United States Patent

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[54] FLUID PRESSURE ACTUATED CONVEYOR SYSTEM

10 Claims, 14 Drawing Figs.

[52] U.S. Cl. 104/155, 104/165
[51] Int. Cl. B61b 13/12; B65g 25/08
[50] Field of Search 104/155, 162, 165, 172, 178

[56] References Cited

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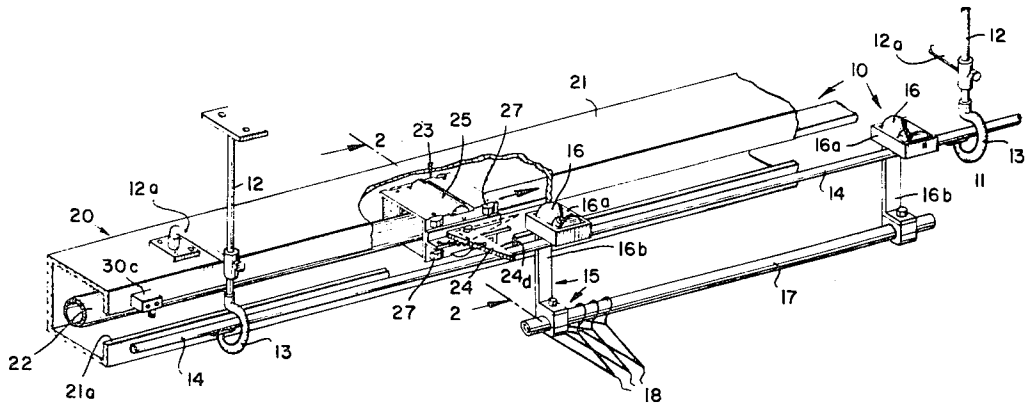
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Assistant Examiner—Robert Saifer
Attorney—Barnett and Barnett

ABSTRACT: A pliably collapsible elongated conduit has a traveler adapted to compress a portion of the conduit thereat into a constriction. A fluid pressure is applied within the conduit to expand the constriction against the traveler for propulsion therealong. Valve means selectively applies the fluid pressure from a source to either of opposite ends of the conduit to determine the direction of movement of the traveler, the latter being adapted to engage a vehicle for propulsion on a track paralleling the conduit or may comprise the vehicle, *per se*. Automatic means actuated by the traveler at the end of a predetermined run reverses the valve means.



