

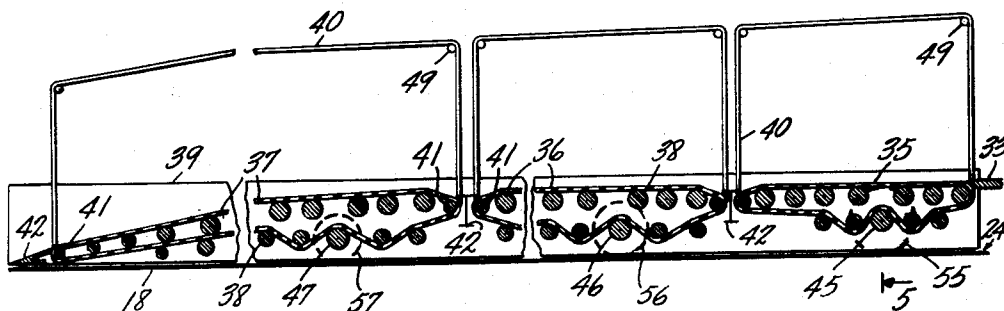
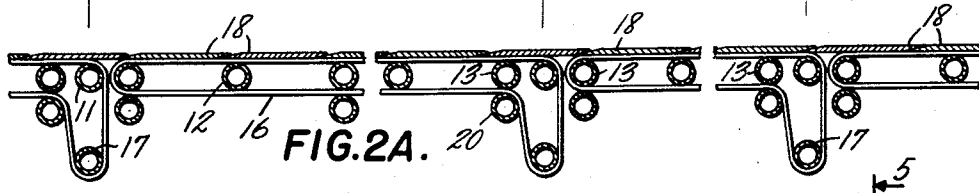
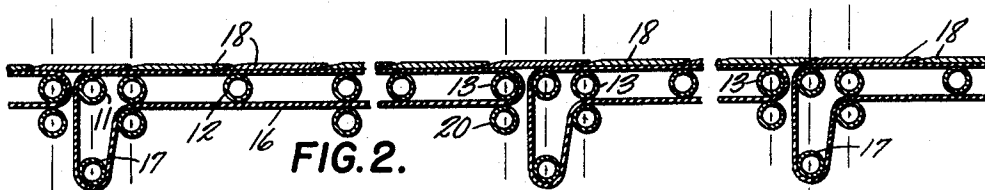
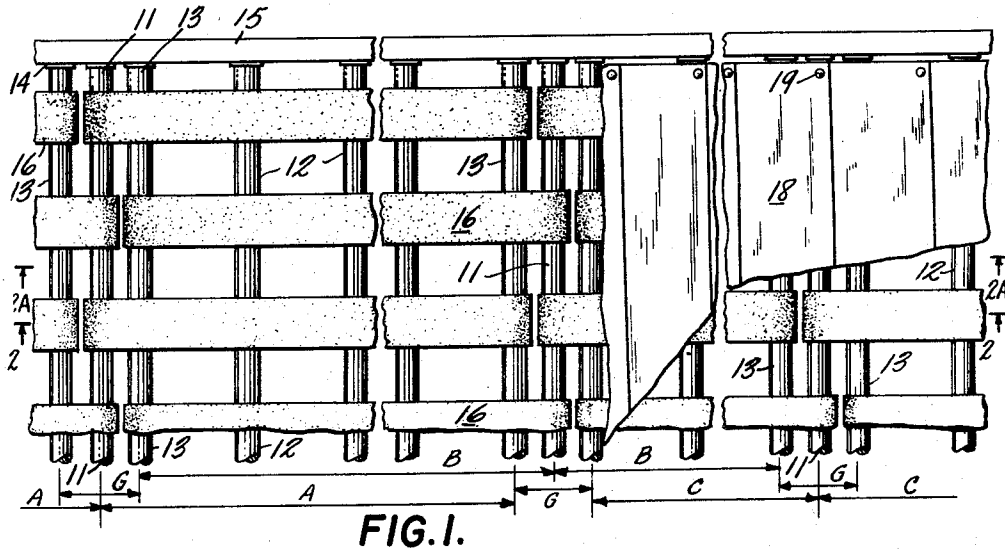
May 17, 1960

