United States Patent

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[33] **Great Britain**
[31] **2961/68**

[54] **INFLATABLE TUBE CONVEYOR**
6 Claims, 7 Drawing Figs.

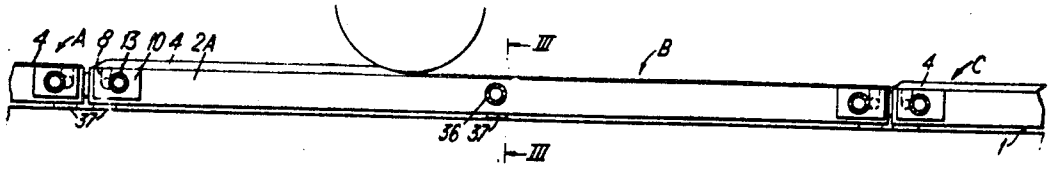
[52] **U.S. Cl.** **198/1,** 104/155
[51] **Int. Cl.** **B65g 35/00**
[50] **Field of Search** ..... 198/1, 108, 220 B; 104/155

[56] **References Cited**
UNITED STATES PATENTS

3,327,832	6/1967	Kyle	198/1
3,360,096	12/1967	Moore et al.	198/1
236,555	1/1881	Conger	104/155

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ABSTRACT: The invention consists in a conveying apparatus comprising elongated inflatable tubing to receive a load on its exterior and fluid supply means connected to the tubing to create within the tubing an inflationary through flow of fluid which causes movement of the load along the tubing.



