March 3, 1964 C. V. DONALDSON 3,123,200

WORK TRANSPORTER SYSTEM

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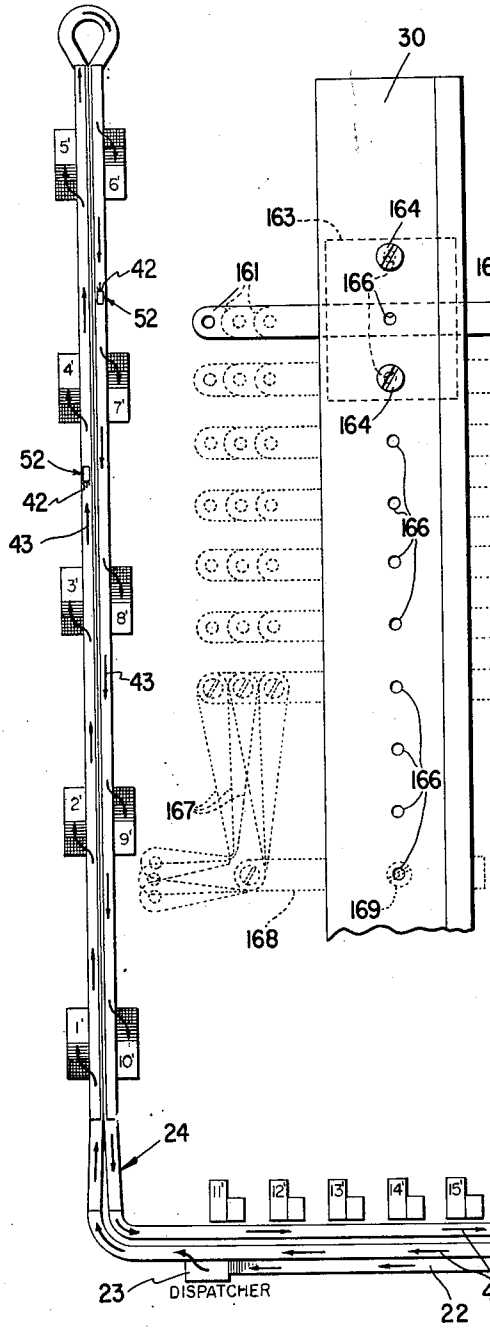

Fig. 1.

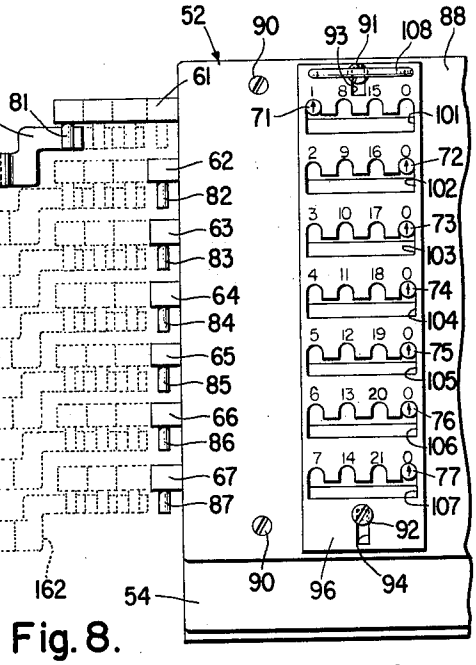

Fig. 8.

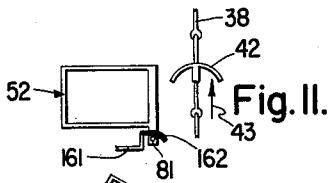

Fig. 11.

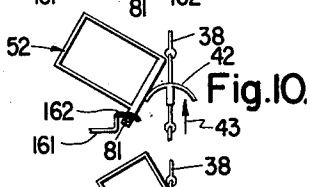

Fig. 10.

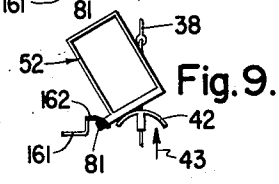

Fig. 9.

