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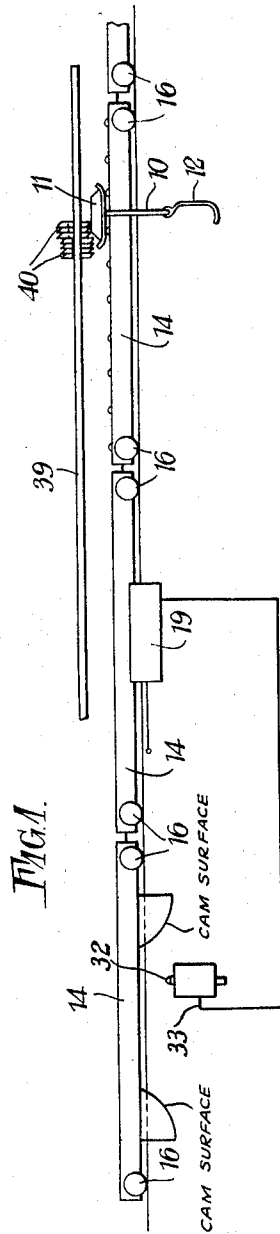
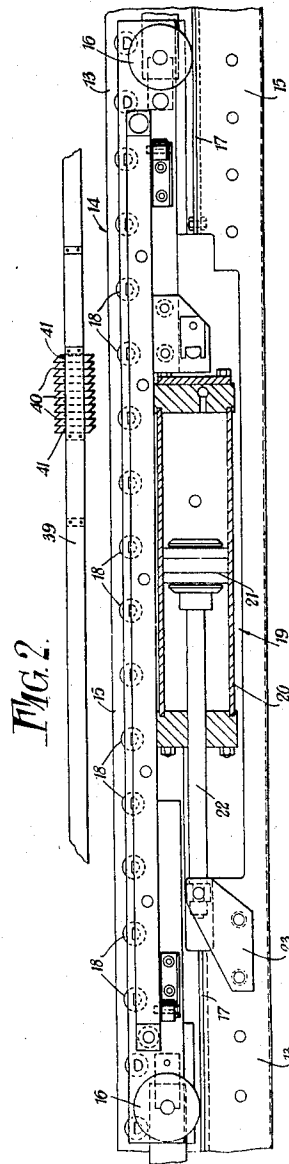
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CONVEYOR SYSTEMS

Filed May 22, 1956

2 Sheets-Sheet 1



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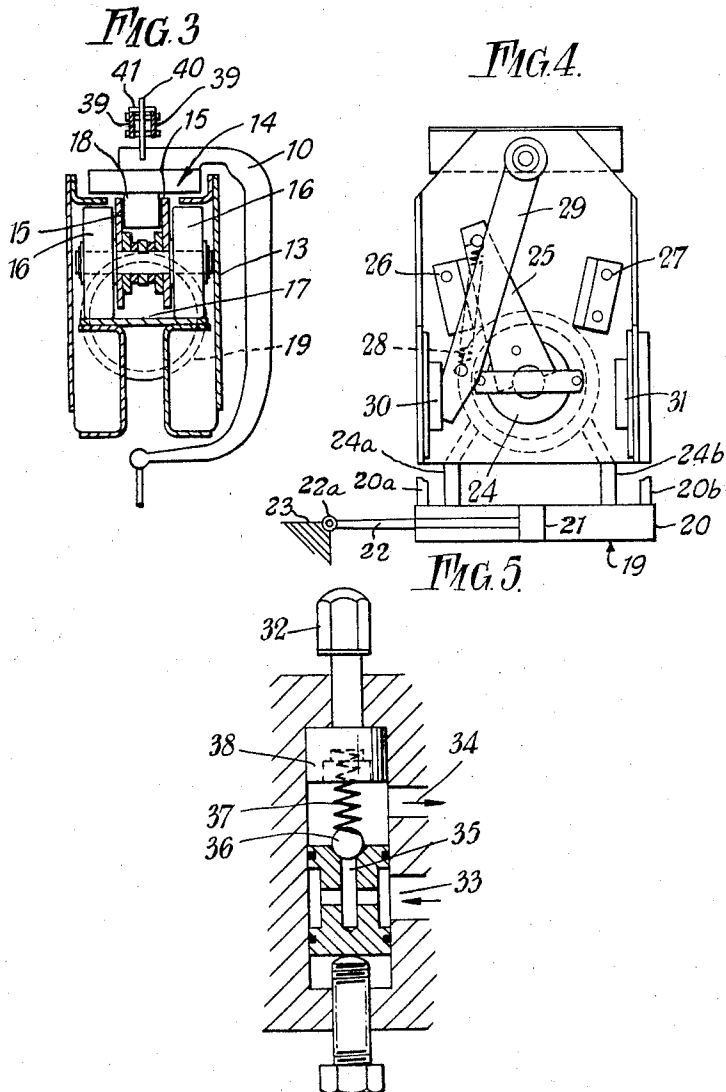
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CONVEYOR SYSTEMS