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Sheet 1 of 4

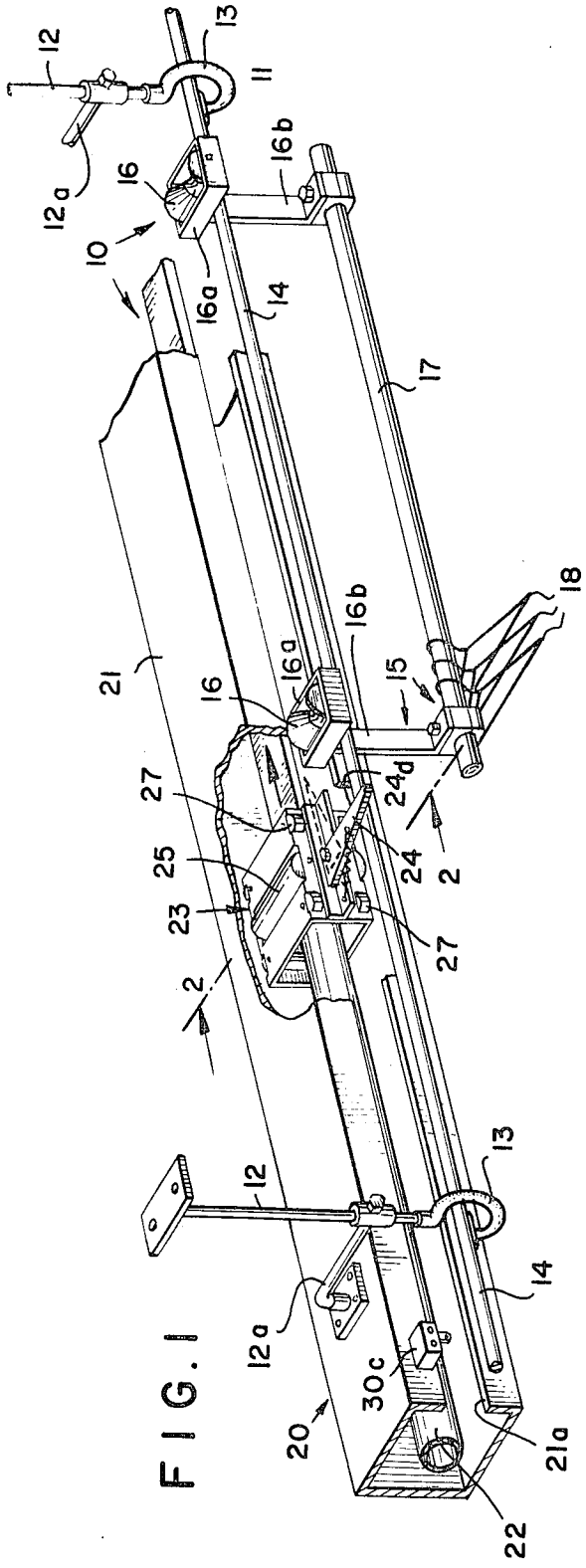


FIG. 1

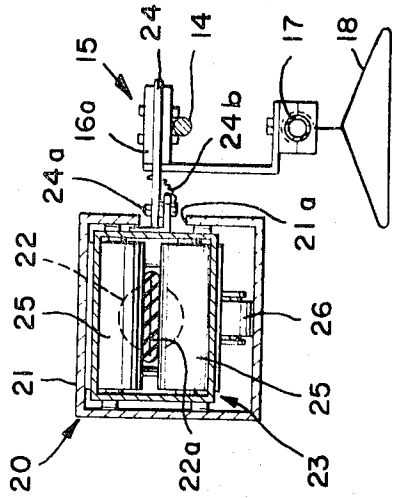


FIG. 2

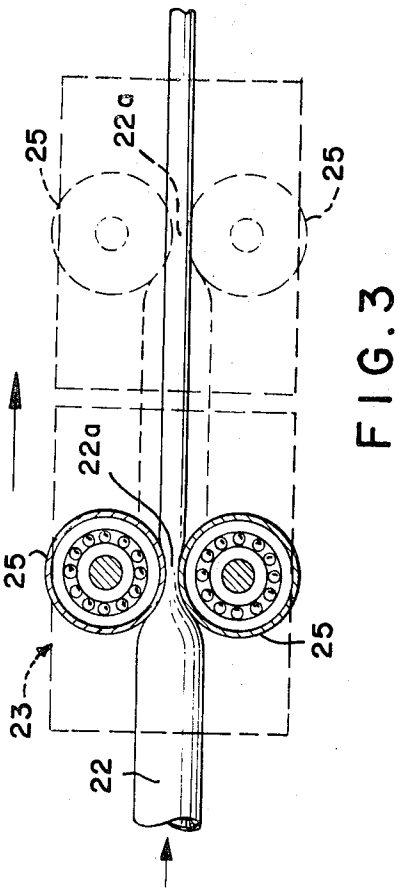


FIG. 3

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FIG. 4

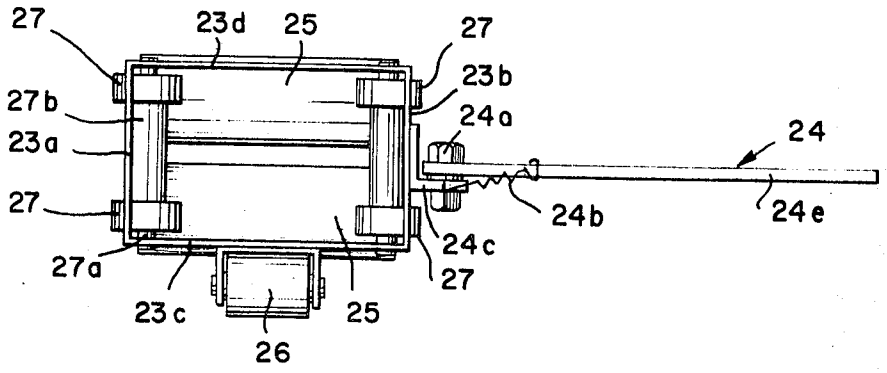


FIG. 7

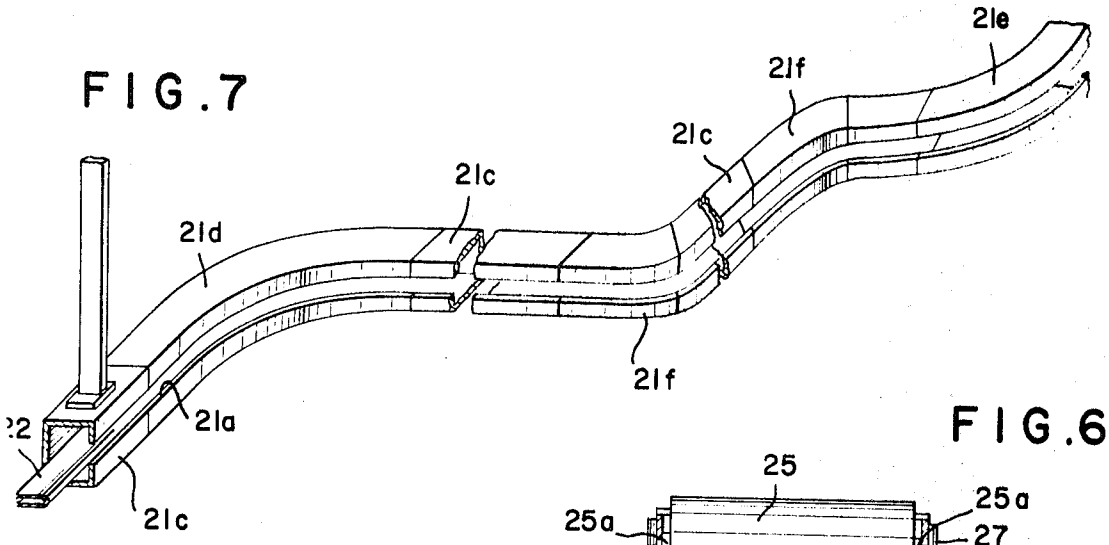


FIG. 6

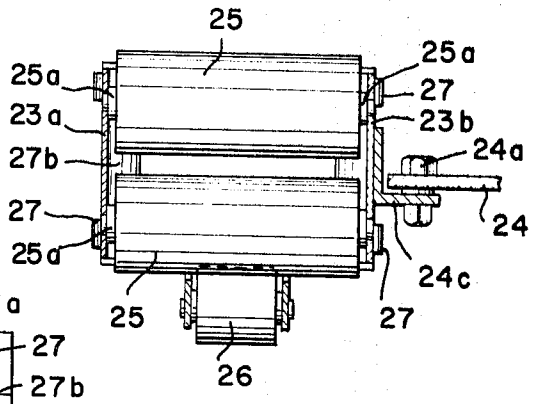
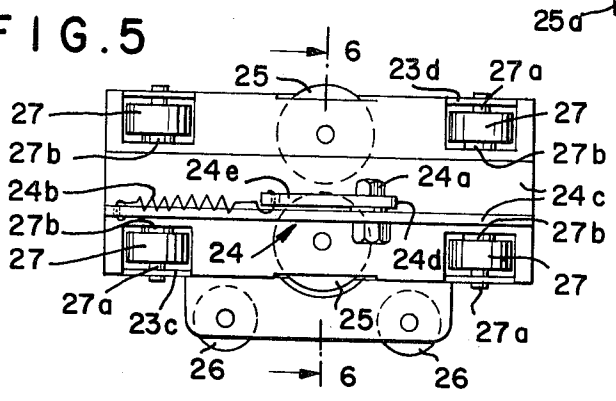


