April 15, 1952 A. L. LEE 2,592,915

CHAIR AND IDLER ROLL STAND ASSEMBLY FOR CONVEYERS

Filed March 8, 1945 4 Sheets-Sheet 1

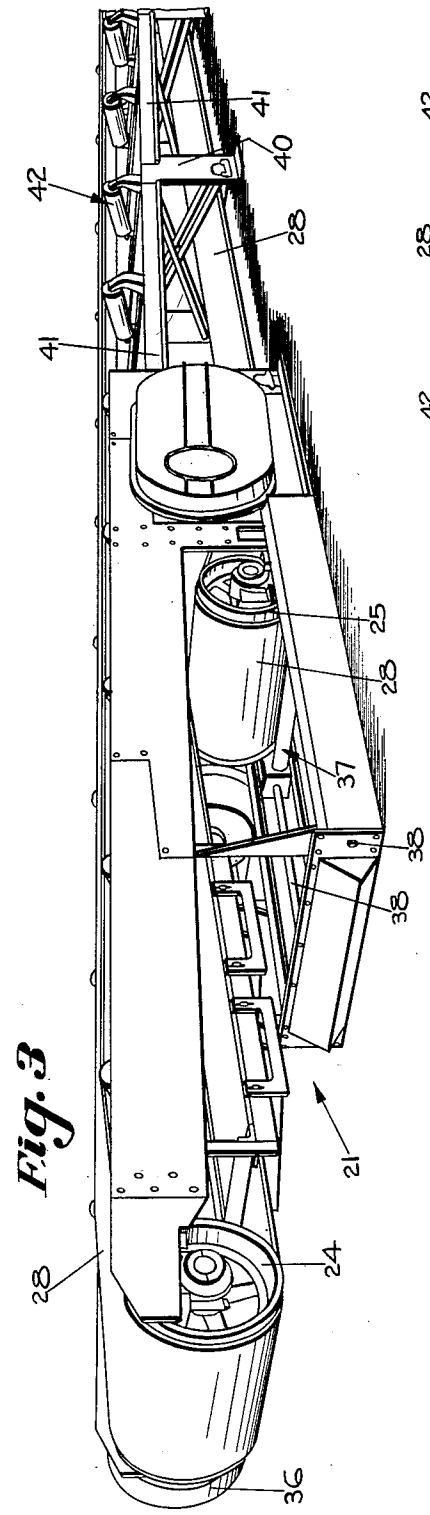


Fig. 3

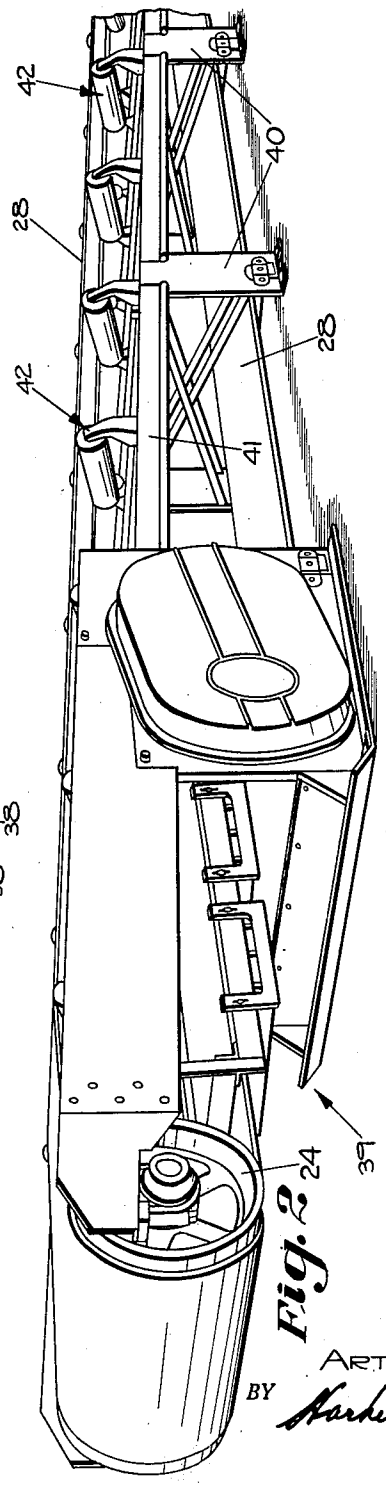


Fig. 2

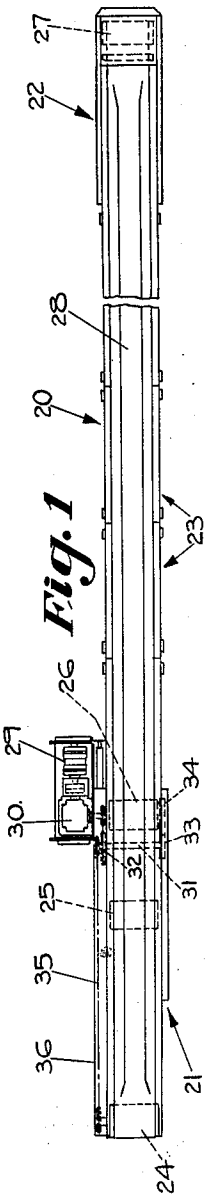


Fig. 1

INVENTOR;
ARTHUR L. LEE,
BY Harder H. Mitten,
ATTY.