S. H. SEIDMAN
LOAD TRANSFER SYSTEM

2,936,873

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2 Sheets-Sheet 1



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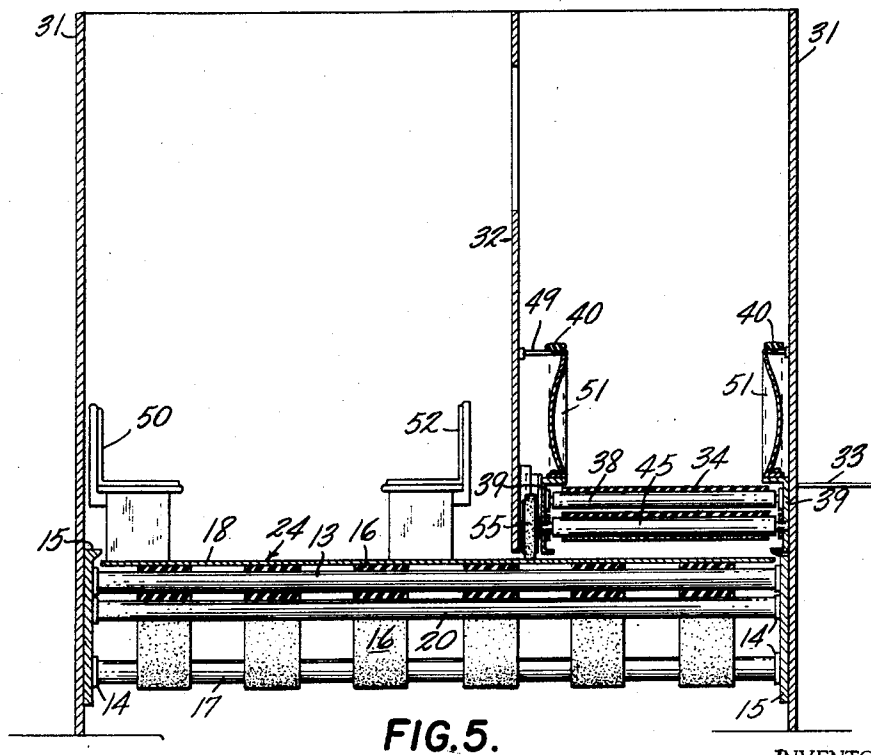
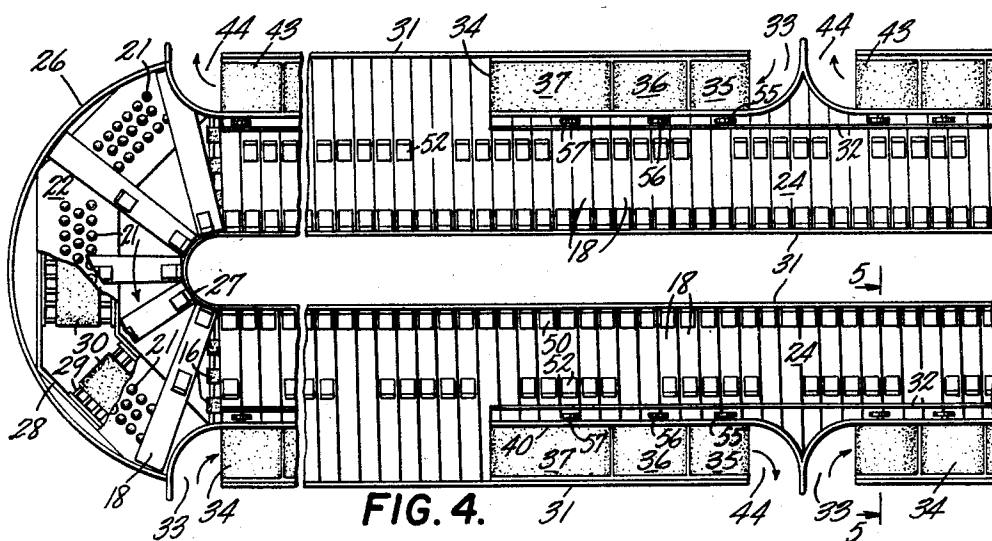
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1

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LOAD TRANSFER SYSTEM

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7 Claims. (Cl. 198—76)

This invention relates to load transfer devices and more particularly to moving roadways.

