacity for the conveyer *c*. Each girt 10 is preferably made from sheet metal with its lower edge, below the bracket 8, suitably shaped at 11 for stiffening purposes, while the upper edge is cut out along its sides and retroverted at 12 into contact with the girt body, and said retroversion is provided with spaced holes 13, proximate its upper edge, for a purpose hereafter explained. The girt side cut-out portions provide extensions *e* for attachment to the inwardly-directed flanges of the angle brackets 8. The retroversion 12 is also appropriately shaped to provide an inverted U-shaped portion 14 in spaced relation to said retroversion and, jointly defining upwardly-open and downwardly-open grooves 15, 16, respectively; while the U-shaped bend 14 is provided with holes 17, intermediate those 13 previously referred to, said holes 17 being of a diameter for snug reception of the split shank 18 of cotter pins 19, with the lower part 20 of the one shank portion bent back into contact with the confronting leg of the U-shape 14 to prevent removal of said cotters.

The conveyer section *s* may consist of a length of reticulate screening as shown in Figs. I–X; or, they may be formed of perforate sheet metal as illustrated in Figs. XI–XV. Each such section *s* measures in one dimension approximately the "pitch" of the chain links 1, 2; or, in other words the distance between the axial centers of the chain pins 4; and in the other dimension the sections *s* run continuously across the full width of the conveyer *c* as best understood from Figs. IV and V. The "leading" end of each consecutive section *s*, it is to be noted, is bent downward, with the downturned part or lip 21 inserted in the upwardly-open groove 15 in the girt 10, and to which it is secured by flexible fastening means 22, best seen in Fig. VII. Each such means 22, preferably, consists of a short length of appropriate gage wire bent to staple-form and inserted through the screening *s* and girt holes 13 from above, in an obvious manner, with the free ends twisted together at 23 therebelow. On the other hand, the "trailing" end of each section *s* is retroverted to provide a bend 24 which is clamped or securely clinched between an overfold 25 of a hinge-section 26 of a dimension substantially equalling the width of said section *s*. The hinge-section 26, as best shown in Figs. VI, VII and X, consists of a length of sheet metal longitudinally retroverted and formed along the side paralleling the overfold 25 to embody a substantially-tubular or hinge portion 27, which is suitably cut-out or slotted at intervals to provide notches 28 for the reception of the looped heads of the cotter pins 19; while the opposing side or overfold 25 of said hinge-section is retroverted at 29 to form a groove 30 in which the bent-back "trailing" end 24 of the section *s* is firmly secured or clinched. Now it will be readily apparent that, with the just described construction, as the conveyer *c* passes around the sprocket 6, the angle between the girts 10 and the conveyer section down-turned lips 21 is always maintained without any variation from its initial position; the hinge action necessary, incident to rounding the sprocket being entirely relegated to the section 26, cotter pins 19, and the inserted hinge pins or rods 31 employed for connecting the one edge of each section *s* to the girt 10. It is to be here remarked that the hinge pins 31 align with the axes of the associated chain pin-and-sleeve connections 4, 5.

In order to prevent material carried by the conveyer *c* from falling-off the sides of the sections *s* and at the hinges *h*, each said section is fitted with a side guard 32 fastened thereto and to an underlying flat strip 33 by suitable securing means 34. These side guards 32 are of appropriate length to provide end overlaps 35, and are laterally stepped in cross-section for their major extent, as well as cut away at 36 to leave only their upper vertical flanges forming the overlaps 35; while the lower vertical flange parts 37 defined by the lateral stepping are of a depth to protect the section side edges from damage or "fraying" when the sections *s* are made of wire mesh. It will also be seen that the guard overlaps 35 are so shaped that a practically continuous side wall is maintained not only when the conveyer *c* is on its transporting and return flights but similarly when rounding the sprockets 6, as clearly understandable from Figs. II, III and VI more particularly. In conjunction with the conveyer side guards 32, stationary guards 38, indicated by dot-and-dash lines in Figs. IV and V, may be used, said latter guards being rigidly supported in proximate relation to the movable guards 32, so as to extend well below the top of the guards 32, in accordance with known practice.