April 15, 1952 A. L. LEE 2,592,915

CHAIR AND IDLER ROLL STAND ASSEMBLY FOR CONVEYERS

Filed March 8, 1945 4 Sheets-Sheet 2

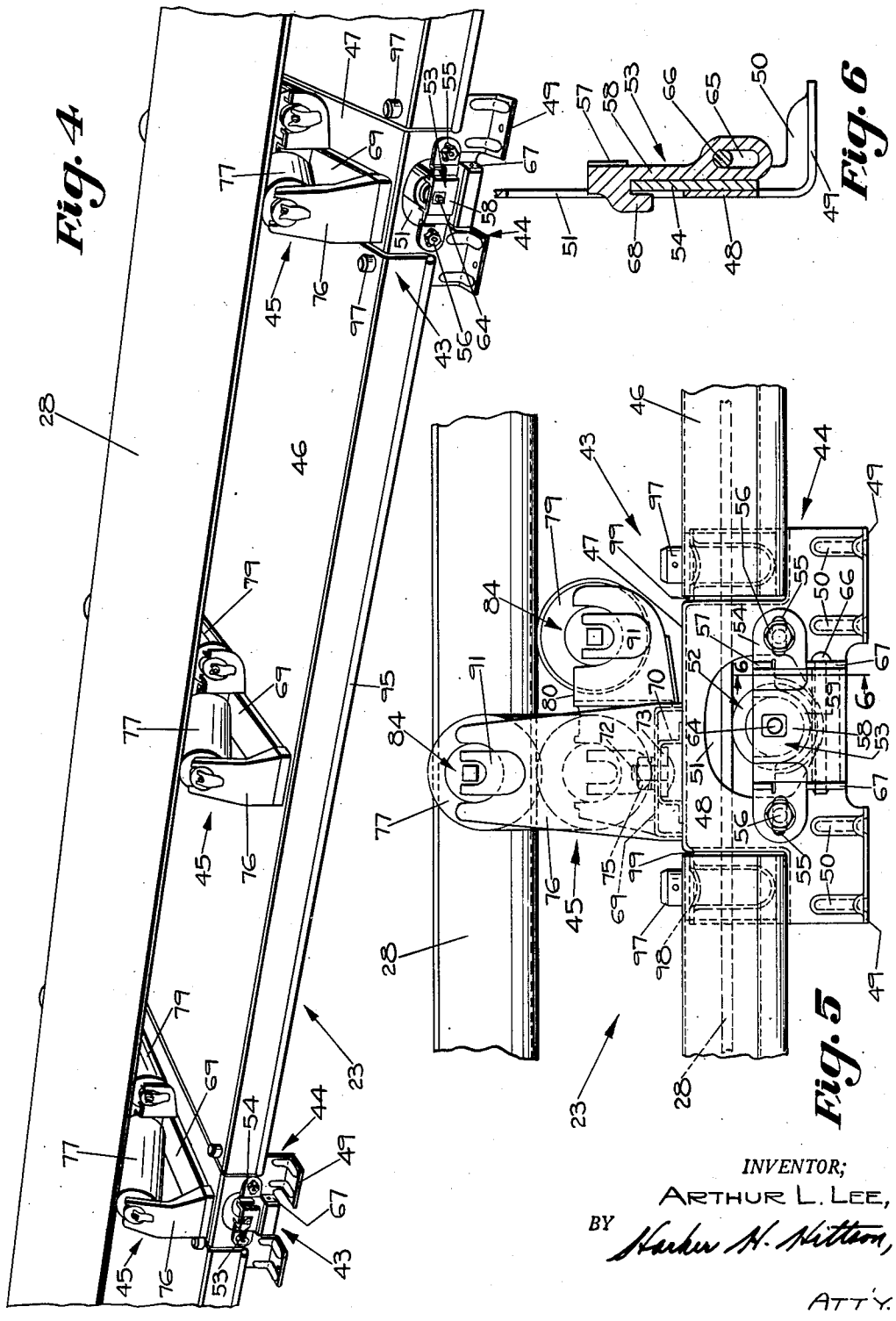


Fig. 4

Fig. 6

Fig. 5

INVENTOR;
ARTHUR L. LEE,
BY Harlow N. Hitton,
ATT'Y.