FIG. 5



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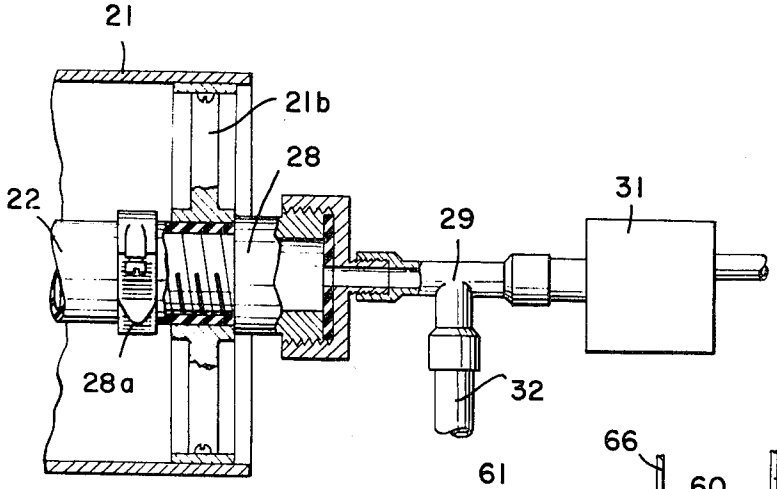


FIG. 8

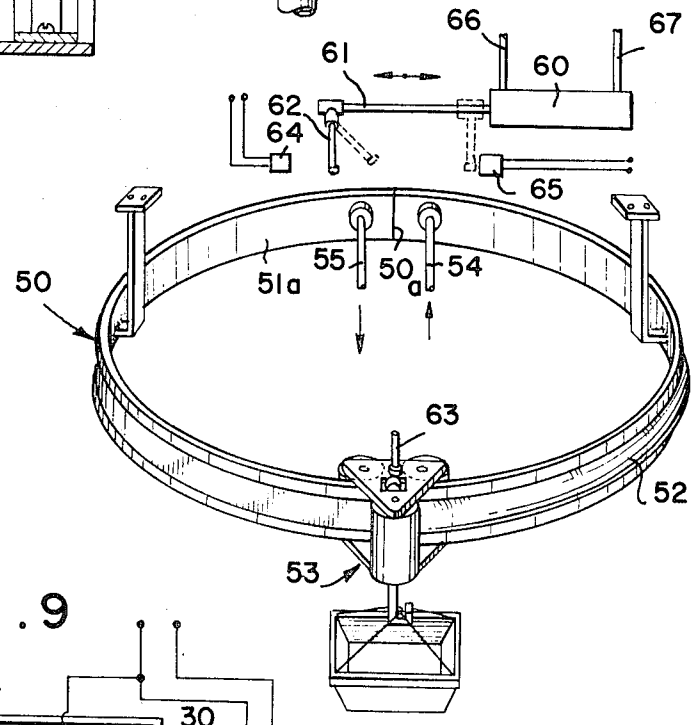
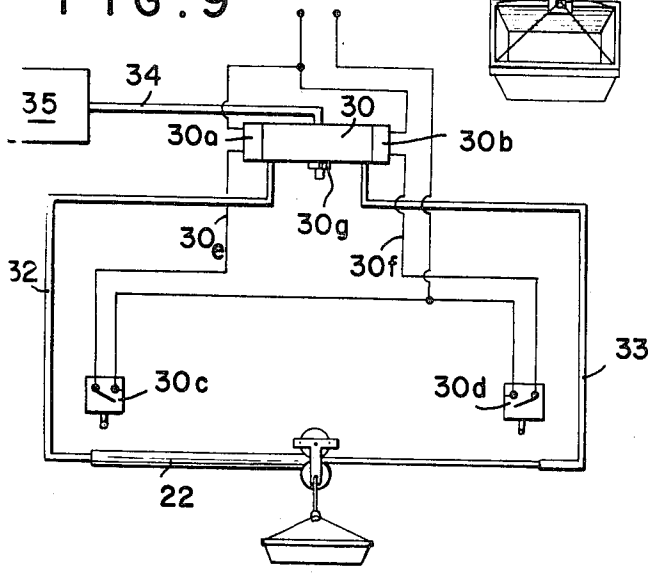