An object of this invention is to provide a continuously moving load transfer device of any desired length and width which is made up of standard mass produced elements.

Another object is to provide belt drives having self contained power driven units which are adapted to interlock with corresponding units to form a belt conveyor system of any desired length.

Another object is to provide a means for insuring safe operation of the belt drive system regardless of instances of local breakdown of any element in the system.

A further object is to provide wear resisting, load distributing floor sections, in conjunction with the belt drives whereby the sections are moved forward as a continuous roadway.

Still another object is to provide for varying the speed of load movement between a continuously moving roadway and way stations.

Another object is to provide a continuous roadway adapted to move at considerable speed between stations with means for accelerating or decelerating the speed of load movement between the way stations and the roadway.

These and other objects and features will be evident from the description, and drawings forming a part thereof, of a preferred embodiment of the invention.

In the drawings:

Fig. 1 is a plan view of a portion of the roadway with parts removed to show the novel belt drive construction;

Fig. 2 is a cross-sectional elevation of the above roadway taken on line 2—2 of Fig. 1;

Fig. 2A is a cross sectional elevation taken on line 2A—2A in Fig. 1, and shows belts extending from the same drive shaft as in Fig. 2, but looped and extending in reverse direction from the belts in Fig. 2;

Fig. 3 is a schematic representation of means for effecting variation in the speed of load transfer between a stationary platform and the moving roadway;

Fig. 4 is a plan view of a portion of a preferred embodiment of the invention showing a means for terminating the roadway; and

Fig. 5 is a cross-sectional view taken on line 5—5 of Fig. 3.

Referring to Figs. 1 and 2, three substantially identical load transfer units A, B and C are shown by their lengths AA, BB and CC. Each of these units has one idler roller 11 at the center of the unit, a loop roller 13 at each extremity of the unit and a plurality of rider rollers 12 intermediate rollers 11 and 13. All of these rollers are journaled in bearings 14 mounted on supporting members 15. A plurality of endless belts 16, preferably of uniform size are disposed substantially parallel to one another over rollers 11, 12 and 13. As shown in Fig. 2, each of these endless belts 16 passes over a power driven or driving roller 17—the power drive being conventional and not shown—then over idler roller 11, then

2

over rider rollers 12 to loop around loop roller 13 at the end and return, supported by support rollers 20, back to driving roller 17. It will be noted that from each driving roller 17 adjacent endless belts 16 extend alternately forward and backward along the path of the roadway over the rollers as just described with the top surface of all belts moving in a single direction.

The above described arrangement of belts 16 permits interlocking of adjacent units. As is evident from Fig. 1, the belts of unit A which extend to the right from their idler roller 11 are disposed between the belts of unit B which extend to the left of their idler roller, while between the belts of unit B which extend to the right, are disposed belts of unit C which extend to the left of their idler roller 11 in unit C. Such interlocking permits the user to include any desirable length or width of roadway by adding or subtracting units or increasing or decreasing the number of parallel belts respectively. Furthermore, the distance G between loop rollers 13 of units A and C is negligibly small. Should any unit, such as B, have a major breakdown of its power drive, belts 16 of units A and C would continue moving a load over gap G and thereby avoid interruption of the operation of load transfer.

Thus the present conveyor apparatus is effected by a novel combination of standard units made from elements adapted to mass production. Further, the apparatus may be varied to any desired length and width and will continue to function despite local breakdowns which may occur as a consequence of defects of material or workmanship or of normal wear.

While the belt system described can transfer certain types of load effectively and continuously, another feature of this invention is the provision of a moving roadway having a substantially continuous surface and adapted to carry and resist the wear of diversified, distributed or concentrated loads. To that end, the roadway is formed by a plurality of floor members 18 which may vary in design from a grillage to simple plate sections, as shown, with or without special abrasive or resilient surfacing materials.