April 15, 1952 A. L. LEE 2,592,915

CHAIR AND IDLER ROLL STAND ASSEMBLY FOR CONVEYERS

Filed March 8, 1945 4 Sheets-Sheet 3

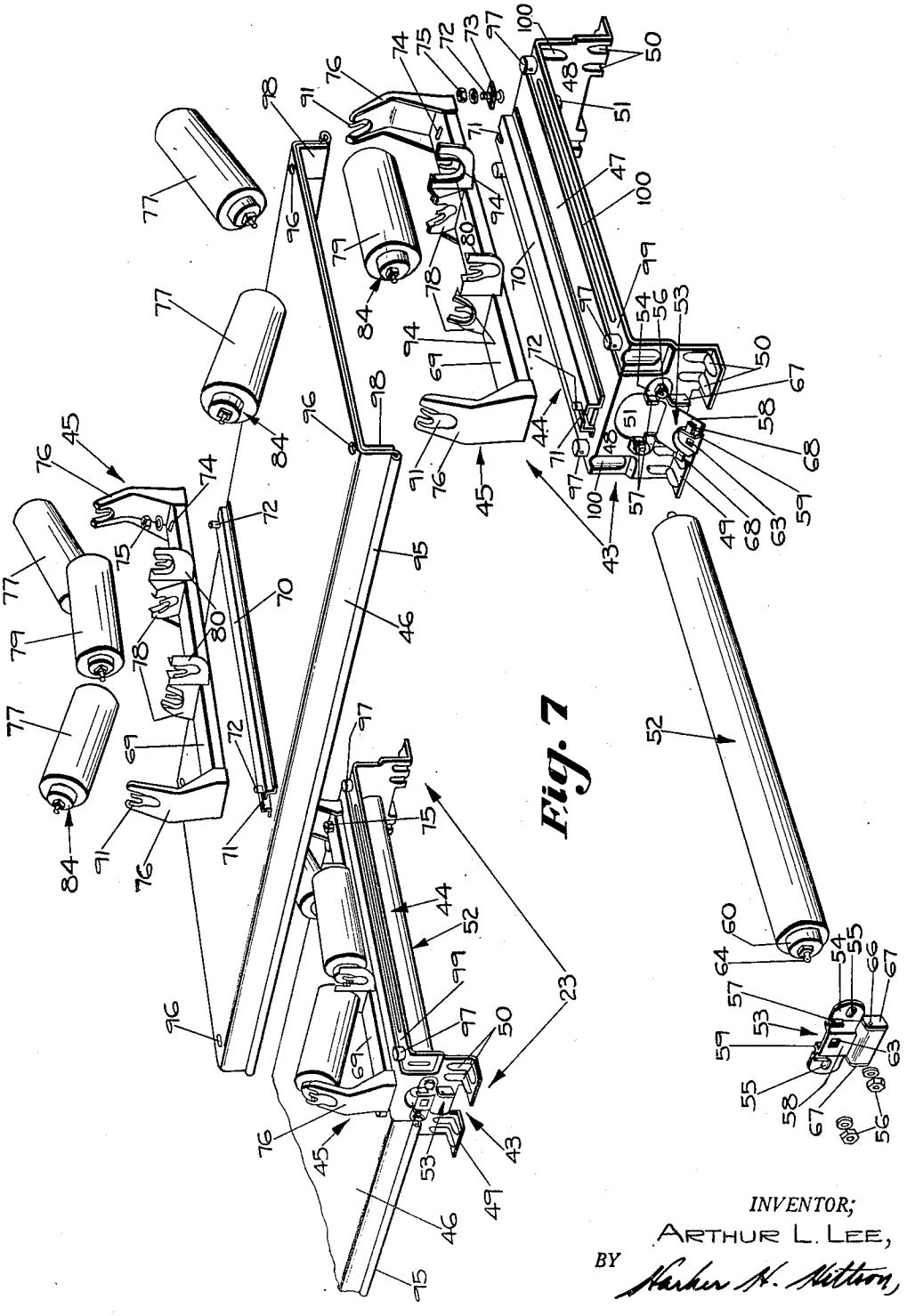


Fig. 7

INVENTOR;
ARTHUR L. LEE,
BY Harker H. Kitton,
ATT'Y.

April 15, 1952 A. L. LEE 2,592,915

CHAIR AND IDLER ROLL STAND ASSEMBLY FOR CONVEYERS

Filed March 8, 1945 4 Sheets-Sheet 4

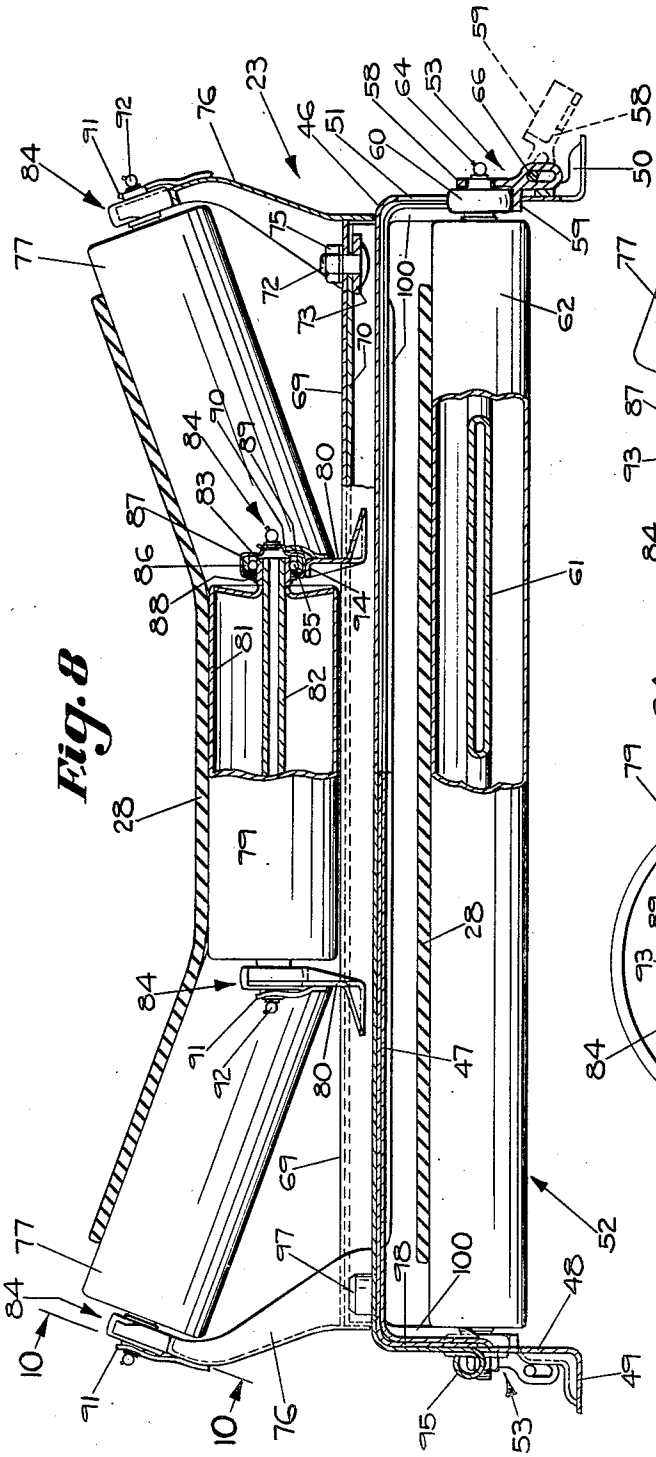


Fig. 8

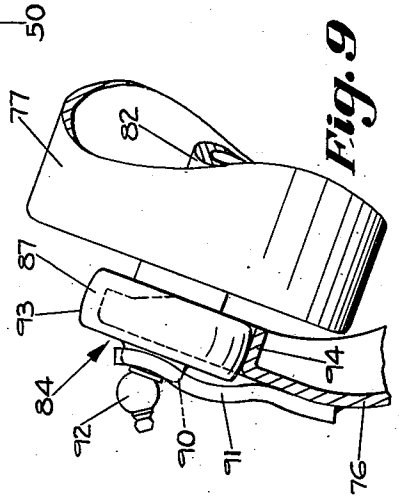


Fig. 9

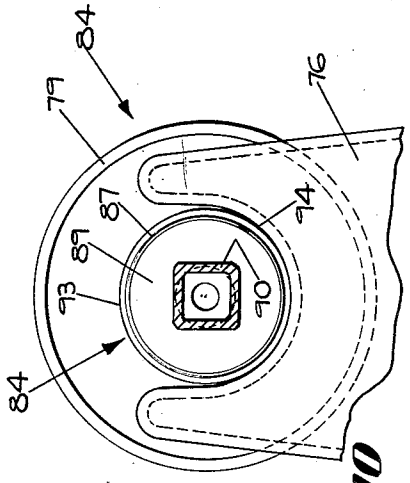


Fig. 10

INVENTOR;
ARTHUR L. LEE,
BY Parker & Watson,
ATT'Y.