FIG. 14

FIG. 9



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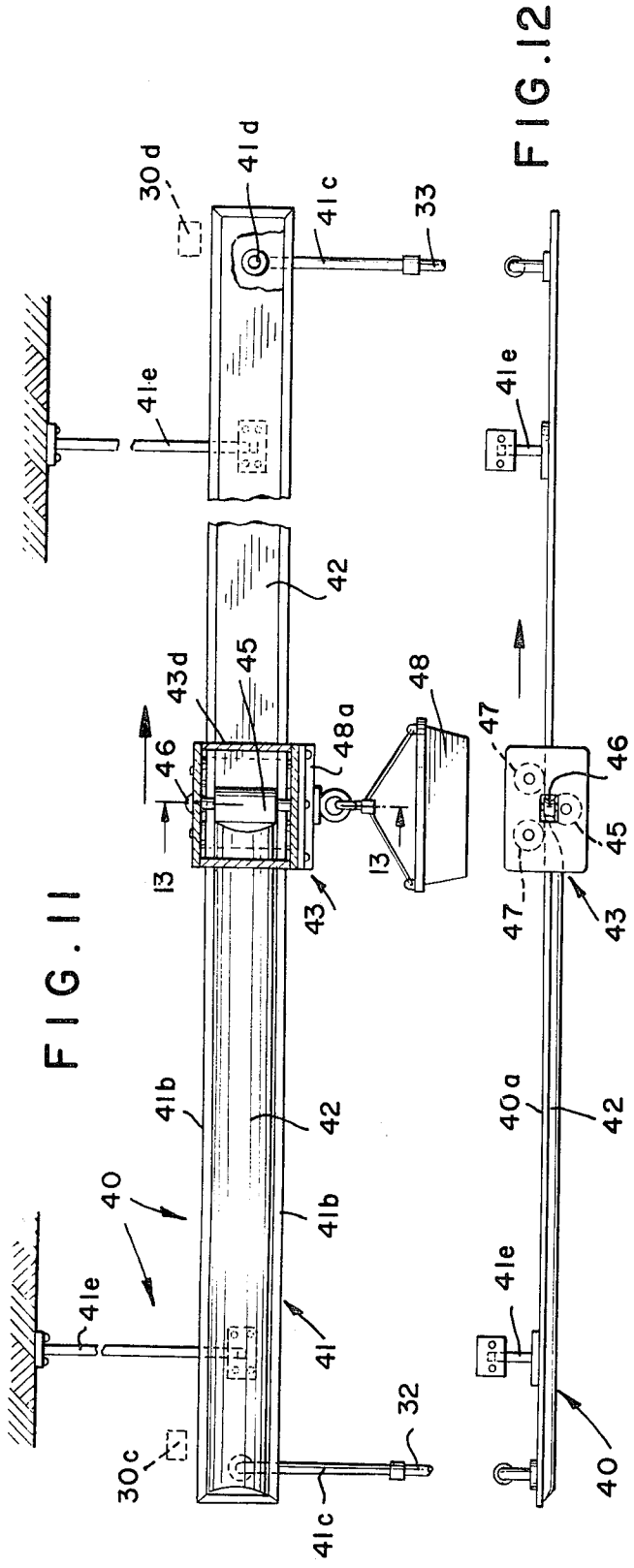


FIG. 11

FIG. 12

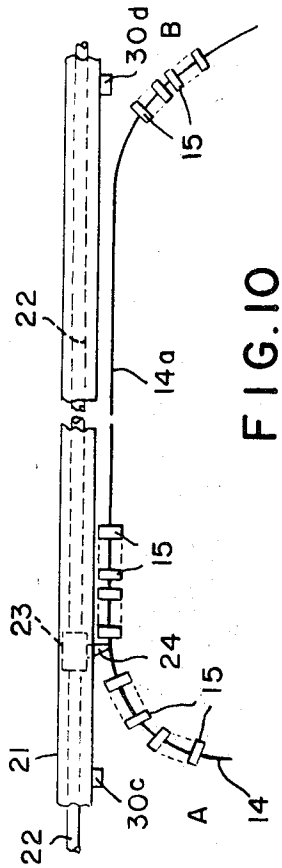


FIG. 10

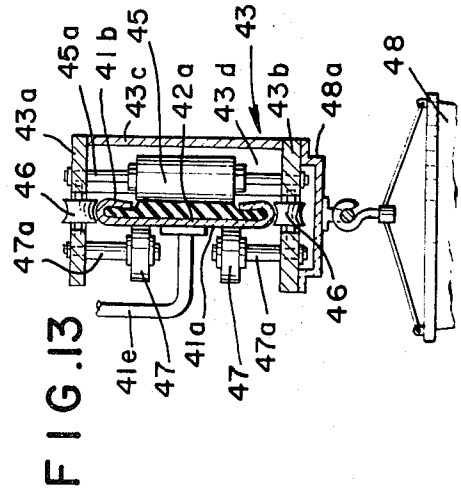


FIG. 13

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FLUID PRESSURE ACTUATED CONVEYOR SYSTEM

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to the utilization of fluid pressure as a prime mover in a propulsion device for a vehicle along a predetermined course and more particularly is directed to the combination of a collapsible conduit for the fluid under pressure and a traveler mounted for movement there along, said traveler having means to compress the conduit forming a constriction which under fluid pressure progressively propels the traveler along the conduit.

2. Description of the Prior Art

The invention satisfies the long felt need for a readily controllable prime mover for conveyor systems. One example of such need is for the controlled propulsion of merchandise racks or trolleys along a rail system in manufacturing facilities and particularly in distribution warehouses where merchandise, such as garments, may be received and placed on hangers suspended on such trolleys. Conventional chain or belt driven means using electric motors with or without clutch control mechanisms have been found to be clumsy, inefficient, expensive, and difficult to adapt to existing overhead track systems with the result that movement of the trolleys along overhead track systems from station to station, for example, for ticketing, selection, sorting for distribution to various stores, holding for loading, and final movement to loading docks is done manually.

The simplicity of the propulsion device embodying the invention not only permits use of power in place of manual operation but greatly facilitates the adaptation of controls thereto for automatic or semiautomatic operation of the conveyor systems.

SUMMARY OF THE INVENTION

Among the objects of the invention is to utilize fluid pressure as a prime mover in a novel propulsion device which shall comprise relatively few and simple basic parts which can be readily and economically adapted as a conveyor system *per se* or serve as an accessory for track and trolley conveyor systems, for example, of the overhead type used in manufacturing and distribution warehousing facilities.

The basic combination embodying the invention comprises an elongated readily collapsible conduit for a fluid medium under pressure and a traveler mounted for movement along the length of the conduit and having means compressing the latter into a substantially closed-off constriction. Fluid medium pressure from a suitable source, such as compressed air, is applied to an end of the conduit, acting to expand the constriction, causes an undulation thereof against the compressing means which propels the traveler in advance of the undulation. A valve means may selectively apply the fluid pressure to either of opposite ends of the conduit to determine the direction of movement of the traveler and automatic reversal of the latter may be achieved by its actuation of electric switch means at the end of a course in one direction.