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This invention relates to conveyor systems and more particularly to such a system of the kind wherein the load supporting member is reciprocated thereby to impart an intermittent forward or feed movement to the load.

According to the invention a conveyor system comprises a movable unit adapted to support individual load carriers and movable back and forth along a predetermined path, means for imparting a reciprocating motion to said unit and means operative to prevent reverse movement of any load carrier present on said unit during the reverse or return stroke of the latter. The unit may conveniently comprise an articulated train of carriage elements which are supported on a fixed track, such train being adapted to have a reciprocating motion imparted thereto through the medium of one or more fluid operated rams or the like. Preferably means will be incorporated to ensure that the motion at the beginning of each stroke of the articulated unit in each direction will be uniformly accelerated motion while the motion at the end of each stroke in each direction will be uniformly decelerated motion.

In order that the said invention may be clearly understood and readily carried into effect the same will be hereinafter more fully described with reference to the accompanying drawings in which:

Figure 1 is a diagrammatic side elevational view showing a portion of a reciprocating conveyor,

Figure 2 is a part sectional side elevational view of one of a train of carriages forming the conveyor, one of the conveyor supporting tracks having been removed for the purpose of better illustration,

Figure 3 is an end view looking from the left of Figure 2,

Figure 4 illustrates a valve operating mechanism for controlling the supply of motive fluid to the ram associated with the carriage illustrated in Figure 2,

Figure 5 illustrates diagrammatically an additional component which may be introduced.

It is to be understood that the reciprocating conveyor now to be described is intended to support and to traverse load carriers of the type disclosed in the specification of prior patent application No. 292,627, now Patent No. 2,844,105, such load carriers comprising as indicated in Figure 1 frame structure 10 of substantially C shape in end elevation having at its upper part a shoe element 11 adapted to bear on rollers carried by the conveyor member i.e. the endless driving chain or in this particular case the reciprocating conveyor. The lower limb of each carrier 10 is adapted to support a depending load bar or the like 12 to which loads to be conveyed may be attached.

In the present case the reciprocating conveyor comprises a fixed elongated box like track 13 in which reciprocates an articulated train of carriages designated generally by 14 each such carriage comprising two vertical side plates 15 disposed in spaced parallel relation and disposed longitudinally with respect to the track, said side plates being supported adjacent each end by fixed axles on which suitable load bearing wheels 16 are rotatably

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mounted, said wheels being adapted to bear and run on a running surface 17 incorporated in the fixed track. Mounted between and projecting above the side plates 15 forming each carriage is a plurality of freely rotatable rollers 18 which latter are spaced apart lengthwise of the carriage and are adapted to support the load carriers i.e. the shoe elements 11 of the load carriers will bear on said rollers. The train of carriages is adapted to be reciprocated longitudinally of the fixed track by means of a double acting fluid operating ram designated generally by 19. The cylinder 20 of the ram is fixedly mounted on a selected carriage 14 to move therewith, the ram or piston 21 being carried by a piston rod or the like 22 the outer end 22a (Fig. 4) of which is anchored to a fixed point e.g. a bracket or the like 23 affixed to the track 13. The arrangement is such that, on supply of motive fluid alternately to opposite ends of the cylinder 20 via flexible lines 24a and 24b (Fig. 4), the ram or piston 21 will remain stationary while the cylinder, its supporting carriage 14 and the associated carriage train will reciprocate relatively thereto. A suitable fluid control valve or valves and controlling gear will be provided to control the supply of motive fluid to the cylinder in order to give continuous operation of the ram assembly.