Patented Apr. 15, 1952 2,592,915

UNITED STATES PATENT OFFICE

2,592,915

CHAIR AND IDLER ROLL STAND ASSEMBLY FOR CONVEYERS

Arthur L. Lee, Upper Arlington, Ohio, assignor, by mesne assignments, to The Jeffrey Manufacturing Company, a corporation of Ohio

Application March 8, 1945, Serial No. 581,630

7 Claims. (Cl. 198—192)

1

This invention relates to a belt conveyor, and more particularly to the structure of chairs and chair and idler roll assemblies that carry the belt of the conveyor.

An object of the invention is to provide an improved chair of simplified construction as well as an improved chair and idler roll stand assembly of simplified, rugged, and inexpensive construction.

Other objects of the invention will appear hereinafter, the novel features and combinations being set forth in the appended claims.

In the accompanying drawings,

Fig. 1 is a plan view, somewhat diagrammatic, illustrating a sectional belt conveyor incorporating the features of my invention;

Fig. 2 is an enlarged perspective view of one form of head section of the conveyor seen in Fig. 1;

Fig. 3 is a view, similar to Fig. 2, showing a different form of head section incorporating a novel drive for the belt, as well as a belt tensioning or take-up roller which is located ahead of a relatively stationary driving roller of the head section;

Fig. 4 is a perspective view of an intermediate section of the conveyor, including two chairs and associated idler stands;

Fig. 5 is an enlarged side elevational view of a chair and associated idler stand of an intermediate section, together with the interconnected pans and a portion of the associated belt;

Fig. 6 is an enlarged sectional view taken on the line 6—6 of Fig. 5, looking in the direction of the arrows;

Fig. 7 is an exploded view of an intermediate section of the belt conveyor, also showing an associated chair and idler stand, together with the connecting pan, in perspective;

Fig. 8 is a transverse sectional view, with certain parts also shown in section along different planes, showing particularly the chair, idler stand and associated pan of an intermediate section of the conveyor;

Fig. 9 is an enlarged sectional view through the supporting bracket of one of the idler bearing assemblies, with the bearing assembly and part of the associated pan shown in elevation; and

Fig. 10 is a view taken along the line 10—10 of Fig. 8, looking in the direction of the arrows.

Referring particularly to Fig. 1 of the drawings, it will be seen that the conveyor includes a frame which as a whole is designated by the reference character 20; said frame 20 being formed of a head or drive section 21, a foot or tail section 22,

2

and a plurality of intermediate sections 23, the number of which may be varied to provide a conveyor of variable length.

The head section 21 is disclosed more in detail in Fig. 3 of the drawings, and includes a head pulley 24, an adjustable or belt tensioning pulley 25, and a drive pulley 26. When this particular form of head section is employed, the foot or tail section 22 is non-adjustably connected to the intermediate sections 23. As a consequence, the foot or tail pulley 27 of the tail section 22 is not adjustable with respect to the intermediate sections 23. The take-up pulley 25 compensates for any stretching of an endless conveyor belt 28, the upper run of which extends continuously between the foot or tail pulley 27 and head or discharge pulley 24 over troughing idlers including those supported by intermediate sections 23.

The return run of belt 28, upon leaving the head pulley 24, is guided rearwardly around the drive pulley 26, then forwardly around the adjustable pulley 25, and then rearwardly again through the intermediate sections 23 to the tail pulley 27.

As illustrated diagrammatically in Fig. 1 of the drawings, the drive pulley 26 is driven from a motor 29 through a speed reducer 30 which drives a transverse shaft 31 through chain and sprocket drive mechanism 32. The shaft 31 has a gear 33 on the opposite end from that of chain and sprocket drive mechanism 32, which meshes with another gear 34 keyed to the shaft of the drive pulley 26.

It is desirable that at least two pulleys drive the belt 28 and consequently I also drive the head pulley 24. This is effected by providing a chain and sprocket drive mechanism 35 between the shaft 31 and the head shaft associated with head pulley 24. This drive mechanism 35 is preferably provided with a casing 36.

The above described arrangement of the head section is particularly desirable because it eliminates the necessity of providing for adjustment of the foot or tail pulley 27 and also eliminates undesirable features of prior known devices in which belt tensioning or adjustable pulleys have been associated with the head sections of underground belt conveyors. In general, in these prior devices the tensioning pulley was an additional pulley over the three otherwise employed, involving the head pulley and a pair of drive pulleys. Thus, there were normally more than three pulleys in such head sections. Furthermore, they have been located to the rear of the

drive pulley or pulleys and this has caused complications and, in some instances, undesirable increasing of the height of the rear portions of the head sections.

In my improved arrangement, with the adjustable pulley 25 ahead of, rather than behind, the drive pulley 26, there is inherently more clearance for it, since it is desirable to have the head section gradually sloping upwardly and forwardly. Furthermore, by providing the driving arrangement of the drive pulley 26 and the head pulley 24, I still maintain two driving pulleys or drums.

The forward and rearward or longitudinal adjustment of the tensioning pulley 25 is provided by virtue of the fact that it is mounted on a carriage 37 slidable in the base portion of the frame of head section 21 and adjustable by a pair of threaded rods or screws, one of which is seen at 38, there being a similar one on the opposite side; the head of said opposite screw being clearly seen in Fig. 3 of the drawings and also being designated 38.