Referring now to Figs. XI and XII, all those parts corresponding with the items hereinbefore described are similarly designated by like reference characters in order to obviate unnecessary repetitive descriptive explanation. The distinguishing feature of this form of the invention consists in the use of sections *s'*, formed from a sheet 39 of perforate metal, with one end angled to provide an attaching lip 40 for fixture in the groove 15, as previously set forth in connection with Figs. I–X. The other end of the perforate sheet 39 is suitably fashioned to provide hinge loops 41 with spaced cut outs 42, respectively, for insertion of the hinge pin 31, and free accommo-

dation of the heads of the cotter pins 19, as before described.

Figs. XIII, XIV and XV, show a further modification of the invention, or an alternative manner of engagement between the "leading" ends of the perforate sheet metal sections 39' similar to those of Figs. XI and XII, and the girts 10, without the use of securing means such as 22 in Figs. I–X. In this form of the invention the girt 10' is stepped at 43 and formed to inverted U-shape 14' as before described. Incidentally it will be seen the retroversion 12 is dispensed with and that the girt 10' is provided with only a downwardly-open groove 16', and holes 17' for insertion of the cotter pins 19'. Furthermore, the leading end of the section 39' is offset to provide merging corrugations 44, 45; the former of which 44 is of a curvature to receive the hinge loops 41' of the adjacent section, while the latter 45 is of a curvature to snugly engage the top rounding 46 of the inverted U-shape 14', with provision of a lip 47 normally in abutment with the forward leg portion of said U-shape. In addition the holes for accommodation of the heads of the cotter pins 19' are formed more in the nature of elongated slots 48 so as to permit the head of said cotter pins to pass freely therethrough for convenience in assembling the conveyer c, or when replacing a worn or damaged section 39'. In assembling this form of the conveyer c, the "leading" end of the section 39' is placed on top of the girt 10' with the corrugation 45 contacting the girt rounding 46 and the heads of the cotter pins 19' projecting through the spaced slots 48; whereupon the "trailing" end of the adjoining section hinge loops 41' is lined up with the notches 42' engaging the cotter pin heads, when the hinge pin 31' is inserted, and the section connection completed. All other parts in Figs. XIII–XV having their equivalents in Figs. I–XII are correspondingly designated with "primed" references to avoid repetitive description.

Fig. XVI illustrates a fragmentary portion of the "leading" end of a wire-mesh section s having the said end formed in accordance with the disclosure in Figs. XIII–XV, inclusive, the only difference being that the slots for the cotter pin heads are fitted with grommets 49 to prevent disruption of the surrounding mesh; accordingly similar references to those used for explaining the alternative structural features shown by Figs. XIII–XV are applied with an added prime for form differentiating purposes.

From the foregoing disclosure the merits and advantages of this invention will be clearly understood by those conversant with the art, but it is desired to herein emphasize the more pertinent features of novelty. In the first place, it will be obvious that in each form of the invention described, the hinge pins 31, 31' do not have any load to carry, when the conveyer c is in use, as the lower edge of the hinge tubular portions 27, 41, or 41', transmit the load directly to the top of the girt U-shapes 14 or 46. Furthermore, the clearance between the screen lips 21 and 40, as well as the diameter of the hinge pins 31 or 31' in relation to the hinge loops 27, 41 and 41' may be made so that considerable allowance for slight variation in either the width of the sections s, s' or 39, 39', or variations in the pitch of the chain pins 4 are readily accommodated. In other words, by providing for a reasonable degree of easy fit in the parts just mentioned, the conveyer sections s, s' or 39, 39', may be considered as automatically adapting themselves to minor structural inaccuracies, alignment defects, as well as expansive and contractive changes produced by extremes in temperature. Another characterizing distinction of this invention over the prior art resides in the fact that the sections s, s', 39, or 39', are not hinged directly together; one end edge thereof being angularly connected, in the manner described, to the conveyer girts 10 or 10', whereas the other end edge is hingedly connected to such girts, guarding against strains being imposed on the said sections. An important consideration with this type of conveyer apron, especially as shown in Fig. XI, is that the conveyer has a considerable amount of freedom to adjust itself to mechanical misalignment or to inaccuracies in the manufacturing. It is very common in existing conveyers to find that the angle between the conveyer chains and the cross girts is not exactly ninety degrees. With the construction of Fig. XV, the edge 44, 45 of the conveyer sections s' may move slightly underneath the edge of the adjoining section 41', and thus compensate for such misalignment without exerting any strains on either the girt or the sections.