The collapsible conduit may be provided in at least two different forms; namely, as a collapsible hose which has a rigid support formed as, but not limited to, a housing in which the traveler is mounted and supported, the traveler having a pair of compressing rollers between which the hose extends; or as an elongated rigid backing plate with an overlying strip of elastic sheet material secured to the plate along the opposite longitudinal edges thereof, the elastic material being inflatable by introduction of the fluid pressure medium between the rigid plate and elastic sheet, the backing plate extending substantially through the traveler, the latter having a roller pressing the elastic sheet against the backing plate.

The propulsion device will be seen to have a wide range of versatility in that the traveler may be formed as a vehicle for carrying a load directly or may be provided with a projecting pusher arm for engaging a trolley or other vehicle riding on a track system adjacent the conduit.

The fluid pressure provides a smooth and dependable propulsive force to the traveler capable of moving its intended load both on level and inclined tracks and has the advantageous characteristic of permitting stop and go control by the simple imposition of an obstruction in the path of the vehicle without causing any excessive shock, strain or wear on the equipment.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a fragmentary perspective view of a portion of an overhead suspension trolley system having mounted thereon a propulsion device embodying the invention, parts being broken away to show interior construction, direction of travel from left to right being indicated by the arrow.

FIG. **2** is a transverse section taken on line **2–2** in FIG. **1** showing the traveler mounted within the housing and the hose compressed between the rollers.

FIG. **3** is an enlarged transverse sectional view through the compressing rollers showing in full lines constriction of the hose thereby with fluid pressure being exerted in the hose from the left end toward the right to propel the traveler along the hose to an instantaneous advanced position illustrated in broken lines.

FIGS. **4** and **5** are enlarged end and side elevational views, respectively, of the traveler removed from the housing showing details of construction.

FIG. **6** is a transverse sectional view of the traveler taken on line **6–6** in FIG. **5**.

FIG. **7** is a fragmentary perspective view of a portion of a propulsion device shown in FIG. **1** in which the housing is formed to parallel a trolley system (not shown) having curved and inclined sections.

FIG. **8** is a fragmentary enlarged view, partly in section, showing an end portion of the housing of the propulsion device wherein one end of the hose is supported and connected to a line to the fluid pressure source.

FIG. **9** is a diagrammatic representation of propulsion device hose shown in FIG. **1** with its line connections to a reversing valve and electric wiring for automatic reciprocation of the traveler.

FIG. **10** is an illustrative diagram of a trolley system having an automatic reciprocating propulsion device arranged to move trolleys from station A to station B.

FIGS. **11** and **12** are side elevational and top plan views, respectively, of a modified propulsion device embodying the invention wherein a rigid supporting structure serves as part of the conduit and the traveler is illustrated as a load carrying vehicle.

FIG. **13** is an enlarged transverse sectional view taken on line **13–13** in FIG. **11**, and

FIG. **14** is a perspective view of a propulsion device, similar to that shown in FIG. **11**, adapted as an endless closed track conveyor system.

DESCRIPTION OF PREFERRED EMBODIMENTS

Referring in detail to the drawings, **10** denotes a power propelled trolley system shown in FIG. **1** to comprise an overhead suspension trolley system **11** having mounted thereon a propulsion device **20** constructed to embody the invention.

Overhead trolley system **11** may be of any conventional construction, such as, the type installed in manufacturing or distribution warehousing facilities for station to station conveyance of articles in the process of manufacture or of merchandise through the various receiving, sorting, tagging, storing, and reloading operations in such warehousing. As shown in FIG. **1** trolley system **11** has a plurality of spaced apart suspenders **12** which are suitably anchored at their upper ends to ceiling beams or the like (not shown) and terminate in C-brackets **13**. The latter support the rail or track **14** which may extend horizontally from station to station on a single level and may include inclined portions connecting multiple levels and branches terminating in dead ends, all in the

well understood manner. A plurality of vehicles are adapted to run on track **14** and may be suitably equipped as required, for example, with baskets for carrying small articles, hooks for meat carcasses, or as here shown as trolley **15** having a pair of spaced grooved wheels **16** journaled in frames **16***a* from which brackets **16***b* depend, the latter supporting therebetween a rack **17** on which hangers **18** for garments (not shown) may be carried.

Propulsion device **20**, shown in FIGS. **1** and **2** as an accessory to trolley system **11**, comprises an elongated tubular housing **21**, a collapsible conduit in the form of a hose **22** extending therethrough, and a traveler **23** mounted for reciprocation in housing **21** and for compression of hose **22** into a constriction **22***a* thereat. Housing **21** may be suitably mounted as by brackets **12***a* connected to suspenders **12**, to parallel track **14** in spaced relation thereto and has an elongated side opening **21***a* facing track **14** through which a pusher arm **24** extends from traveler **23** to engage trolley **15** for movement therewith along track **14**.

As seen in FIGS. **4**, **5** and **6**, traveler **23** may comprise a tubular frame having opposite side walls **23***a*, **23***b*, a bottom wall **23***c*, a top wall **23***d*, and a substantially open front and rear through which hose **22** extends between a pair of compressing rollers **25** mounted for free rotation on a pair of shafts **25***a* extending between opposite side walls **23***a*, **23***b*. Any suitable means may be provided to properly centralize traveler **23** for propulsion through housing **21** with a minimum of friction, here shown as a pair of longitudinally spaced wheels **26** supported from bottom wall **23***c* and eight side thrust rollers or wheels **27**, one mounted adjacent each corner of each of the side walls **23***a*, **23***b* to freely rotate on four shafts **27***a* extending between top wall **23***d* and bottom wall **23***c*. Where required, as for example, when housing **21** is formed with curved portions, a guide roller **27***b* for hose **22** may be mounted on each shaft **27***a* between wheels **27**.