The floor members 18 are adapted to rest on and extend across the full width of the belts 16 and, while of moderately short lengths along the belts 16, they are preferably adapted to distribute load over a number of rollers 11, 12 and 13. Floor members 18 preferably have divergent edges so that the leading edge of one member 18 laps over the trailing edge of the adjacent member 18. It is also preferred that at the corners of the lapped members 18, there is provided suitable pivotal connections 19. The pivotal connections and lapped portions permit free relative movement of the members 18 at all times for adjustment and negotiations of moderate rates of curvature of the system without gaps between members 18. The above construction also permits the preferred short sections to be of substantial width and results in a chain of lapped sections to form a substantially uniform roadway activated by a moving belt system.

Fig. 4 shows a plan view of roadways 24, 24 formed by the members 18 which move in substantially the same plane but in opposite directions on the two roadways. The roadways 24, 24 are connected at each end by an annular shaped unit 26. In unit 26, which for the purpose of the preferred embodiment illustrated, is not intended for transporting payload, movement of members 18 is shown in a sharp curve of substantially 180 degrees to effect the reversal of direction of the roadway. The peripheral limits of the annular unit 26 are formed by inner and outer supporting and guiding structures 27 and 28 respectively. Operatively secured between these structures are a plurality of belt drives, each of which includes parallel rollers 29 having belts 30 thereon with

conventional power drives (not shown) adapted to activate the belts 30 at a speed pre-determined and greater than that of belts 16. Thus, while the pivotally connected ends of members 18 would travel at the same speed as belts 16, the outward ends would be moved at a sufficiently greater speed to cause the outer ends of members 18 to reach the straight roadway 24 at the end of the 180 degree swing at substantially the same time as the inner ends and thereby maintain the continuous lapped relationship throughout the lengths of roadways 24.

Because of the inadvisability of having angular movement of members 18 on the straight moving belts 30, it is preferred to interpose between members 18 and belts 30 bearings 21 adapted to be retained in rotating position within a perforated plate 22 so that the straight movement of the belts 30 is transferred to the members 18 through these bearings 21 in a manner that permits angular movement of members 18. Of course, belts 30 would in that case be moved in direction opposite to belts 16 whereby rollers 21 would effect continuity of movement of the floor sections 18. The elimination of relative slippage between members 18 and belts 30 insures low cost operation with minimum maintenance.

In order to maintain continuous surfaces for the entire roadways 24, 24, the movement of the floor sections 18 and, of course, of the belt drives A, B, C, etc. must be at the same speed for the entire length of the roadways 24, even though the construction is adaptable to a wide range of desired speeds. This has the advantages of minimum operating and maintenance cost due to constancy of speed and minimum initial cost in view of the mass production made possible by the uniformity of the motor drives for the system as well as of the other elements comprising the system. For wider latitude of load transfer, however, an important feature of the invention is variation of speed of load movement as and where desired, especially without loss of the advantages cited above of constant speed of the elements of the system. The preferred embodiment achieves the important feature of variations of payload speed in predetermined ratios to the roadway speed while maintaining constant speed of every moving element in the system and while further maintaining continuity of the roadway surface.

Figs. 4 and 5 illustrate a preferred embodiment particularly applicable to passenger load. Movement of the roadways 24, 24 is at a speed considerably greater than normal pedestrian speed. Therefore, loading from a stationary platform requires means for accelerating the passenger load to substantially the speed of the roadway, and, at exits, means for correspondingly decelerating the passengers.

The loading and unloading may be at the ends but also at any desired stations along the roadway. This is achieved by ramps 34 for acceleration and ramps 43 for deceleration from platform 33 and to platform 44 respectively. While the width of roadway 24 is substantially the full distance between partitions 31, 31, the width of the ramps is shown considerably narrower than roadway 24 and partitions 32 are preferably hung from beams spanning partitions 31 to separate the ramps from the balance of the roadway and to aid in retaining the ramps in laterally fixed disposition. Thereby a transfer lane is provided lengthwise of the conveying roadway 24 in a portion of its width. The balance of the width of the conveying roadway then becomes a constant speed travel lane for conveying load continuously toward its desired destination and by-passing the intermediate ramps in the transfer lane of the roadway.