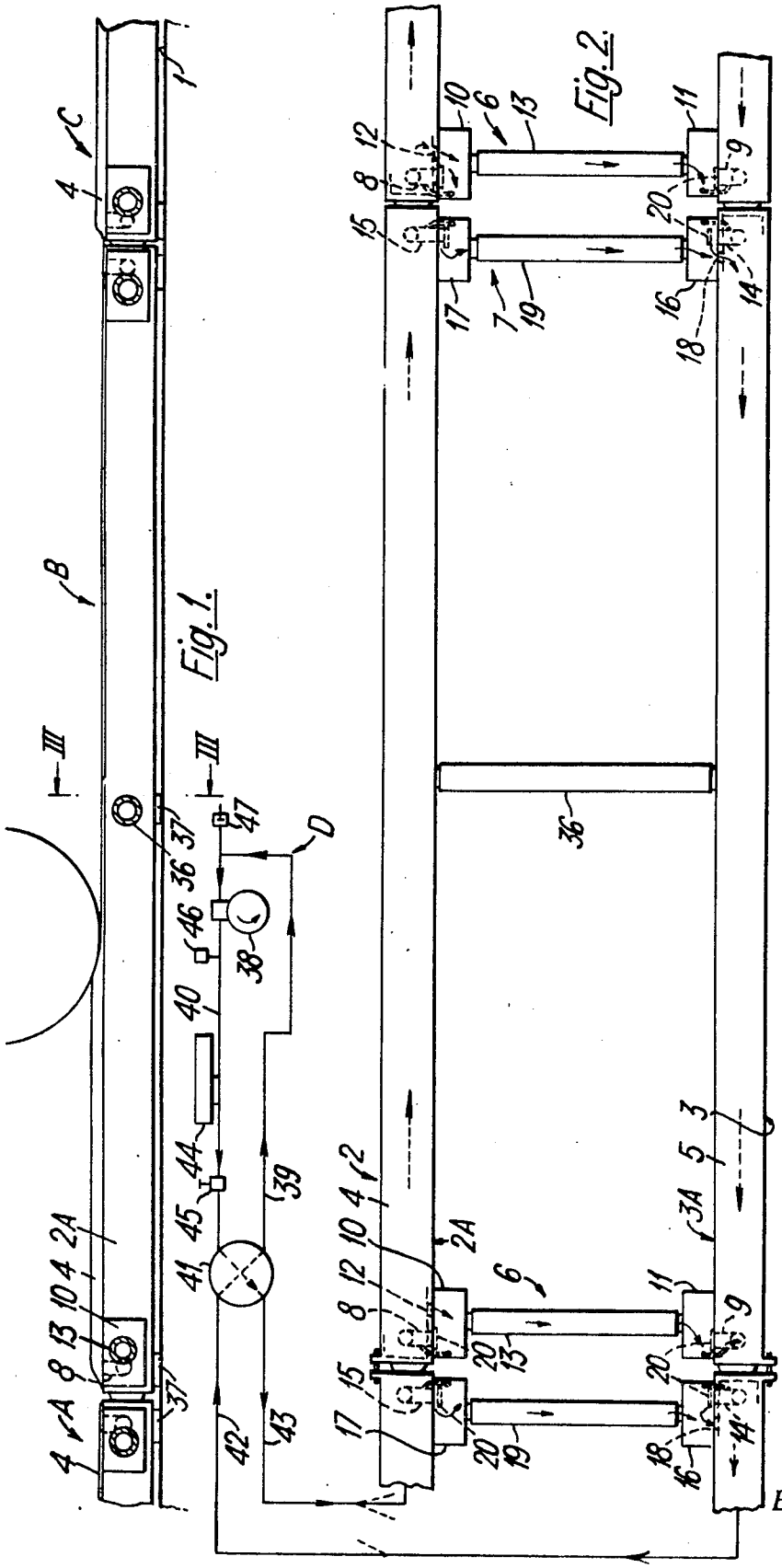


Fig. 1.

Fig. 2.

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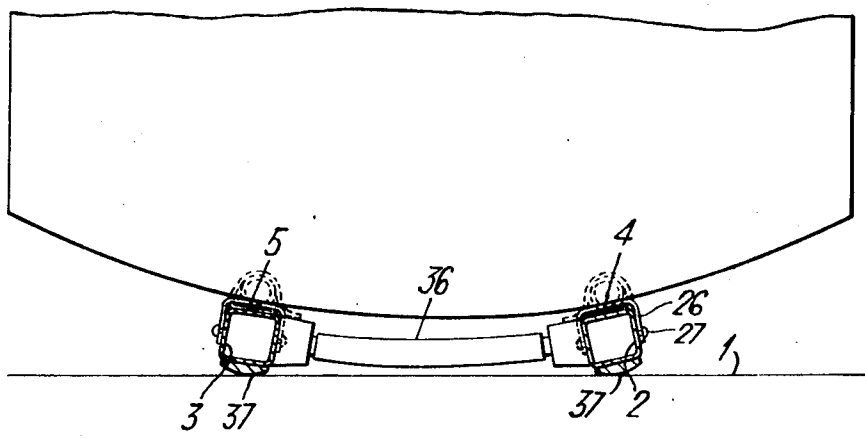


Fig. 3.

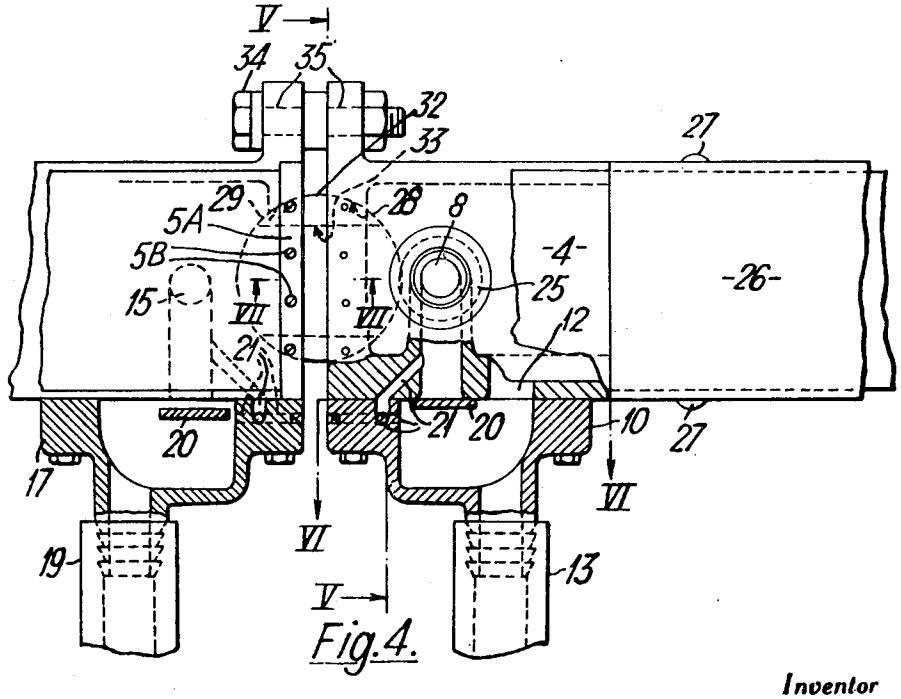


Fig. 4.