Without further elaboration, the foregoing will so fully reveal the gist of this invention that others can, by applying current knowledge, readily adapt it for various utilization by retaining one or more features that, from the standpoint of the prior art, fairly constitute essential characteristics of either the generic or specific aspects of this invention, and, therefore, such possible adaptations should be, and are intended to be, comprehended within the meaning and range of equivalency covered by the following claims.

Having thus described my invention, I claim:

1. An apron conveyer comprising spaced link chains, transverse girts carried by the chains, spaced eyes on said girts in approximate alignment with the chain link pivots, foraminous sheet conveyer sections between the girts and having one transverse edge supported by one girt, spaced openings in said section edge for passage of the eyes aforesaid, said openings being an easy fit for the eyes to accommodate relative operating movements between the section and the girt in the plane of said section, and the adjoining section end edge being of hinge formation with spaced notches corresponding to and for reception of the aforesaid eyes, and pivot pins inserted through said eyes and aligned hinge portion.

2. An apron conveyer comprising spaced link chains, transverse girts carried by the chains, spaced eyes on said girts in alignment with the chain link pivots, foraminous sheet conveyer sections between the girts, each said section having one transverse edge angularly-connected to one girt, the adjacent section end edge being provided with transversely-aligned hinge loops and intervening notches corresponding to and for reception of the spaced eyes, and a pivot pin inserted through said eyes and hinge portions.

3. An apron conveyer as defined in claim 2, in which each conveyer sheet section has one transverse edge acutely angled, and a hinge forming strip of sheet metal is clinched across said transversely angled edge.

4. An apron conveyer comprising spaced link chains, transverse girts carried by the chains, spaced eyes attached to said girts in alignment with the chain link pivots, foraminous sheet conveyer sections between the girts, each said sec-

tion having one end edge engaging one girt in definite angular relationship thereto and the other end edge having hinge connection to another girt, said hinge connection including spaced notches corresponding in number to and for reception of the aforesaid eyes, and pivot pins inserted through said eyes and hinge portion.

5. An apron conveyer as defined in claim 4, in which the foraminous sheet conveyer section consists of reticulate material with a strip of retroverted sheet metal attached to one of the transverse edges to form the hinge connection.

6. An apron conveyer comprising spaced link chains, transverse girts carried by said chains, eyed cotter pins engaged through spaced holes in said girts and attached thereto, the eyes of said cotter pins being in alignment with the chain link pivots, foraminous sheet conveyer sections between the girts, each said section having one transverse edge sustained by one girt and in definite fixed angular relationship thereto, the other transverse edge of said section being formed to hinge section with spaced notches corresponding to and for reception of the aforesaid cotter pin eyes, and pivot pins inserted through said eyes and hinge sections.

7. An apron conveyer comprising spaced link chains, transverse girts carried by said chains, split cotter pins inserted through spaced holes in said girt and attached thereto, the eyes of the cotter pins being in axial alignment with that of the chain link pivots, foraminous sheet conveyer sections between the girts, each said section having one end edge rectangularly bent down and fixedly attached to one girt, the other end edge of each section being formed to substantially tubular section with spaced notches corresponding to and for reception of the cotter pin eyes, and pivot pins inserted through said eyes and tubular section edge.

8. An apron conveyer comprising spaced link chains with angle attachments near the link pivots, transverse girts secured to said angle attachments, spaced eyes engaged in the girts in axial alignment with the chain link pivots, foraminous sheet conveyer sections between the girts, each said section having one end edge angled down for support by one girt in definite angular relationship thereto with the other end edge formed to substantially hinge cross-section for pivotal connection to the following girt, said hinge cross-sectioned edge having spaced notches corresponding to and for reception of the aforesaid eyes, and pivot pins inserted through said eyes and tubular section.