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WORK TRANSPORTER SYSTEM

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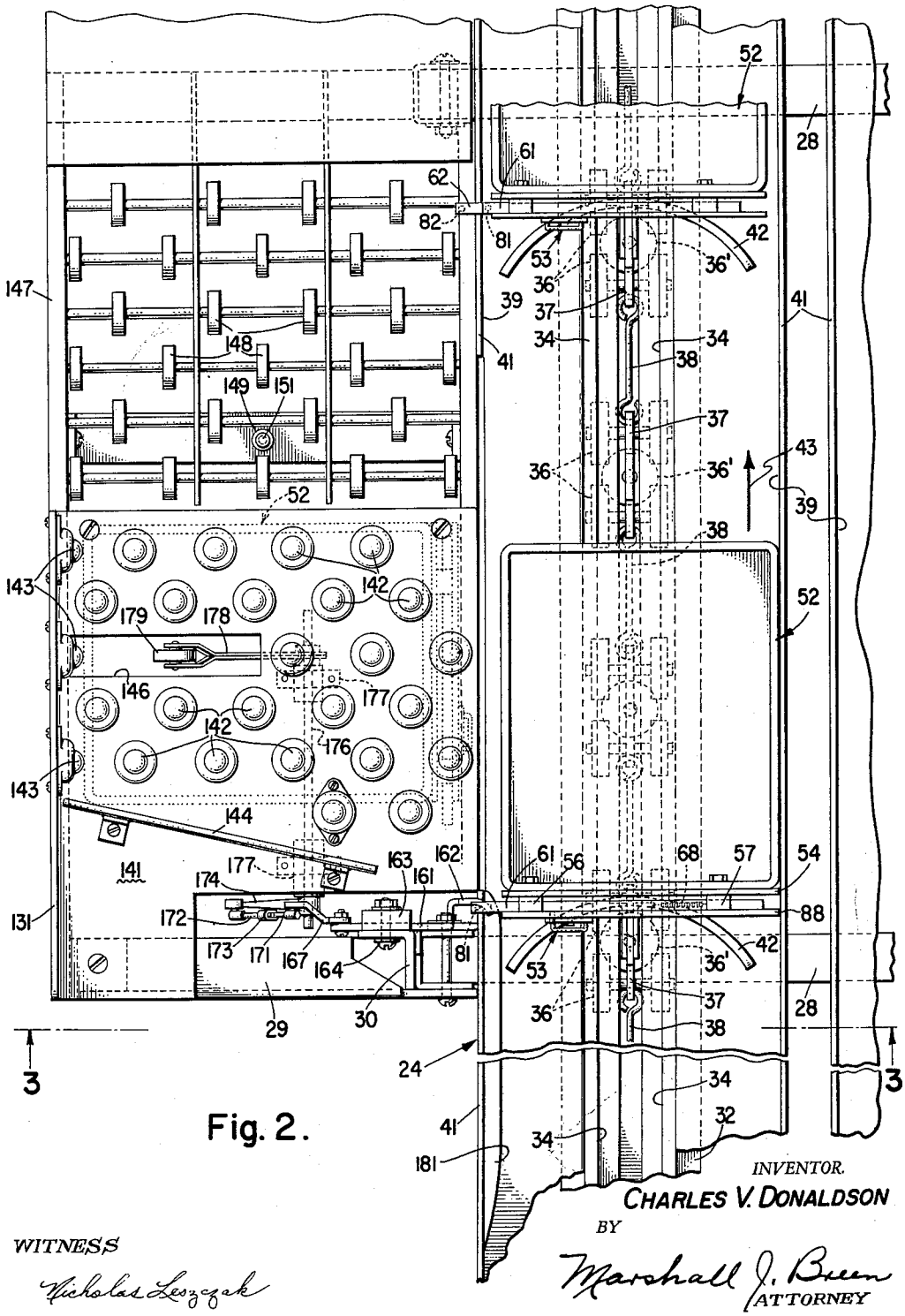

Fig. 2.