The threaded rods or screws 38 are preferably connected to rotate in unison by well known chain and sprocket connecting mechanism, not illustrated, and by turning the head of either screw 38, they will both rotate together to adjust the carriage 37 and its associated tensioning pulley 25, thus to adjust the belt tension.

In Fig. 2 of the drawings, I have illustrated a more or less standard form of head section 39 which differs from head section 21, first of all, in that it has no belt tensioning pulley 25. On the other hand, it is provided with a pair of driving rollers, one of which is comparable to the above described roller 26, the other of which is mounted on a shaft generally similar to shaft 31.

The general manner of reeving the belt 28 around the two drive pulleys of the head section 39 is similar to the manner in which the belt 28 is reeved about pulleys 25 and 26. In this modified head section 39, the head pulley 24 is preferably not driven. Also when this head section 39 is employed, the tail section 22 is preferably constructed to provide for tensioning adjustment of the tail or foot pulley 27, in a manner well understood in this art.

The head sections 21 or 39, as the case may be, include what is generally termed a special intermediate head end section which may, for the purpose of this description, be considered as a portion of the head section, these special intermediate sections being seen to the rear of the drive pulleys in Figs. 2 and 3 of the drawings.

It may be stated, in general, that these special intermediate head sections include special chairs 40, removable interconnecting pans 41, and roll or idler stand assemblies 42 including troughing idlers which, except for obvious differences, are all generally similar in construction to their counterpart elements of the intermediate sections, which are disclosed and described in full detail hereinafter. Obviously, however, the chairs 40 will be of greater height than those of the intermediate sections.

Attention is now directed particularly to Figs. 4 to 10, inclusive, and to the construction of the intermediate sections 23 and the constituent parts thereof. The intermediate sections 23 are built up of a plurality of spaced-apart similar chair and idler or roll stand assemblies 43 which are of similar construction and the principal parts of each of which are a chair 44 and an idler or roll stand 45.

Interconnecting adjacent chair assemblies 43 and holding them in proper spaced relation and alignment, while providing for a certain amount of flexibility in their relative vertical positions, is an interconnecting frame member in the form of an inverted U-shaped pan 46, the structure of which is described in detail hereinafter.

Each chair 44 is formed of a rigid inverted U-shaped structural steel member having a generally horizontal flat top cross-piece or cross plate 47 with a downwardly extending or upright leg or plate 48 at each end thereof, each leg 48 being provided with a pair of ground engaging feet 49. The feet 49 and adjacent portions of the leg 48 are preferably provided with reinforcing depressions or indentations 50. The legs 48 and associated construction on each side of the transverse cross-piece 47 are of similar construction. Each leg or plate 48 includes a centrally disposed opening 51 which is of sufficient size to provide for extending a return idler or roll 52 therethrough, which return idler 52 is supported by the chair 44 in a manner hereinafter described, and which supports the return run of the belt 28 and also provides for training of said return run of the belt.

Adjacent each opening 51 is an adjustable bracket assembly 53 which provides for the removable supporting of the adjacent end of the return idler 52 and also provides for adjustment of said supported end forwardly and rearwardly relative to the direction of travel of the belt 28 in a horizontal plane, or, in other words, provides for training adjustment of said idler 52.

The bracket assembly 53 includes a longitudinally extending generally U-shaped strap or plate 54 forming wings having elongated slots 55 adapted to receive nuts and bolts 56 which attach said wings of the strap 54 to the plate or leg 48 on opposite sides of the opening 51 and adjacent thereto. Elongated slots 55 provide for the training adjustment of the bracket assembly 53, since they provide for forward and rearward adjustment of one end of the return idler 52 which is supported by said bracket assembly 53.

The inner edges of the strap or plate 54 are sheared and bent out to provide guide tabs 57 which act as guides and abutting means for a pivoted U-shaped bracket 58, at the upper and inner portion of which there is a U-shaped bearing or supporting member 59 which receives and supports a bearing assembly 60 of the idler 52, there, of course, being duplicate bearing assemblies 60 on opposite ends of a hollow live shaft 61 (see Fig. 8) of the idler 52; the ends of the shaft 61 being welded to the ends of a cylindrical roller 62 of said idler 52. The shaft 61 extends beyond the ends of the roller 62 and is supported by the bearing assembly 60 in a manner similar to that hereinafter described in connection with the troughing idlers.

The bracket or plate 58 also includes a square opening or hole 63 which receives a squared projection on the bearing assembly 60 and thus holds said bearing assembly 60 against rotation. This squared projection is also preferably provided with a grease fitting 64 by which the bearing of the bearing assembly 60 is lubricated.

At its bottom, the bracket or plate 58 is provided with an elongated pivotal opening 65, (see Fig. 6), which receives a pivot pin 66 rigidly connected to and extending between a pair of spaced

outwardly extending wings 67 formed on the bottom of the strap or plate 54. The top of the bracket or plate 58 is provided with a pair of spaced lugs or hooks 68 (see Fig. 6), there being one adjacent each edge and on opposite sides of the U-shaped member 59, the lugs or hooks 68 being adjustable so that they can be lifted over and then moved downwardly to form an interlocking relation with inward projections of the strap or plate 54 relative to opening 51, as clearly illustrated in Fig. 6 of the drawings.

The normal assembled relation of the parts of the bracket assembly 53 is illustrated in Figs. 4, 5 and 6 of the drawings, for example, and it is to be noted that the co-operating relation between the hooks 68 and projecting portions of the plate or strap 54 holds the U-shaped bracket 58 in a position to receive and support the idler 52 through the bearing assembly 60. Opposite ends of the idler 52 are supported by the two similar bracket assemblies 53 and bearing assemblies 60. The relation of parts provides a self-aligning type of bearing in a manner which is described more completely hereinafter, in connection with troughing idlers.