9. An apron conveyer comprising spaced link chains, transverse girts carried by the chains, spaced eyes sustained by said girts in axial alignment with the chain link pivots, foraminous conveyer sections between the girts, each such section having one transverse edge connected to one girt in definite angular relationship thereto and the other transverse edge retroverted to substantially hinge formation with spaced notches, said notches serving for passage of the spaced eyes on the adjoining girt, pivot pins inserted through said eyes and hinge formation, and guard elements attached to the longitudinal sides of each foraminous section adjacent the chains to form continuous side walls for the conveyer.

10. An apron conveyer comprising spaced link chains, transverse girts carried by the chains, spaced eyes sustained by the girts in axial alignment with the chain link pivots, foraminous sheet conveyer sections between the girts, each said section having one transverse edge of corrugate-angled cross-section for support by one girt, openings at intervals along said edge for passage of the spaced eyes, the other transverse section edge being formed to provide a substantially tubular-section hinge portion with interval notches corresponding to and for reception of the aforesaid eyes, pivot pins extending through said eyes and hinge portion, and guards attached to each edge of the conveyer sections adjacent to the chains to form continuous side walls for the conveyer.

11. An apron conveyer comprising spaced link chains, angle attachments secured to the chains near the chain link pivots, transverse girts sustained by said angle attachments, spaced eyes supported by said girts in axial alignment with the chain link pivots, foraminous sheet conveyer sections between the girts, each said section having one edge angularly-supported by and connected to one girt, spaced openings in said section edge for passage of the aforesaid eyes, and the adjoining section edge formed to hinge section with corresponding notches for reception of the spaced eyes and openings, and pivot pins inserted through said eyes and hinge section edge.

12. An apron conveyer comprising spaced link chains, foraminous sheet sections between the chains, each said section having one transverse edge bent to a right-angle and the other transverse edge formed to hinge cross-section with spaced notches therein, inwardly-projecting brackets on the chains proximate the chain link pivots, transverse girts secured to said brackets, each girt being in part of inverted U section lengthwise with spaced holes through said section, split-shank cotter pins inserted in said holes with the eye portions in alignment with the chain link pivots and having individual shank portions secured to the adjoining U-section leg, the eye portions of said cotter pins engaging in the foraminous sheet hinge-section notches, means securing the adjoining sheet section rectangularly-bent edge to said girt, and a pivot pin through the first mentioned sheet hinge-section edge and the cotter pin eyes pivotally connecting said section to the girt.

13. An apron conveyer in accordance with claim 12, wherein the rectangularly bent edge of each section is connected with the body portion thereof by intervening reversely-directed merging curvatures, and transversely-directed slots medially pierce said merging curvatures for free passage of the cotter pin eye portions.

14. An apron conveyer comprising spaced roller chains, inwardly-projecting brackets on the spaced chains near the roller axes, transverse girts secured to said brackets, each said girt embodying an upwardly open groove with a paralleling inverted U-section providing a downwardly-open groove, spaced holes through the U-section rounding, split-shank cotter pins in said holes having their eyes outwards and their shanks anchored to the U-section, said cotter pins registering in the hinge element notches, foraminous sheet sections between the girts, each said section having one end bent to define a rectangular lip and the other end retroverted to an acute angle bend, a hinge element with one edge formed to tubular cross-section and the opposing edge retroverted for reception and attachment of the foraminous acute angled bend, spaced notches across the hinge element tubular portion,

means securing an adjoining foraminous section rectangular lip to one girt, with said lip engaged in its upwardly-open groove, a pivot pin through one foraminous section hinge element tubular portion and the cotter-pin eyes for hinging it to the associated girt, and guards attached to the aligned foraminous sheet sections forming continuous side walls for the conveyer.

15. An apron conveyer as defined in claim 14, wherein the means for rigidly securing each foraminous section rectangular lip to the girt comprises spaced holes near the upper edge of the latter, and wire staples passed through the foraminous section and said holes from one side, with the free ends of each staple secured together at the other side thereof.

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