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WORK TRANSPORTER SYSTEM

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Fig. 3

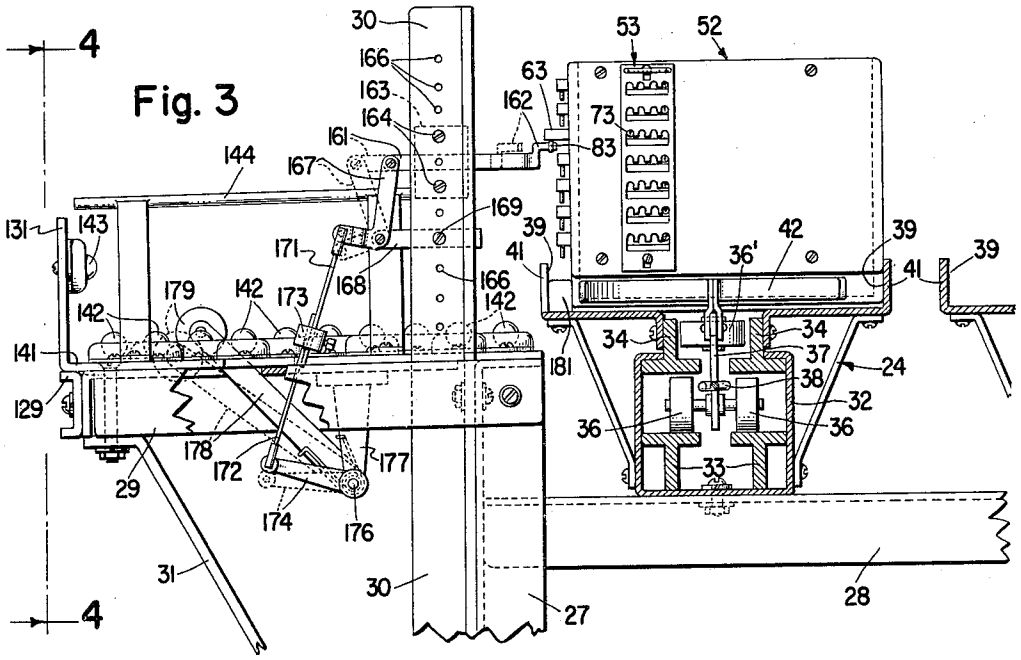
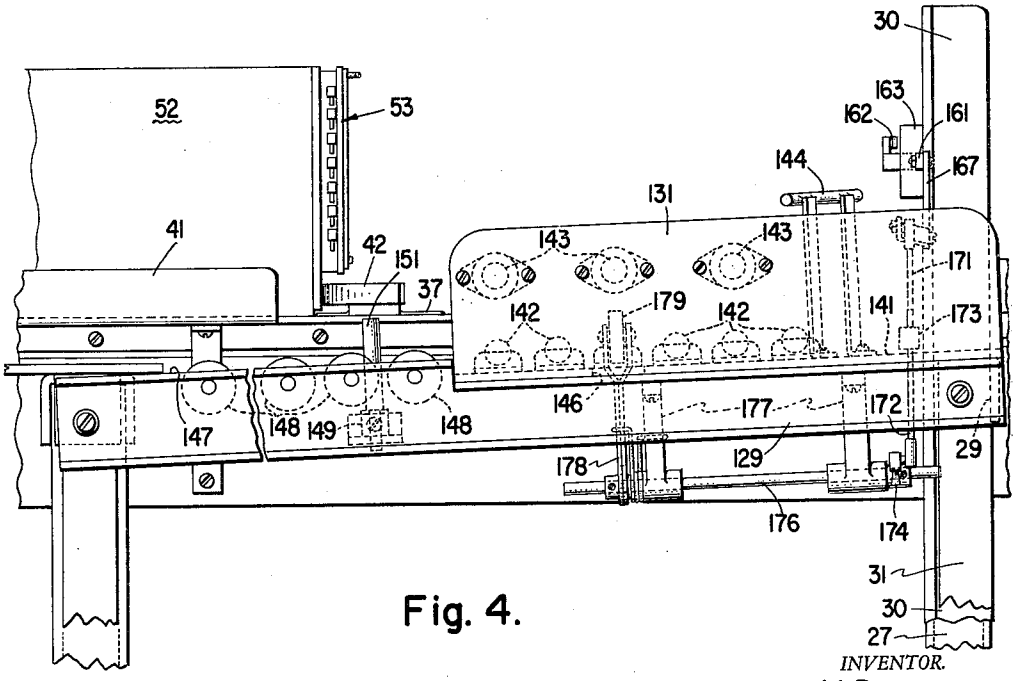


Fig. 4.