Hose **22** is supported solely at opposite ends thereof in any suitable manner for proper alignment with respect to the space between compressing rollers **25** of traveler **23** and for proper connection to a fluid pressure source, which in this embodiment is compressed air. To this end, hose **22** is shown in FIG. **8** connected by a clamp **28***a* to a reducing coupling **28** which may be mounted by a bracket **21***b* in tubular housing **21** located beyond each end of the course traversed by traveler **23**. The smaller end of coupling **28** may carry a T-fitting **29**, one branch of which connects to air hose **32**, the other branch to a quick release valve **31**. Hose **22** is similarly mounted at both ends, one end connecting to air hose **32**, the opposite end to an air hose **33**, as illustrated in FIG. **9**. Air hoses **32** and **33** in turn are alternately connected to a compressed air tank **35** through a suitable four-way valve which may be manually operable, or as shown diagrammatically in FIG. **9**, may be the solenoid operated valve **30** of an automatic reversing control for traveler **23**.

In the embodiment of the invention shown in FIGS. **1** to **8**, inclusive, traveler **23** is required to effectively push one or more trolleys **15** along a portion of track **14** in only one direction. To this end, pusher arm **24** is shown mounted as a detent to pivot on a pin **24***a* from a normally extended position across the path of trolley **15** biased by tension spring **24***b* to a trolley clearing position shown in broken lines in FIG. **1**. An angle bar **24***c*, attached to traveler side wall **23***b*, supports pusher arm **24** so that in its normally extended position leading edge **24***d* thereof, disposed substantially perpendicular to the path of travel, engages trolley wheel frame **16***a* for forward movement by traveler **23** and angularly disposed trailing edge **24***e* serves as a cam surface for deflective pivoting of pusher arm **24** by wheel frame **16***a* against action of spring **24***b* permitting traveler **23** to pass by trolleys **15** when moving in a reverse direction.

A simple control for automatic reciprocation of traveler **23** is shown in FIG. **9** as comprising four-way valve **30** operated by solenoids **30***a* and **30***b* in parallel circuits **30***e* and **30***f* to an electric power source through normally open microswitches **30***c* and **30***d*. Solenoid **30***a* shifts valve **30** to a first position connecting main air hose **34** from tank **35** to hose **32** and venting hose **33** at port **30***g* while solenoid **30***b* shifts valve **30** to a second, alternate position connecting main air hose **34** to hose **33** and venting hose **32** at port **30***g* in the well understood manner.

Propulsion device **20** is readily adaptable to serve a trolley system having various curved and inclined sections. As indicated in FIG. **7**, housing **21** may comprise a plurality of sections, for example, straight sections **21***c*, horizontally curved sections **21***d* and **21***e* turning to the right and left, respectively, and vertically curved sections **21***f* which may serve both for the lower and upper ends of an incline. These sections are joined together in any suitable manner to provide a smooth duct for traveler **23** and support for hose **22** which is placed to extend therethrough in a relatively loose manner being supported at the opposite ends thereof by brackets **21***b* in the manner shown in FIG. **8**.

The utility and operation of the invention will be apparent from the description of an installation of propulsion device **20** having an automatic control of a type shown in FIG. **9** for reciprocation of traveler **23**. Device **20** propels trolleys **15** along a section of an overhead suspension system **11** illustrated in FIG. **10** as extending between stations A and B in a distribution warehouse wherein, for example, at station A garments, previously hung on hangers **18** suspended on racks **17**, are ticketed and at station B the garments on racks **17** are staged for loading into trucks for distribution to the various stores.

After the garments are tagged at station A, trolleys **15** are advanced around the curved portion of track **14** onto track portion **14***a* which lies along the path of pusher arm **24** of reciprocating traveler **23**. As traveler **23** approaches the end of its return run, that is, its travel in a direction from right to left as seen in FIGS. **1**, **9** and **10**, it engages microswitch **30***c* closing circuit **30***e* to energize solenoid **30***a* and shift valve **30** to a position connecting air hose **32** to main hose **34** to supply air pressure from tank **30** to the left end of hose **22** and simultaneously venting hose **33** through port **30***g* to relieve the pressure at the right end of hose **22**. The air pressure introduced into the left end of hose **22** causes it to inflate and imparts an expanding force to the left side of constriction **22***a*. The simultaneous release of air pressure on the right side of constriction **22***a* creates an inequality in pressure which propels rollers **25** toward the right. Traveler **23**, now advancing in its load carrying direction from left to right, engages the first of the trolleys **15** on track portion **14***a* with pusher arm **24** and propels the entire group to station B where track **14** curves away from housing **21** permitting clearance of pusher arm **24**. Traveler **23**, in completing its run, engages microswitch **30***d* energizing solenoid **30***b* to shift valve **30** to its alternate position wherein hose **32** is vented and hose **33** supplies air pressure to the right end of hose **22** reversing traveler **23**. Any trolleys **15** on track portion **14***a* will offer no obstruction to the return of traveler **23** because of the detent action of pusher arm **24** which pivots against the action of spring **24***b* to the retracted, clearance position shown in broken lines in FIG. **1**. Upon arrival at microswitch **30***c*, traveler **23** initiates its next forward run in its continous automatic reciprocation, moving the succeeding group of trolleys **15** from station A to station B.

In order to reduce resistance to the forward motion of traveler **23** in its progressive constriction of hose **22**, the venting of air is accomplished immediately adjacent the ends of hose **22** with the aid of quick release valves **31** used in the manner shown in FIG. **8**. Valves **31**, which are of conventional construction, close when a predetermined internal pressure is applied and open when the internal pressure is relieved. Thus, when air pressure is applied through hose **32** or **33** by four-way valve **30**, the respective valve **31** closes but when the pressure is relieved by hose **32** or **33** being vented through four-way valve **30**, the respective valve **31** opens for quick venting of air being forced out of hose **22** by the approach of traveler **23**, whereby the length of hose **32** or **33** to vent **30***g* is bypassed after the initial release of pressure through vent **30***g*.