The training effect of the idler 52 may be adjusted by adjusting the bracket assembly 53 on either or both of the legs 43 of the chair 44. This, of course, is effected by loosening the nuts 56, after which adjustment they are tightened to clamp the bracket assemblies 53 in position. An idler 52 may be removed from either side of the chair by the simple expedient of first lifting upwardly on the bracket or plate 58, then lifting the hooks 68 free of the projecting portions of strap or plate 54, as provided by the elongated pivotal opening 65. Thereupon, the bracket 58 may be swung downwardly and outwardly, as illustrated in Fig. 7 of the drawings, and the idler 52 can be moved outwardly as suggested in said Fig. 7, wherein an idler 52 is shown laterally of a chair 44.

The hollow construction of shaft 61 of the idler 52 also provides for lubricating the bearings of both bearing assemblies 60, by applying grease to one of them. This may be desirable, particularly where only one of the grease fittings 64 is readily accessible. This is also described more completely in connection with the troughing idler roller, and it is to be understood that the fundamental relation between the roller and bearing assembly of the return idler 52 is the same as that of each troughing idler. Each bracket 58, of course, not only supports the associated bearing asembly 60, but also takes any end thrust on the idler 52.

Referring particularly to Figs. 4 and 7 of the drawings, it will be seen that upon each chair 44 and forming a part of the assembly 43, is an idler or roll stand 45. Furthermore, intermediate each chair and stand assembly 43 and supported by an interconnecting pan 46 is a similar idler or roll stand 45. Each roll stand 45 includes an inverted U-shaped base or channel 69 which is adapted to rest on the cross-plate 47 of a chair 44 or on top of an inverted U-shaped pan 46.

The channel 69 extends over and is directly attached to and guided by an inverted U-shaped idler stand guiding and chair reinforcing member 70 which has feet or wings at the bottom thereof, which are welded or otherwise rigidly attached to cross-piece 47. A similar member 70 is provided substantially at the center of each

pan 46 to receive the associated idler stand 45, and to reinforce said pan 46.

In view of the channel shape of the base 69 it obviously will fit over the member 70 and the ledges provided by the feet thereof will act as guides to provide alignment of the idler stand 45 on the cross-piece 47, or the pan 46, as the case may be. However, adequate clearance is provided between the upright webs of the base or channel 69 and the ledges provided by the feet of the cross-member 70, so that the longitudinal axis of the base or channel 69 may be angularly adjusted with respect to the longitudinal axis of the member 70. This provides for manual adjustment of the angle of the base 69 with respect to the axis of movement of the belt 28, thus providing for training action on said belt 28.

The opposite ends of the U-shaped members 70 are provided with open slots 71 through which bolts 72, provided with large square heads 73, extend, which square heads 73 co-operate with the side walls of the members 70 to prevent rotation of the bolts 72. The bolts 72 extend through elongated slots 74 and receive clamping nuts 75. The elongated slots 74 provide the training adjustment of the idler stands 45 above mentioned.

The idler stands 45 also include a pair of similar or complementary end brackets 76 which support the outer and upper ends of inclined troughing idlers 77, the inner and lower ends of which are supported on spaced brackets 78. In addition, a center or horizontal idler 79 is provided, which is supported on spaced brackets 80; all of the brackets above mentioned being mounted on the base 69, with the last mentioned brackets spaced laterally from the others, relative to the axis of said idler stand 45.

Except for the inclined relation of the idler rollers 77, produced by the fact that the brackets 76 are longer than the brackets 78, the important structure of the brackets 76, 78 and 80 is similar.

In Fig. 8 of the drawings I have illustrated in some detail the structure of the idler 79 and the associated bracket 80. Said idler 79 includes a cylindrical roll 81 with integral heads or ends which are welded or otherwise permanently attached to a transversely extending hollow shaft 82. In other words, the hollow shaft 82 is a live shaft and rotates with the roll 81. The shaft 82 extends along its own axis beyond the opposite heads of the roll 81, forming projections which receive, for example, as by a relatively tight fit, the inner race 83 of a ball bearing assembly designated generally by the reference character 84.

The ball bearing assembly 84 is identical in construction to the previously mentioned bearing assembly 60. It includes a series of precision balls 85 which ride on the inner race 83 and within an outer race 86. The ball bearing formed by the inner and outer races 83 and 86 and the balls 85 is essentially of standard ball bearing construction, except that the outer periphery of the outer race 86 is crowned or is a segment of a sphere.

The ball bearing 83—86 is mounted in a casing or housing 87 which is preferably formed of mild pressed steel, the casing or housing being open at one side and receiving a grease seal 88 which closes the opening of the casing in cooperation with the rotating inner race 83.

The outer race 86 and casing or housing 87 are, of course, stationary, and the outer end of the casing 87 includes an integral head or plate 89,

at the center of which is a boss or projection 90 which has square sides extending into a U-shaped bifurcated clip 91 which co-operates with said square boss or projection 90 to prevent rotation of the bearing assembly 84. Furthermore, as best illustrated in Fig. 9 of the drawings, the prongs of the clip 91 are preferably curved at their points of contact with the head or plate 89 of casing 87, thus providing a rolling contact therewith.

Furthermore, said spaced points of rolling contact between the prongs of clip 91 and said head or plate 89 lie in a plane which passes through the axis of the shaft 82 or, in other words, through the axis of the idler 79, or of the idlers 77, as the case may be. It is thus evident that axial thrusts of the idlers 77 or 79 are taken by the bifurcated clips 91 along their axes and thus there is no rotating moment which tends to cause twisting or rotating of the bearing assemblies 84 in planes at right angles to their axes.

The squared sides of the projections or bosses 90 also serve an additional purpose. Said projections or bosses 90 are provided with grease fittings 92 which provide for lubrication of the bearings 83—86. As clearly illustrated in Fig. 9 of the drawings, the receiving nipple of these projections extends at an angle to the axis of the bearing assembly 84, and this nipple may extend to any one of four different angles, depending upon how the projection 90 is received by the prongs of the clip 91. The grease fitting will be held in any position to which it is thus adjusted.