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WORK TRANSPORTER SYSTEM

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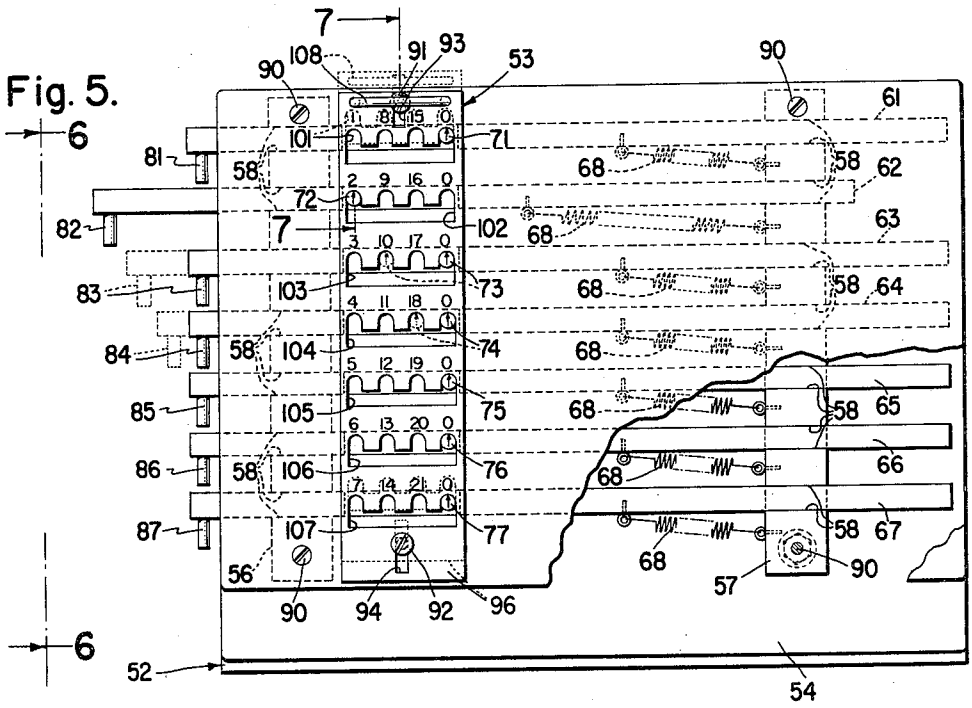
Fig. 5.



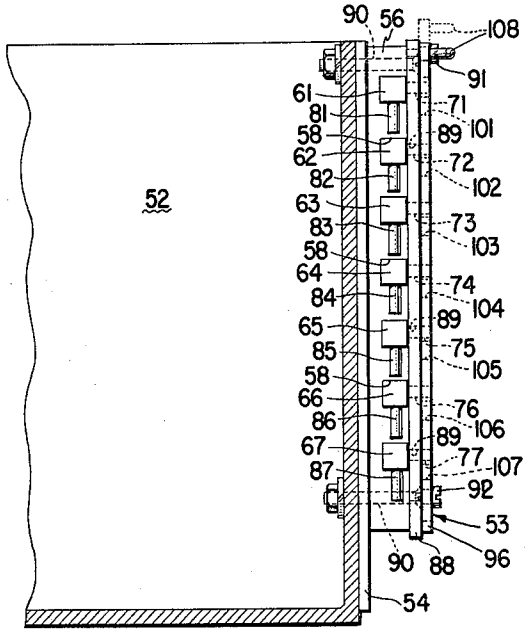


Fig. 6.

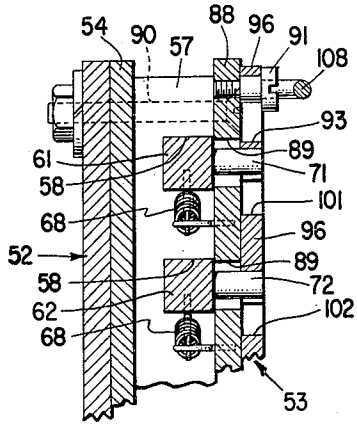


Fig. 7.

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WORK TRANSPORTER SYSTEM

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Filed Apr. 7, 1961, Ser. No. 101,500
1 Claim. (Cl. 198—38)

This invention relates to work transporter systems especially adapted for use in needle trade factories where various sewing machine operations are performed on garments, shoes, etc. More particularly, the present invention relates to improved work stations and tote boxes especially adapted for use with this type of work transporter system and the primary object of the present invention is to provide improved devices of this character.

Another object of the invention is to provide an improved work station pull-off device.

A further object of the invention is to provide an improved station selector assembly for use with tote boxes.

A still further object of the invention is to provide an improved means for automatically removing a tote box from a conveyor.

Another object of the invention is to provide improved station selector equipment whereby any individual tote box can be indexed so that it will be pulled from a conveyor at any selected work station.

A further object of the invention is to provide means whereby, if one or more tote boxes are located at any one work station, additional tote boxes indexed for that station will by-pass the said station.