A conveyor system 40 is shown in FIGS. 11, 12 and 13 as a modification embodying the invention comprising a track 41 along which a load carrying traveler 43 is propelled. Track 41 is constructed to carry the weight of traveler 43 and its intended load and also to provide a collapsible and inflatable conduit for the propulsion device. To this end, track 41 is formed as an elongated rigid backing plate 41*a* having a strip 42 of elastic sheet material mounted on one face thereof forming an inflatable cavity or conduit therebetween. Strip 42 is suitably joined along its edges as by joints 41*b* which may be formed by edge borders of plate 41*a* being folded over to clampingly grip the edges of strip 42 leaving the center portion thereof free for expansion by fluid pressure introduced between plate 41*a* and strip 42 through suitable pipe fittings 41*c* terminating in openings 41*d* in plate 41*a* adjacent opposite ends of track 41. Fittings 41*c* may be connected to a fluid pressure source, such as, to air hoses 32 and 33 to the left and right ends of track 41, respectively, as indicated in FIG. 11. Track 41 may be supported from a floor, or as shown, may be hung from a ceiling by suspenders 41*e* having angularly disposed ends attached to a central portion of backing plate 41*a* at spaced intervals therealong.

Traveler 43, substantially surrounding track 41, has top and bottom walls 43*a* and 43*b*, respectively, interconnected by a front wall 43*c* and two small opposite side walls 43*d*. A pair of opposing wheels 46 are mounted in suitable openings in top and bottom walls 43*a* and 43*b* and have grooved surfaces conforming to the rounded edges of joints 41*b* on which wheels 46 ride. A compressing roller 45 freely rotates on shaft 45*a* extending between top and bottom walls 43*a* and 43*b* and is opposed by two pairs of thrust rollers 47 mounted on stub shafts 47*a* extending inwardly from top and bottom walls 43*a* and 43*b*.Rollers 47, riding on the rear surface of backing plate 41*a*,coact with compressing roller 45 which may be centralized between each pair of rollers 47, as is clear from FIG. 12. Compressing roller 45 rides on elastic strip 42, extending across the width thereof, to provide a constriction 42*a* in the inflatable cavity between backing plate 41*a* and strip 42, constriction 42*a* functioning in the same manner as hereinbefore described for constriction 22*a* in hose 22 formed between rollers 25 of traveler 23. A load carrying suspending basket 48 is suitably attached to bottom wall 43*b* by a bracket 48*a* or where track 41 is disposed near the floor, top wall 43*a* may be constructed to carry a desired load above track 41.

A conveyor system 50 is illustrated in FIG. 14 utilizing a track 51, of similar construction to track 41, having a backing plate 51*a* and elastic strip 52. Although shown as circular in shape, it is to be understood that track 51 may be of any closed configuration with the ends of plate 51*a* brought together and joined at 50*a* to form a smooth track structure on which traveler 53 may be propelled continuously in one direction. Strip 52 is closed off at the juncture 50*a* separating pressure medium inlet 54 from outlet 55 which are located adjacent opposite sides of juncture 50*a*.

An appropriate means is required to carry traveler 53 across the juncture 50*a* which otherwise would obstruct its progress. A suitable spring loaded mechanical device actuated by the forward movement of traveler 53 as it approaches juncture 50*a* will serve such purpose. Another such means utilizes the fluid pressure from the source supplying inlet 54 and is diagrammatically indicated to comprise cylinder 60 having a reciprocatable piston rod 61 carrying a puller arm 62 for engaging a protruding rod 63 on traveler 53, microswitches 64 and 65, and hoses 66 and 67 which connect to a four-way solenoid operated valve (not shown) similar to valve 30.

In its clockwise advance along track 51, as traveler 53 approaches juncture 50*a*, protruding rod 63 deflects and passes puller arm 62, the latter being pivotally mounted for such deflection as indicated in broken lines. Microswitch 64 is positioned to be closed by traveler 53 as soon as puller arm 62 clears rod 63 and springs back to its operative position. The closing of microswitch 64 shifts the solenoid operated valve to deliver pressure to hose 66 which moves piston rod 61 toward the right, as seen in FIG. 14, to the position shown in broken lines, whereby puller arm 62 engages rod 63 carrying traveler 53 across juncture 50*a* and beyond inlet 54. Traveler 53, now being propelled by the pressure from inlet 54, engages microswitch 65 shifting the solenoid operated valve to an alternate position to supply pressure to hose 67 which returns piston rod 61 to its extended position ready for the next cycle. In this manner continuous motion in the same direction is imparted to traveler 53.

It will now be apparent that propulsion of travelers 43 and 53 is achieved in a manner similar to that of traveler 23, namely, by the introduction of a fluid, such as air, under pressure between plate 41*a* and strip 42 to expand the latter against one side of constriction 42*a*. This pressure propels roller 45 and its traveler 43 over the uninflated portion of strip 42, the constriction 42*a* advancing under roller 45 as a progressing undulation.

The collapsible-inflatable conduit combined with a supporting means for the traveler as a prime mover accessory to a conveyor system such as hose 22, housing 21 and trolley system 11 or formed as the self-contained conveyor systems 40 and 50 may be further modified within the contemplated scope of the invention to serve particular conveyor needs. Thus, for example, housing 21 may be reduced to a supporting plate upon which hose 21 rests with a traveler resembling the construction of traveler 43 having compressing roller 45 constricting the hose against the plate. A platform may be provided on such traveler to carry a desired load. Likewise, traveler 43 may be fitted with a pusher arm to serve in a manner similar to pusher arm 24 of traveler 23, and tracks 41 and 51 may be arranged to be in a horizontal instead of a vertical plane as shown.