Referring to Fig. 3, a schematic representation is shown by a ramp 34 comprising a plurality of belts 35, 36, 37, etc. of approximate ramp width adapted to move on rollers 38 which are journaled in fixed structural supports 39, 39. Rollers 45, 46, 47, etc. are driving rollers for belts 35, 36, 37, etc. respectively. The rollers 45, 46,

47 are activated by wheels 55, 56, 57 respectively to which wheels the rollers are concentrically secured. The wheels which are preferably rubber tired are retained in contacting relation to the floor sections 18 by the weight of the above rollers journaled in structural members 39, 39. Rollers 38 are of uniform diameter where practicable, but rollers 41 at the ends of the belts 35, 36, 37 are preferably of smallest practical diameter and located to create a slight dip in the belts to create an obtuse angle between the ends of these belt units. This not only permits reduction in the amount of gap between the belts, but insures easy transition of load from belt to belt. Cross members 42, which are adapted to retain the longitudinal members 39, 39 in parallel disposition, are preferably located between end rollers 41 whereby the gap is covered by the flange of the cross member.

Each of belts 35, 36, 37, etc. is driven at a constant speed by virtue of the traction between the wheels 55, 56, 57, etc. on the constant speed roadway 24. However, wheel 55 nearest the stationary platform 33, is relatively large, so that for a given peripheral speed corresponding to the speed of the moving roadway, the wheel revolutions are relatively small. The diameter of the concentric roller 45 is selected to be substantially less than that of the wheel 55, with which it turns. The peripheral speed of the roller 45 and consequently the speed of the belt 35 is thus considerably less than that of the floor sections 18.

In order to accelerate the load by any given increment, the belt 36 adjoining belt 35 is caused to move at such higher speed as desired by varying the diameter of either roller 46 or wheel 56 or both. In the embodiment illustrated, the diameter of the wheel 56 is two thirds of wheel 55 and the diameter of roller 45 is three fourths that of roller 46 so that the speed of belt 36 would become double that of 35, such as 2 ft. per sec. for belt 35 and 4 ft. per sec. for belt 36. In order to further increase the speed of the load by the same increment it may be preferred to retain the same wheel diameter on the next belt unit, but the diameter of the roller could then be increased to effect the desired speed of the belt.

Of course, the number of belts in a ramp would depend upon the relationship of gradations required and maximum speed of the roadway. Yet each of the belt units forming the ramps operate at its constant speed to act as a differential to provide an easy transition from one unit to the next. All belt speeds are directly dependent upon the speed of the roadway which activates each of them. Thus, if, for any reason, the roadway should stop moving or be slowed, all ramp units would also stop or react correspondingly in their speeds in proper relation to the roadway speed for optimum automatic effectiveness and safety.

Thus a passenger after transferring from a stationary platform 33 onto belt 35 would thereafter be moved forward or may walk from belt to belt and thus be accelerated at any desirable speed gradation for maximum comfort and safety onto the roadway 24 whereby they are then moved at maximum speed consistent with safety and comfort to the desired station.

Deceleration ramps 43 are similar to acceleration ramps 34. Belts 35, 36 and 37 and their driving elements are arranged so that passengers may step onto the fastest belt 37 from the roadway 24 and be moved onto slower moving belts 36 and 35 from which they would step onto stationary platform 44.

For a passenger load it is advisable to provide hand rails, particularly on the accelerating and decelerating ramps. Since the speed of the hand rail should correspond to the speed of the respective ramp belt, the narrow hand rail belts 40 could be activated by rollers 45, 46 and 47 similarly to belts 35, 36 and 37 except that while tread portions of belts 35, 36, 37, etc. travel on rollers 37, the hand rail portions of the belts 40 would travel on rollers 49 journaled at proper hand rail level

5

in suitable bearings on guards 51 which support same. Thus, the hand rail speeds always correspond to the load transfer speeds.