Referring now to Figure 4 which illustrates one convenient control valve and operating mechanism therefor, 24 denotes the movable member of a plate type valve having an operating arm 25 associated therewith such arm being movable between two limiting stops 26 and 27. In one limiting position of the arm 25 the valve will be operative to supply motive fluid e.g. compressed air, to one end of the cylinder 20 while connecting the other end of said cylinder to exhaust and in the second limiting position the operation will be reversed fluid being supplied to said other end of said cylinder and exhausted from the first mentioned end. As will be seen from Figure 4 the arm 25 is coupled by means of a spring 28 to a pivoted actuating lever 29, the arrangement being such that when said actuating lever has been moved angularly a predetermined amount from one limiting position the spring 28 acting as a dead center spring will be effective to cause the arm 25 to snap over into its alternative limiting position. As will be seen from Figure 4 the free end of the lever 29 is suitably tapered so that said lever will cooperate with limit stops 30 and 31 which latter serve to limit its movement in either direction. The arrangement is such that as the carriage approaches the end of its movement in either direction the lever 29 will be actuated, for example, by arms 20a and 20b (shown partially broken away) which are attached to cylinder 20 and move therewith to engage physically arm 29. Movement of arm 29 effects an actuation of the arm 25 with consequent operation of the valve and appropriate reversal of the motive fluid supply.

In certain cases it may be advisable to incorporate means which are adapted to ensure that the valve will be operated in such a way that the motion at the beginning and end of the ram stroke in each direction will be uniformly accelerated motion. An example, of one device suitable for obtaining the proposed control of the reciprocating motion is shown in Figure 5 and in that figure 32 denotes a plunger element with which two oppositely inclined ramp or cam surfaces operatively associated with the cylinder are adapted to cooperate. The control device will be mounted on a convenient stationary part and so disposed that as the cylinder approaches the end of its travel in either direction the appropriate ramp or cam surface associated therewith will cooperate with the plunger element 32 which projects from the control device thereby to actuate the latter. In the embodiment illustrated the control device comprises a cylindrical casing which is provided with an inlet port 33 and an ex-

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haust port 34 which are spaced axially of the cylinder and so arranged that the inlet port is below the exhaust port. The inlet port 33 is adapted to be coupled to the exhaust outlet from the valve controlling the operation of the ram while the exhaust port 34 is adapted to communicate with the atmosphere. Disposed within the cylindrical casing of the control device at a point intermediate the respective inlet and exhaust ports is a valve seating having a central port or passageway 35 which provides communication between said inlet and exhaust ports. Cooperating with said valve seating is a ball or the like 36 which latter is urged by a spring 37 into its operative position the spring being adapted to bear on the underside of a piston element 38 which is associated with the aforesaid plunger element 32, the latter being movable axially of the cylindrical casing. The control device above described is adapted to operate as follows:

During the major part of the ram movement one end or other of the ram cylinder will be open to exhaust through the control valve and thence through the control device. As the ram cylinder approaches the end of its travel however the appropriate ram or cam surface thereon will cooperate with the plunger element 32 thereby to depress the latter. Depression of the plunger element 32 will cause the piston element 38 progressively to mask the exhaust port 34 and moreover the spring 37 will press the ball 36 towards the aforesaid valve seating with increasing force thereby further to damp the flow of exhaust fluid from the inlet port 33 to the exhaust port 34. This progressive retarding of the exhaust from the ram cylinder will progressively slow down the motion of the latter. At the commencement of the reverse stroke of the ram cylinder the reverse will take place so that the motion will progressively accelerate. By virtue of the provision of the ram or cam surface at or adjacent each end of the ram cylinder the control device will be effective at the end portion of each stroke in either direction, said device being however inoperative during the major position of the stroke when the plunger element is out of contact with either of the aforesaid ram or cam surfaces.