Another object of the invention is to provide means whereby a catch finger may become engaged and later on disengaged from a station selector hook.

With the above and other objects in view, as will hereinafter appear, the invention comprises the devices, combinations and arrangements of parts hereinafter set forth and illustrated in the accompanying drawings of a preferred embodiment of the invention, from which the several features of the invention and the advantages attained thereby, will be readily understood by those skilled in the art.

In the drawings:

FIG. 1 is a plan view of a work transporter system suitable for use in needle trade factories showing work stations and tote boxes embodying the present invention,

FIG. 2 is an enlarged plan view of a portion of the work transporter system shown in FIG. 1 and specifically illustrating a typical work station and a tote box,

FIG. 3 is a fragmentary elevational view, partly in section and partly broken away, taken on the line 3—3 of FIG. 2,

FIG. 4 is a fragmentary side elevational view taken on the line 4—4 of FIG. 3,

FIG. 5 is an enlarged partly broken away end view of the tote box shown in FIGS. 1–4 inclusive,

FIG. 6 is a vertical view with walls of the tote box shown in section, and taken substantially on the line 6—6 of FIG. 5,

FIG. 7 is a fragmentary elevational view taken on the line 7—7 of FIG. 5,

FIG. 8 is an enlarged vertical view showing portions of the mechanism illustrated in FIGS. 1–7 inclusive, and

FIGS. 9, 10 and 11 are diagrammatic views showing how the tote box is moved from the conveyor to a work station.

The work transporter system illustrated in the accompanying drawings includes ten work stations numbered 1′ to 10′ inclusive, eight packing stations numbered 11′ to 18′ inclusive, a parcel post or freight station 19′, an empty return gravity conveyor 22, and a dispatching station 23 located alongside of an L-shaped endless conveyor indicated generally by the numeral 24. As best seen in FIGS. 2 and 3, the conveyor 24 is supported on a plurality of spaced steel structures having among other unshown parts, a vertical leg 27, a horizontal bar 28, an arm 29, a post 30 and an angle support 31. A box-like frame 32 is bolted to and supported by each bar 28. T-tracks 33—33 and T-guides 34—34 located within the frames 32 guide wheels 36—36—36′ which carry and guide a plurality of trolley plates 37, the adjacent trolley plates 37 being connected to one another by linkage bars 38, it being understood that the trolley plates 37 and the linkage bars 38 form an endless conveyor belt which extends completely around the conveyor 24. To the upstanding stems of the T-guides 34 (FIG. 3), there are bolted depending edges of a pair of opposite-hand substantially Z-shaped plates which combine to form a trough 39 having upstanding sides 41, a portion of the side 41 on one side of the trough 39 being cut away at each of the work stations 1′ to 10′ inclusive. Every third or fourth trolley plate 37 (FIG. 2) has attached to its upper end a curved or otherwise irregularly shaped pusher 42, which is substantially as wide as the trough 39 and the convex face of which is leading as the conveyor progresses in the direction of arrows 43, and it will be understood that a motor or other power means (not shown) is provided to drive the conveyor belt in a known manner and that the pushers 42 travel in the endless trough of the conveyor 24.

A plurality of tote boxes 52 are positioned in the trough 39 and are pushed in the direction of the arrows 43 by the pushers 42, and unless manually removed or acted upon by means presently to be described, the tote boxes 52, which may be in the form of rectangular parallelepipeds or may be tapered for nesting, will continue to travel around the endless conveyor in the direction of the arrows 43.