By referring again to Fig. 8 of the drawings, it will be seen that at the center portion the head or plate 89 is close to, but slightly spaced from, the adjacent face of the inner race 83. This performs two functions. First of all, it provides a path which offers some resistance to the flow of grease which is delivered to the central portion of the casing or housing 87 through the fitting 92 and boss 99, so that the grease will not all flow to this immediate bearing, but a portion of it will flow through the central bore or passageway provided by the hollow shaft 82 and thus flow to the interior of the other bearing assembly 84 on the other end of the shaft 82. This is particularly important where, as in some instances, only one of the grease fittings 92 of any idler, is readily reached for lubrication. An illustration of this, of course, is found in the inclined idler 77, since the inner bearing assemblies are not readily reached for lubrication.

The structure above described also performs another very important function. In view of the flexibility of the integral head or plate 89 which is inherent in its structure and material, it will readily deflect under force, and thus it is possible, by putting a pipe or fitting over the boss 90, to apply pressure through the head 89 directly on to the inner race 83 without appreciable force traveling through the balls 85 which might cause Brinelling. This is of particular importance in assembling a bearing assembly 84 on the exposed portion of a shaft 82, as it is desirable that the inner race 83 have a reasonably tight fit with said shaft 82.

Attention is now directed to the mounting of the bearing assemblies 84. The portion of the casing 87, which is in close contact with the outer race 86, provides an outer bearing surface which is substantially a portion of a sphere, for example, a portion which might result from cutting a sphere by two spaced parallel planes equidistant from the major diameter thereof. In other words, if a plane were passed substantially through the center of the balls 85, it would cut a circle. If a plane were passed through the axis of the shaft 82 which is the same as the axis of the idler 77 or 79 and the axis of the bearing assembly 84, this plane would cut the housing 87 and on the top and bottom it would be along an arc which is preferably an arc of a circle, though it need not be so, provided it has a somewhat arcuate surface. The section of the bearing assembly 84, seen in Fig. 8, is taken along such a plane.

Thus, this bearing surface which is essentially a segment of a sphere and which is designated 93, will have a rolling contact with a co-operating U-shaped receiving portion 94 of the brackets 76, 78 or 80, as the case may be. In other words, insofar as said receiving portion 94 is concerned, it is the same on each of the brackets 76, 78 and 80.

This U-shaped receiving portion is generally flat, as viewed in section in a plane passing through the axis of shaft 82 or idler 77 or 79, as the case may be. It is obvious, of course, that the bearing surface provided by the receiving portion 94 may, if desired, be made convex in the inclined plane, and the bearing surface 93 might be made substantially cylindrical and produce a similar result. The important characteristic is that one of these surfaces should be convex relative to the other, as viewed in any plane through the axis thereof, thus to provide a rolling contact between the two bearing surfaces 93 and 94.

Also, as best illustrated in Fig. 10 of the drawings, the peripheral contact between the bearing surfaces 93 and 94 extends over an area which is preferably substantially 180° and is desirably at least 90° in extent.

In Fig. 10 of the drawings, the clearance provided for the insertion and removal of the bearing assembly 84 in the receiving portion 94 of bracket 76, has been slightly exaggerated.

The structure of each bearing assembly 84 and co-operating supporting and end thrust taking structures is of considerable importance. First of all, the bearing surface 93 has a large radial angle of contact with the supporting surface 94 and thus it will not become grooved, flat, or unduly worn. At the same time, the bearing assembly 84 is held against rattling in the associated bracket, since the contact between the bearing surfaces 93 and 94 extends preferably over 180°.

It has been found in practice that irregularities in manufacture quite generally produce some cyclic oscillation of portions of the bearings. In many such devices, where the inner and outer races of the bearings are held rigid, this produces binding and undesirable friction. In my arrangement, the bearing surface 93 is free to roll, as required for each cycle of operation, on the bearing surface 94, thus eliminating any undesirable binding or friction during operation. Furthermore, since the inner race of the bearing is the one that rotates, and since its peripheral diameter is less than that of the outer race, it is obvious that the frictional drag inherently produced by the rotation of the balls of the bearing will be a minimum and will be less than that where the outer race is the rotating one, and the inner race the stationary one. Still further, since the axial thrust is taken along a plane passing through the axes of the idlers, there will be no twisting effect on the bearing assemblies 84.

The rollers, bearings and the supports therefor as well as the self-aligning features provided

thereby are claimed in my divisional application, Ser. No. 704,783, filed Oct. 1, 1946, now Patent No. 2,554,037 dated May 22, 1951, for a Belt Conveyor. The rollers and bearings in combination and the bearings per se, above described, are claimed in my divisional application Ser. 763,822, filed July 26, 1947, for a Conveyor Belt Supporting Mechanism.

Referring now to Figs. 4, 7 and 8 of the drawings, it will be seen that each of the U-shaped pans **46** includes a rolled reinforcing bead **95** adjacent its bottom edge and at each end is provided with a pair of spaced holes **96** each adapted to receive and extend over a pin or projection **97** on the chair **44**. It is obvious that each chair **44** will have four pins **97**, one adjacent each corner of the cross-piece **47** thereof, and that the opposite ends of each pan **46** will be supported on adjacent chairs and held there by a pair of pins **97**.

Furthermore, adjacent each end, the pan **46** is provided with a U-shaped reinforcing and wear strap **98** which is welded or otherwise rigidly attached to the inner face of said pan **46** adjacent each end.

To provide a smooth contour between the edges of the pans **46** and the chairs **44**, for example, as best illustrated in Fig. 5 of the drawings, each chair is recessed at its opposite sides, both on the cross-piece **47** and on a portion of each leg **48**, to receive the strap **98** and the end portion of each pan **46**; these recesses being designated **99**. Also both the top and side portions of each recess **99** are provided with depressions or indentations **100** which reinforce these portions of the chair **44** and also act to provide smooth or rounded surfaces which may be contacted by the top or the edges of the return run of the belt **28**. In other words, this prevents the return run of the belt **28** contacting sharp or cutting edges and thus prevents damage being done to it.