With a reciprocating conveyor of the kind with which the invention is concerned it will obviously be necessary, in order to ensure that load carriers supported thereon are moved progressively in the right direction, to provide some means which will be effective to hold such carriers against reverse movement during each reverse or return stroke of the conveyor. In the present embodiment a pair of spaced parallel guide rails or tracks 39 (Figures 1 and 2) are provided above the path of movement of the aforesaid trains of carriages, such guide rails or tracks extending parallel to the track on which said carriages are supported. The guide rails or tracks are adapted to support a plurality of individual plate or strip elements 40 the latter being disposed in side by side or edge to edge relationship and in a vertical plane. Each plate or strip 40 carries a laterally directed projection or peg 41 adapted to rest on the upper surface of one of the guide rails or tracks thereby to maintain said plate in position the arrangement being such that it is freely displaceable vertically. As will be seen from Figures 1 and 2 the plates 40 are so shaped that when a plurality are in position in edge to edge relationship the lower ends thereof, which project below the guide rails or tracks 39 and into the path of the load carriers supported on the conveyor, will form the equivalent of a row of ratchet teeth, each such tooth however being as indicated above freely displaceable vertically independently of the others by reason of the fact that the plates are freely supported between said guide rails or tracks 39. In order to prevent undesired or unauthorized removal of any of the plates 40 once they are in position a retaining member (not shown) may be provided in the form of a rail or strip such retaining member being removably mounted and when in position being spaced above the upper ends of the plates

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40 sufficiently to allow a predetermined upward movement thereof but to prevent complete displacement or withdrawal of a plate from between said guide rails or tracks. The arrangement above described is adapted to operate as follows:

On forward movement of the conveyor the shoe or upper part such as 11 of the frame of any load carrier present thereon will contact the lower edges of the aforesaid plates 40 and by reason of the shape or disposition of such edges will merely cause said plates to be displaced vertically upwardly. On the forward movement of the conveyor therefore the plates 40 will not impede forward movement of the load carrier. On the reverse stroke of the conveyor however the shoe or upper part of the frame of the load carrier will contact a vertical or substantially vertical edge portion of a plate 40 which in the circumstances will not be vertically upwardly displaced and will thus act as a stop to prevent rearward movement of the load carrier.

A reciprocating conveyor of the kind indicated above may be used with advantage as a storage line between for example two runs of a conveyor of the type described in prior patent application No. 292,627, now Patent No. 2,844,105, such runs being in the same plane. When so employed the arrangement may be such that a load carrier will be transferred from one such run to the reciprocating conveyor by means of a transfer unit of the type described in prior application No. 437,173, now Patent No. 2,862,600, said carrier being intermittently traversed along said reciprocating conveyor until it reaches the other end adjacent to the second run or receiving conveyor, whereupon it may be transferred thereto by means of a second similar transfer unit. It will be seen that if load carriers are not transferred to the receiving conveyor from the reciprocating conveyor the number of load carriers on the latter will increase so that said reciprocating conveyor will become in effect a storage line, a purpose for which it is admirably suited since when load carriers are stored thereon they will remain stationary on the supporting rollers which will rotate continuously on reciprocation of the conveyor, meanwhile load carriers passing on to said reciprocated conveyor will be traversed progressively along the latter until they abut against the end load carrier of those being stored.

The arrangement may be such that in the event that the storage conveyor i.e. the reciprocating conveyor, becomes full to capacity the last carrier to be transferred thereto will render the feeder transfer unit inoperative. Similarly means may be provided to render the actuating ram inoperative when the reciprocating conveyor is full of load carriers and operative at other times.

In the above description it may be inferred that the reciprocating conveyor must necessarily follow a straight line horizontal path but such is not the case since the articulated train of carriages may be arranged to articulate in the horizontal as well as the vertical plane and the fixed track may follow a curved path between adjacent straight lengths. A reciprocating conveyor following any desired path in a horizontal plane may consist of one articulated train of carriages driven by one or more rams or of a plurality of such trains each driven by one or more rams.

What is claimed is:

1. A conveyor system comprising a stationary runway, a mobile unit, load carriers normally supported on the unit for movement therewith but displaceable longitudinally thereof, means for imparting a reciprocatory motion to said unit, stationary guide means adjacent said runway and a plurality of individual strip like elements freely supported by said guide means to extend into the path of the load carriers, said strip like elements being individually displaceable and constituting ratchet teeth displaceable by a load carrier on movement of the unit in one direction but stationary and effective to prevent

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movement of the carriers with the unit on movement of the latter in the reverse direction.

2. A conveyor system comprising a stationary runway, a mobile unit, load carriers normally supported on the unit for movement therewith but displaceable longitudinally thereof, means for imparting a reciprocatory motion to said unit, a pair of parallel guide tracks spaced from but extending parallel to said runway and a plurality of individual strip like elements supported in said guide tracks and adapted to extend into the path of a load carrier, said strip like elements being individually displaceable and constituting a row of ratchet teeth individually displaceable by a load carrier on movement of the unit in one direction but stationary and effective to prevent movement of said carrier with said unit on movement of the latter in the reverse direction.