In the preferred embodiment as applied to passenger transportation, each floor section 18 has secured thereto at least one seat 50 which is shown in Figs. 4 and 5 at the pivoted end of floor section 18. It is also preferred that some sections 18 have an additional seat 52 secured thereto at a suitable distance from and facing seat 50. Thus, roadway 24 would have a continuous row of seats 50 on one side. Seats 52 are preferably disposed in groups of perhaps five with two floor sections between them. The relative number depends upon the speed of roadway 24 since the extent of speed retardation determines the distance between passageways formed by spaced groups of seats 52 and thereby the spacing of passengers in the lane of approach to the deceleration ramp 43 for suitable intervals of arrival at the deceleration ramp. The above requirements are met by providing the correct number of seats per group, since the grouping is thus adapted to automatically insure establishment of proper distance between passengers as they approach the deceleration ramps 43. Thus, as the distance between the passengers is reduced due to their deceleration, the initial distance thus effected between them would prevent crowding. Of course, if the passengers walk on the slower moving belts 36 and 35 and thus unto station 44, their spacing is automatically increased.

In summation, a novel combination of simple mass producible elements that form uniform belt drive units has been described. These are adapted to interlock to form a belt drive system of any desired length which in turn is adapted to activate a continuous roadway of any desired width for the entire distance to be traversed. Described also is a novel combination of similar simple mass produced elements whereby load movement on the roadway may be effectively varied in speed so as to be accelerated or decelerated automatically in direct relation to the speed of the moving roadway. Many novel features insuring positiveness of operation and automatic functioning have been described and shown in the drawings. Of course, it is understood that various modifications may be made in the construction and arrangement of parts without departing from the spirit of the invention as claimed.

I claim:

1. A device for transferring load between a way station and a passing load-conveying surface including, in combination, slow moving conveying means disposable intermediate said conveying surface in the direction of load movement thereon, a connecting way to said way station, retained over said passing conveying surface in alignment with said slow moving conveying means, a load accelerating transfer means extending from said slow conveying means forward to said conveying surface and a load speed retarding transfer means extending from said conveying surface to the rear end of said slow conveying means.

2. A device according to claim 1 having means responsive to movement of said load conveying surface for interlocking activation of said slow moving conveying means, of said load accelerating transfer means and of said load speed retarding transfer means with movement of said load conveying surface.

6

3. A device for transferring load between way stations and a passing fast moving surface, including a connecting way adapted to extend from said way station intermediate and over said moving surface, slow conveying means aligned in the direction of said surface movement forward and rearward of said connecting way for load transfer therebetween, a plurality of conveying elements disposed in tandem between either end of said slow conveying means and said moving surface and drives activating said conveying elements each at a different speed arranged progressively between the speed of said slow conveying means and the speed of said passing surface.

4. A load transfer system including a conveyor providing a continuous conveying surface having a travel lane and a transfer lane extending lengthwise of said conveying surface, said travel lane being continuously unobstructed for carrying passengers or other objects continuously at constant speed, and a plurality of conveying devices disposed over said transfer lane, the terminal portions of said conveying devices retained intermediate the length of said transfer lane and operatively proximate over said conveying surface for load transfer therebetween, each of said conveying devices having conveying elements actuated at progressive speed differential for accelerating or retarding load thereon in the direction of load movement in said transfer lane.

5. A load transfer system according to claim 4, having entrance and exit ways extending over said transfer lane of said conveying surface in operative alignment with said conveying devices for transfer of load units therebetween in the direction of load movement on said conveying devices.

6. A load transfer system according to claim 4, having rotatable means riding on said conveying surface for supporting said conveying devices operatively proximate thereto and controlling actuation of said conveying devices correlated to movement of said conveyor.

7. A load transfer system according to claim 4, having means for minimizing crowding of load units during variation of speed for retardation, comprising guide means disposed along said transfer lane of said conveyor and a spacing between said guide means correlated to the speed of said conveyor for effecting arrivals of load units onto said retarding device at suitably timed intervals.

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