On the trailing end of each tote box 52 there is mounted a station selector assembly 53 (FIGS. 5, 6 and 7) which comprises a support board 54 to the trailing face of which are secured two vertical struts 56—57. Each of the struts 56—57, as shown in FIG. 5, is provided with seven open faced notches 58 which in adjacent struts are horizontally in register and thereby accommodate seven slide rods 61, 62, 63, 64, 65, 66 and 67. Each slide rod, as shown in FIG. 5, is biased toward the right by a tension spring 68 one end of which is secured to a slide rod by an eyelet screw and the other end of which is secured to the strut 57 by a second eyelet screw. From the trailing faces of the slide rods 61, 62, 63, 64, 65, 66 and 67 respectively, protrude indexing pins 71, 72, 73, 74, 75, 76 and 77 and from the free end of each slide rod respectively, depend catch fingers 81, 82, 83, 84, 85, 86 and 87. The seven slide rods are held in the notches 58 by a cover 88 which has seven apertures 89 advantageously positioned to allow the indexing pins 71, 72, 73, 74, 75, 76 and 77 to extend horizontally beyond the trailing face of the cover 88 and at the same time the apertures 89 allow the slide rods, with the pins protruding therefrom, to move longitudinally of the rods. The cover 88, the two struts 56 and 57 and the support board 54 are held to the trailing end of the tote box 52 by four screws 90. A pair of headed screws 91 and 92 protrude from the trailing face of the cover 88 and extend through vertically extending elongated holes 93 and 94 formed in the top and bottom ends of a vertically slidable locking plate 96. The locking plate 96 is provided with seven apertures 101, 102, 103, 104, 105, 106 and 107 and each of these apertures has four inverted U-shaped notches which, as clearly shown in FIG. 5, are numbered 0 to 1 or 21. The upper end of the locking plate 96 carries a lifting handle 108 and by use of this handle 108 the locking plate 96 may be

lifted within the limits of elongated holes 93 and 94 and the apertures 101, 102, 103, 104, 105, 106 and 107. When the locking plate 96 is raised, the springs 96 automatically return each and all of the slide rods 61 through 67 to their retracted or 0 positions.

All of the seven slide rods 61 through 67 operate in the same manner and thus the operation of each of the rods will not be fully described. FIG. 5 shows slide rod 61 in its retracted or 0 (zero) position and in this position the indexing pin 71 is received in the inverted U-shaped notch 0 of the aperture 101. Slide rod 62 is shown in its position of greatest extension and in this position the indexing pin 72 is received in the inverted U-shaped notch 2 of the aperture 102. Slide rod 63 is shown by solid lines in its retracted or 0 position and by dotted lines in an extended position in which the pin 73 (dotted position) is in the inverted U-shaped notch 10. The slide rod 64 is shown by solid lines in its retracted position 0 and by dash-dash lines in an extended position in which the pin 74 (dotted position) is in the inverted U-shaped notch 18. Thus, each of the slide rods 61 through 67 can assume any one of four positions and in these positions they place their respective catch fingers 81 through 87 (FIG. 8) in four different positions. It will be understood that the locking plate 96 will have to be manually raised before any slide rod can be moved from its 0 position to a position of higher number. Any slide rod can be moved from a position of higher than 0 to the 0 position by simply lifting the handle 108. This raises the locking plate 96 and, when any of the pins 71 through 77 are disengaged from the inverted U-shaped notches, the springs 68 automatically move the rods to the retracted or 0 position. In the drawings accompanying this specification, the vertical scale of the various showings of the tote boxes 52 has been shortened and thus if tote boxes were constructed according to a scale picked from the present drawings there is a possibility of interference between the rods 61 to 67 inclusive, and the trip element 161 presently to be described. Thus it will be understood that an actual working model of the invention would be so constructed and arranged as to provide greater vertical spacing for the rods 61 to 67 inclusive, than is shown in FIGS. 3 to 8 inclusive.

All of the ten work stations numbered 1′ to 10′, inclusive, are identical and therefore only one of these work stations is fully illustrated and described. FIGS. 2, 3 and 4 show the arm 29 and the members 129 and 131 as supporting and partly enclosing a plate 141, the upper surface of which is slightly inclined, both away from the trough 39 and in a direction parallel to the arrows 43 and the plate 141 carries a plurality of upfacing ball-type rollers 142 and the inner face of the member 131 carries three infacing ball type rollers 143. The upper face of the plate 141 carries a pair of angle brackets which support an upstanding guide 144 and one portion of the plate 141 is cut away to provide a rectangular opening 146. From the edge of the plate 141 located in the direction of the arrow 43 there extends a downwardly inclined ramp 147 formed from a gravity conveyor having a multiplicity of rollers 148. The ramp 147 is fitted with at least one socket 149 into which may be placed an upstanding stop-pin 151 the purpose of which will hereinafter appear.