The mounting of pusher arm 24 on traveler side wall 23*b* may be constructed to facilitate reversing the direction in which trolleys 15 are propelled along track 14, as for example, by a suitable mounting enabling angle bar 24*c* to be readily inverted.

To propel travelers 23 pushing a group of loaded trolleys 15, air pressure on the order of 20 to 40 p.s.i. has been found to render satisfactory results. Greater or lesser pressures may be used depending upon load requirements, inclines in the track, and desired speeds, which pressure may be controlled by suitable valves (not shown) interposed in the various air supply lines, as for example, in main air hose 34 or in hoses 32 and 33. It is thus apparent that a versatility of the invention includes the wide range of speeds that may be developed in travelers 23, 43 and 53 which speeds are controlled by simple adjustment of a conventional air pressure control valve.

It is also contemplated that the movement of travelers 23, 43 and 53 and trolleys 15 be controlled by the imposition of a suitable obstruction in the path of movement thereof since the prime mover permits the stopping of travelers 23, 43 and 53 without adjustment or cutoff of fluid pressure, and also permits the resumption of movement of the travelers 23, 43 and 53 when the obstruction is removed. Excessive buildup of fluid pressure behind such stalled traveler may be prevented by providing suitable pressure safety relief valves (not shown) at the ends of the conduit.

The improved fluid pressure prime mover and conveyor systems herein disclosed are seen to achieve the several objects of the invention and to be well adapted to meet conditions of practical use. As various possible embodiments might be made of this invention, and as various changes might be made in the disclosed constructions, it is to be understood that all matters herein set forth or shown in the accompanying drawings are to be interpreted as illustrative and not in a limiting sense.

I claim:

1. A propulsion device comprising a collapsible-inflatable conduit disposed along a predetermined path between opposite ends thereof, a traveler mounted for movement along said path and having means compressing the conduit into a constriction thereat, air pressure means applied to one of said opposite ends of the conduit to inflate the latter and expand

said constriction as an undulation progressing against said compressing means propelling said traveler along said path toward said other conduit end, in combination with a trolley system having a track portion paralleling said conduit and a trolley mounted on said track for movement therealong, said traveler having projecting means engaging said trolley for propulsion along said track by said traveler, said air pressure means, conduit, traveler and trolley system being so constructed and arranged to permit stoppage of the traveler and trolley by interposition along said track of an obstruction to trolley advancement and continued forward movement of the traveler and trolley upon removal of said obstruction.

2. The propulsion and trolley system combination defined in claim 1 in which said projecting means has a detent action permitting the traveler to engage and propel the trolley in a predetermined direction and to pass by the trolley when the traveler is moving in an opposite direction.

3. The propulsion and trolley system combination defined in claim 1 including means for adjusting the air pressure applied to said first conduit end to control the speed of said traveler.

4. The propulsion and trolley system combination defined in claim 1 including means for selectively applying said air pressure to one of the opposite ends of said conduit and simultaneously venting the other end to propel said traveler toward said conduit other end and for reversing the respective application of pressure and venting to propel the traveler in an opposite direction, control means for said selective air pressure applying means responsive to the approach of said traveler to either end of said path to effect said reversal of pressure and venting providing automatic reciprocation of said traveler.

5. The propulsion and trolley system combination defined in claim 1 including a pressure relief valve located at opposite ends of said conduit preventing excessive pressure buildup when the traveler is stalled by said interposition of an obstruction to the forward movement of the trolley.

6. A propulsion device comprising a collapsible-inflatable hose disposed along a predetermined path between opposite ends thereof, a traveler mounted for movement along said path, said traveler having a pair of rollers supported by said traveler between which the hose passes compressing the hose into a constriction thereat, fluid pressure means applied to one of said opposite ends of the hose to inflate the latter and expand said constriction as an undulation progressing against said rollers propelling said traveler along said path toward the other of said opposite hose ends, a supporting duct through which said hose extends defining said path, said traveler being sized and shaped for support in and movement through said duct.

7. The propulsion device defined in claim 6 in which said traveler has thrust rollers engaging opposite sides of said duct stabilizing said traveler against yawing.

8. The propulsion device defined in claim 6 in which said duct has a longitudinal extending side opening, a trolley system having a track portion paralleling said side opening and a trolley mounted on said track for movement therealong, said traveler having means extending through said opening engaging said trolley for propulsion along said track by said traveler.

9. A propulsion device comprising a collapsible-inflatable conduit disposed along a predetermined path between opposite ends thereof and formed as an elongated rigid backing plate having an overlying elastic strip joined to the plate along opposite longitudinal edges thereof providing an inflatable cavity therebetween, longitudinal edges of said backing plate being folded over to clampingly grip longitudinal edges of said elastic strip as said joining thereof, a traveler mounted for movement on said conduit, said traveler having a pair of opposed grooved wheels riding on the surface of said folded edges and having a roller extending across said strip urging the latter against said backing plate as a constriction thereat, fluid pressure means applied to one of said opposite ends of the conduit to inflate the latter and expand said constriction against said roller propelling said traveler along said path toward the other of said opposite conduit ends.

10. A propulsion device comprising a collapsible-inflatable conduit disposed along a predetermined path between opposite ends thereof, a traveler mounted for movement along said path, said traveler having means compressing the conduit into a constriction thereat, fluid pressure means applied to one of said opposite ends of the conduit to inflate the latter and expand said constriction as an undulation progressing against said compressing means propelling said traveler along said path toward the other of said opposite conduit ends, said conduit opposite ends terminating adjacent each other so that said path defines an endless circuit having a juncture between said opposite ends, said traveler being mounted to bridge said juncture for continuous movement around said circuit, and auxiliary propulsion means actuated by the approach of said traveler to said other opposite conduit end for propelling said traveler across said juncture and beyond said first mentioned conduit end for continued propulsion along said path by said fluid pressure application to said first mentioned conduit end.