3. A conveyor system comprising a stationary runway, a mobile unit, load carriers normally supported on the unit for movement therewith but displaceable longitudinally thereof, means for imparting a reciprocatory motion to said unit, a pair of parallel guide tracks above and parallel to said runway, a plurality of individual strip elements between said tracks and laterally directed peg means associated with each strip element and adapted to engage the upper surface of at least one of said tracks thereby to support the associated element so that it is freely displaceable upwardly from an operative position wherein it depends into the path of a load carrier on the mobile unit, said strip like elements being individually displaceable and constituting a row of ratchet teeth displaceable by a load carrier on movement of the unit in one direction but stationary and effective to prevent movement of said carrier with said unit on movement of the latter in the reverse direction.

4. A conveyor system comprising a stationary runway, a mobile unit comprising a train of articulated wheeled carriages supported on said runway, load carriers normally supported on the unit for movement therewith but displaceable longitudinally thereof, means for imparting a reciprocatory motion to said unit, a pair of parallel guide tracks above and parallel to said runway, a plurality of individual strip elements between said tracks and laterally directed peg means associated with each strip element and adapted to engage the upper surface of at least one of said tracks thereby to support the element so that it is freely displaceable upwardly from an operative position wherein it depends into the path of a load carrier on the mobile unit, said strip like elements being individually displaceable and constituting a row of ratchet teeth displaceable by a load carrier on movement of the unit in one direction but stationary and effective to prevent movement of said carrier with said unit on movement of the latter in the reverse direction.

5. A conveyor system comprising a stationary runway, a mobile unit supported in said runway, load carriers normally supported on the unit for movement therewith but displaceable longitudinally thereof, a double acting fluid operated ram coupled to said unit for imparting a reciprocatory motion thereto, stationary guide means adjacent said runway and a plurality of individual strip like

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elements freely supported by said guide means to extend into the path of a load carrier on said mobile unit, said strip like elements being individually displaceable and constituting a row of ratchet teeth displaceable by a load carrier on movement of the unit in one direction but stationary and effective to prevent movement of said carrier with the unit on movement of the latter in the reverse direction.

6. A conveyor system comprising a stationary runway, a mobile unit supported in said runway, load carriers normally supported on the unit for movement therewith but displaceable longitudinally thereof, a double acting fluid operated ram coupled to said unit and comprising a cylinder and piston assembly, the cylinder being fixedly mounted on the unit to move therewith and the piston being fixedly anchored, means whereby motive fluid may be supplied alternately at opposite sides of the piston thereby to effect reciprocation of said cylinder and hence of said unit, a pair of parallel guide tracks above and parallel to said runway, a plurality of individual strip elements between said tracks and laterally directed peg means associated with each strip element and adapted to engage the upper surface of at least one of said tracks thereby to support the element so that it is freely displaceable upwardly from an operative position wherein it depends into the path of a load carrier on the mobile unit, said strip like elements being individually displaceable and constituting a row of ratchet teeth individually displaceable by a load carrier on movement of the unit in one direction but stationary and effective to prevent movement of said carrier with said unit on movement of the latter in the reverse direction.

7. A conveyor system as claimed in claim 6 wherein the means for controlling the supply of fluid to the cylinder comprises a valve coupled to the cylinder, a dead center spring device, and a lever coupled to said spring device and said valve for movement of the latter alternately from one operative position to another.

8. A conveyor system as claimed in claim 7 comprising control means coupled to the cylinder for controlling the movement of the same so that the motion at the beginning and end of the cylinder reciprocations are uniformly accelerated motions.

9. A conveyor system as claimed in claim 8 in which the control means comprises a depressible plunger element adapted to be actuated as the cylinder approaches the end of its stroke in each direction progressively to mask a port through which exhaust fluid from said cylinder is discharged thereby progressively to slow up the motion of said cylinder, the exhaust port being progressively opened during initial movement of the cylinder in either direction to allow for uniform acceleration of said cylinder.

References Cited in the file of this patent

UNITED STATES PATENTS

384,345	Boulton	June 12, 1888
2,557,170	Bjorlo	June 19, 1951