Each work station 1′ to 10′, inclusive, is equipped with a means for ejecting any selected tote box from the conveyor. This is accomplished by means of a trip element 161 (FIG. 3), the free end of which carries a station hook 162 designed to be engaged by a selected one of the indexing pins 71 to 77, inclusive. The trip element 161 is slidably mounted in a groove formed in a vertically adjustable supporting block 163. The block 163 is selectively mounted on the post 30 by means of a pair of screws 164 passing through any two of a plurality of apertures or holes 166 formed in the post 30. The end of the trip element 161 remote from the hook 162 is pivotally connected to the upstanding end of a bell crank lever

167 and the knee portion of the lever 167 is pivotally mounted on the cantilever end of an arm 168 which is secured to the post 30 at a location below the block 163 by a screw 169 passing through one of the holes 166. The lower end of the bell crank lever 167 is pivotally connected to the upper end of a rod 171. The lower end of the rod 171 is adjustably connected to the upper end of a second rod 172 by a set screw fastened block 173, and the lower end of rod 172 is pivotally connected to the free end of a rock arm 174, the other end of the rock arm 174 being secured to a rock shaft 176, which is pivotally supported below the plate 141 by a pair of depending pillar blocks 177. Also secured on the shaft 176 is one end of an upwardly spring biased trip arm 178 and the free end of the trip arm 178, which in certain positions may extend upwardly through the opening 146 to a position (FIG. 3) above the plate 141, rotatably carries a sensor device or wheel 179. It will be understood that the vertical position of the station hook 162 can readily be adjusted by removing the screws 164—164 and 169 and by then moving the block 163 and the arm 168 up or down as required and then replacing the screws 164—164 and 169 in the proper holes 166. At the same time the overall effective length of the rods 171—172 is changed by loosening and then tightening the set-screw fastened block 173.

In operation, the work transporter system of the invention functions in the following manner. Loaders working at the loading station 22 place work (not shown) in tote boxes 52, 52, 52, etc., and the loaded tote boxes will be passed along to the dispatcher's station 23 where the dispatcher will decide to which of the work stations Nos. 1′ to 10′, inclusive, each particular tote box is to be sent. As a matter of illustration, let us assume that one of the tote boxes 52 (FIG. 8) is to be transported to station No. 1′. To do this the dispatcher, or in some instances the loader, before the tote box reaches the dispatcher, will lift the handle 108 of the locking plate 96. This frees the indexing pin 71 from the numeral 0 (zero) portion of the aperture 101. Then the dispatcher or the loader grasps the catch finger 81 and pulls the slide rod 61 against the bias of its spring 68 (not shown in FIG. 8) until the pin 71 is below the numeral 1 portion of the aperture 101. Then the dispatcher or the loader releases the handle 108 and the portion 1 will engage the pin 71 and hold the slide rod 61 in the position shown by solid lines in FIG. 8. When the tote box 52 arrives at station 23, the dispatcher will place the indexed tote box 52 on the conveyor 24 and one of the pushers 42 will engage the trailing end of the tote box 52 and push it along the trough 39 until it arrives adjacent to work station No. 1′ where a cam bar 181 carried by the trough 39 properly positions the tote box 52. Then, as seen in FIGS. 8–9, the depending catch finger 81 will engage the hook 162 at station No. 1′. When this happens the pusher 42 continues to apply pressure to the trailing end of the tote box 52. Under these conditions the rod 61 and the trip element 161 in cooperation with the finger 81 act as a hinge to swing the tote box 52 in an arc about the finger 81 (FIG. 10). As the conveyor moves forward, the momentum gained by the tote gox 52, as it swings from the position shown in FIG. 9, to the position shown in FIG. 10, and eventually to the position shown in FIG. 11, causes the tote box 52 to continue to move on the rollers 142 in a direction away from the trough 39 until the tote box 52 finally arrives in the position shown by dash-dash lines in FIG. 2. In this connection, it should be noted that the curved pusher 42 accelerates the movement of a tote box 52 as it is removed from the trough 39. When the finger 81 first engages the hook 162, the tote box 52 is being turned by a force having a radius which is approximately one half the length of the pusher 42, but as the tote box 52 swings about the finger 81, the force of the pusher 42 is applied at a shorter and shorter radius, thus accelerating the movement of the tote box 52. Reference to FIG. 8 shows that the station hook 162 is