From the above description, it is obvious that elements of the intermediate sections **23** of the belt conveyor may be broken down into a great many small parts and this is of importance in the transportation of intermediate sections, since they may be laid on top the belt and delivered to the point where they are to be used. In the drawings and in the preferred embodiment of the invention, the pans **46** are shown as one piece pans. If desired, however, they may be split down the middle or may be split into three parts, including a central portion and two side parts. If any such splitting is done, it may be desired to employ additional pins or projections **97**, to the end that each portion or at least each outside portion will have two pins holding it to each chair **44**.

It is further obvious that I have provided a belt conveyor intermediate section construction in which both the working and return runs of the belt may be trained. Furthermore, it is possible to remove an idler stand **45** and all its idlers, while other idler stands on opposite sides thereof are supporting the belt. For example, the idler stand **45** supported by pan **46**, may be removed, while the belt **28** is supported by idler stands on the chairs **44**, or vice versa.

It is, of course, obvious that each individual idler **77** or **79** may be removed and replaced by the simple expedient of lifting it upwardly out of its supporting bracket. Also any return idler **52** may be removed from either side of the chair by swinging its supporting bracket **52** downwardly and removing the idler **52** through an opening **51**. The other features of the belt conveyor are believed evident from the previous description thereof.

Obviously those skilled in the art may make various changes in the details and arrangement of parts without departing from the spirit and scope of the invention as defined by the claims hereto appended, and I therefore wish not to be restricted to the precise construction herein disclosed.

Having thus described and shown an embodiment of my invention, what I desire to secure by Letters Patent of the United States is:

1. In belt conveyor apparatus, an idler stand including a cross-piece and idler supporting brackets, supporting means for said idler stand including a substantially horizontal member having a guide co-operating with the cross-piece of said idler stand, and means removably connecting said idler stand to said supporting member, said cross-piece being of inverted channel structure which receives said co-operating guide and said guide including an inverted channel member rigidly attached to said supporting means, said removable connecting means including bolts extending through both said inverted channels and having square heads in the inverted channel member attached to said supporting means which square heads cooperate with the side walls of said last named inverted channel member to prevent rotation of said bolts.

2. A chair and idler roll stand assembly including a chair having a generally horizontal flat top cross-piece and an upright leg at each end thereof adapted to support an idler roll between them, said legs each having a ground engaging foot and an opening through which said idler roll may be extended, bracket means for supporting said idler roll adjustably associated with each of said legs, a relatively narrow inverted generally U-shaped chair reinforcing member on the top of said cross-piece, an idler stand on the top of said cross-piece including a relatively wide generally inverted U-shaped base adapted to rest upon said cross-piece and over said relatively narrow chair reinforcing member, and means for removably and adjustably securing said idler stand on said chair including bolts extending through said chair reinforcing member and said idler stand base, said bolts including heads engaging the sides of said chair reinforcing member whereby the latter prevents rotation of said bolts, said chair reinforcing member including slots through which said bolts may be removed.

3. A chair and idler roll stand assembly including a chair having a generally horizontal flat top cross-piece and an upright leg at each end thereof, a relatively narrow inverted generally U-shaped chair reinforcing member on the top of said cross-piece, an idler stand on the top of said cross-piece including a relatively wide generally inverted U-shaped base adapted to rest upon said cross-piece and over said relatively narrow chair reinforcing member, and means for removably and adjustably securing said idler stand on said chair including bolts extending through said chair reinforcing member and said idler stand base, said bolts including heads engaging the sides of said chair reinforcing member whereby the latter prevents rotation of said bolts, said chair reinforcing member including slots through which said bolts may be removed.

4. A sheet metal chair and idler roll stand assembly including a chair having a generally horizontally extending top cross-piece and an upright leg at each end thereof, a relatively nar-

row generally U-shaped sheet metal reinforcing means rigidly fixed to and extending across said top cross-piece, an idler stand on the top of said cross-piece including a relatively wide inverted generally U-shaped sheet metal base resting upon said cross-piece, and fastening means interconnecting said idler stand base and said chair, said chair reinforcing means limiting rotation of said fastening means in said chair.

5. A sheet metal chair for supporting an idler roll stand including a generally U-shaped sheet metal member having a generally flat horizontal top cross-piece and a downwardly extending leg at each end thereof provided with a ground engaging foot, and a relatively narrow inverted generally U-shaped sheet metal chair reinforcing member rigidly fixed on said flat top cross-piece having slotted ends adapted to receive means for securing said idler stand thereto.

6. A sheet metal chair for supporting an idler roll stand including a generally U-shaped sheet metal member having a generally flat horizontal top cross-piece and a downwardly extending leg at each end thereof provided with a ground engaging foot, and a relatively narrow inverted generally U-shaped sheet metal chair reinforcing member rigidly fixed on said flat top cross-piece forming means adapted to receive fastening means.

7. A sheet metal chair for supporting an idler roll stand including a generally U-shaped sheet metal member having a generally horizontally extending top cross-piece and a downwardly extending leg at each end thereof, and sheet metal

means rigidly fixed on said top cross-piece forming a relatively narrow generally U-shaped channel adapted to reinforce said top piece and to receive fastening means for securing said idler stand to said chair.

ARTHUR L. LEE.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
625,342	Lynch	May 23, 1899
1,499,319	Reid	June 24, 1924
1,502,976	Baldwin et al.	July 29, 1924
1,629,054	Smith	May 17, 1927
1,762,772	Fisher	June 10, 1930
1,837,480	Philips	Dec. 22, 1931
2,094,748	Philips et al.	Oct. 5, 1937
2,128,309	Madeira	Aug. 30, 1938
2,165,759	Nyborg	July 11, 1939
2,179,187	Kendall	Nov. 7, 1939
2,207,790	Fairbairn et al.	July 16, 1940
2,278,363	Broshkervitch	Mar. 31, 1942
2,283,825	Sloane	May 19, 1942
2,312,610	Weis et al.	Mar. 2, 1943

FOREIGN PATENTS

Number	Country	Date
391,426	France	Aug. 28, 1908
429,336	Great Britain	May 28, 1935
508,902	Great Britain	July 7, 1939