elevated considerably above the trip element 161. Reference to this same figure also shows that the length of the depending catch finger 81 is such that as the tote box 52 swings from the position shown in FIG. 11 to the position shown in FIG. 2, the finger 81 escapes from engagement with the hook 162 by reason of the fact that the lower end of the finger 81 is above the upper edge of the trip element 161. When the tote box 52 is in the position shown by dash-dash lines in FIG. 2, the bottom of the tote box 52 pressses on the wheel 179 causing the wheel 179 and the arm 178 (FIG. 3) to move downwardly in a counterclockwise direction turning the rock shaft 176 until the wheel 179 and the arm 174 reach the position shown in dash-dash lines in FIG. 3. Movement of the arm 178 and the rock shaft 176 causes the arm 174 to pull the rods 172 and 171 and the bell crank 167 to the dash-dash positions shown in FIG. 3. This in turn pulls the trip element 161 and the hook 162 to the retracted position shown in dash-dash lines in FIG. 3. In the event that a stop pin 151 (FIGS. 2 and 4) is placed in the socket 149, the tote box 52 will not move down the gravity conveyor ramp 147. Then, if the dispatcher should happen to send a second tote box 52 indexed for work station No. 1', the catch finger 81 of the second tote box 52 would not engage the retracted hook 162 and the second tote box 52 would continue to travel around the conveyor until such time as the operator at the work station No. 1' removes the first tote box 52. It will be understood that a second or even a third socket 149 (not shown) may be positioned further down the ramp 147. And if a stop-pin 151 were placed in one or the other of these further sockets 149, the work station No. 1' would then accommodate two or three tote boxes 52 before the wheel 179 would be held depressed to withdraw the hook 162.

In the event the dispatcher should wish to send a tote box 52 to station No. 3' he would lift the handle 108 and the plate 96 on the tote box 52. Then he pulls the slide rod 63 until the pin 73 is below the numeral 3 position of the aperture 103. Next the dispatcher releases the handle 108 and the portion 3 will hold the slide rod 63 in the position shown in FIG. 3. Reference to FIG. 8 shows that rod 61 can be indexed for stations Nos. 1 and 8, that rod 62 can be indexed for stations 2 and 9, that rod 63 can be indexed for stations 3 and 10, that rod 64 can be indexed for station 4, that rod 65 can be indexed for station 5, that rod 66 can be indexed for station 6, and that rod 67 can be indexed for station 7. In addition to the above, the locking plate 96 has provisions for indexing stations 11 to 21, inclusive, should it become desirable to revise the work transporter system to provide work stations 11' to 21', inclusive, with trip elements 161 and station hook 162.

Reference to FIG. 8 shows that the shape and position of each of the many station trip elements 161 and station hooks 162 as well as the shape, position and curvature of each of the slide rods 61 through 67 and of the indexing pins 71 through 77 are such that only the proper indexing pin can engage the proper hook 162. In other words, if a particular tote box is indexed for example for work station No. 8, then this tote box will not be stopped or swung off the trough 39 at any station except station No. 8.

Having thus set forth the nature of my invention, what I claim herein is:

A work transporter system comprising in combination a support; an endless trough; an endless conveyor belt coextensive with said trough; a plurality of pushers carried by said conveyor belt; a plurality of tote boxes placed in said trough and pushed along by said pushers; a station selector assembly mounted on the leading end of each of said tote boxes; and a plurality of work stations located adjacent to said trough; said support comprising a plurality of vertical legs, a plurality of horizontal bars extending to one side of each of said legs for supporting said endless trough, a plurality of horizontal arms extending on the other side of certain of said legs for supporting said work stations, and a post extending above certain of said horizontal bars and arms; said endless trough comprising a pair of Z-shaped plates each having an upstanding side, portions of said side being cut away at each work station to permit exit of said tote boxes from said trough to said work station; said conveyor belt comprising a plurality of trolley plates, a plurality of linkage bars connecting adjacent trolley plates, and means for supporting said trolley plates by said horizontal bars; said pushers comprising a horizontally disposed bar having a curved front face, and means for attaching said bars to the upper end of certain of said trolley plates; said tote boxes each comprising a bottom wall, an upstanding leading wall and a trailing wall; each station selector comprising a support board adapted to be secured to the trailing wall of a tote box; an apertured cover carried by said support board, an apertured locking plate vertically slidable on said cover, a plurality of spring biased slide rods located on the reverse side of said cover, an indexing pin carried by each slide rod and extending through said cover and engageable by said locking plate, a depending catch finger carried on one end of each of said slide rods; and each work station comprising an inclined plate, a plurality of ball type rollers carried by said plate, a trip element carried by said post and said trip element and having a hooked end adapted for engagement with a selected one of the catch fingers on said slide rods of said tote boxes, and means for preventing engagement of said station hooks with any of said catch fingers when a tote box occupies said work station.

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