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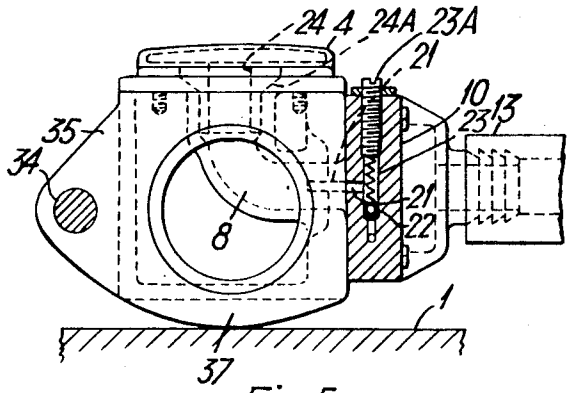


Fig. 5.

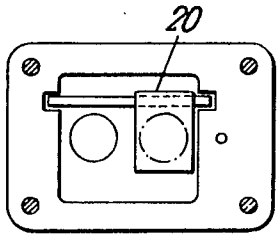


Fig. 6.

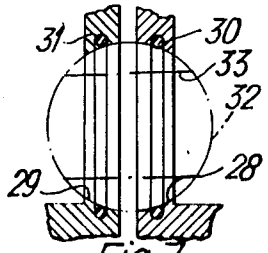


Fig. 7.

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INFLATABLE TUBE CONVEYOR

This invention relates to conveying apparatus especially but not exclusively for rolling loads such for example as barrels, casks, drums or the like containers (hereinafter and in the claims referred to simply as barrels).

The chief object of the present invention is to provide simple, inexpensive and efficient conveying apparatus.

According to the present invention conveying apparatus for a rolling load comprises two parallel, laterally spaced rails each of which is formed of end-to-end tubular rail sections, each rail forming a trunk which is part of a pressure fluid supply system, and a length of elongated inflatable tubing mounted on each rail section to receive thereon the rolling load and receiving pressure fluid from said system so that there is a through flow of pressure fluid through the tubes to cause movement along the rails of the rolling load resting on the inflatable tubing.

Embodiments of the invention will now be described by way of example with reference to the accompanying drawings in which:

FIG. 1 is a fragmentary side view of barrel conveying apparatus with a barrel travelling along same;

FIG. 2 is a diagrammatic top plan view of FIG. 1;

FIG. 3 is a transverse sectional view on the lines III—III of FIG. 1;

FIG. 4 is a part-sectional detail view of FIG. 2;

FIG. 5 is a sectional end view on the line V—V of FIG. 4;

FIG. 6 is a sectional detail view on the line VI—VI of FIG. 4;

FIG. 7 is a sectional detail view on the line VII—VII of FIG. 4.

Conveying apparatus for barrels is laid on the floor 1 of a warehouse and is composed of a number of end-to-end interconnected conveyor sections A, B and C. Each section consists of a pair of spaced parallel-box-section tubular rails 2 and 3 forming a rolling track; a pair of flat, closed, inflatable inelastic tubes 4 and 5 (for example, hoses as used in firefighting) on the flat, top faces of the respective tubular rails and having their closed ends secured to the rails by clamping bars 5A secured to the rails by screws 5B; and pressure-fluid supply means D connected to the tubes and including the tubular rails 2 and 3 which form respectively feed and exhaust trunks, transverse feed conduit means 6 communicating with the trunk 2 and interconnecting one pair of tube ends, and transverse exhaust conduit means 7 communicating with the trunk 3 and interconnecting the other pair of tube ends. The transverse feed conduit means 6 includes a pair of outlet ducts in the form of pipe bends 8 and 9 extending between the tubes 4 and 5 and the inner sidewalls 2A and 3A of the trunks, a pair of casings 10 and 11 on the exterior of the sidewalls 2A and 3A, an aperture 12 formed in the sidewall 2A to connect the trunk 2 with the casing 10, and a flexible pipe 13 engaging spigots on the casings to interconnect the casings. The transverse exhaust conduit means 7 includes a pair of outlet ducts in the form of pipe bends 14 and 15 extending between the tubes 4 and 5 and the inner sidewalls 2A, 3A of the trunks; a pair of casings 16 and 17 on the exterior of the sidewalls 3A and 2A, an aperture 18 formed in the sidewall 3A to connect the trunk 3 with the casing 16, and a flexible pipe 19 engaging spigots in the casings 16 and 17 to interconnect the casings.

The flexible pipes 13 and 19 as well as a flexible pipe 36 engaging spigots on the sidewalls 2A and 3A serve as crossties spacing the trunks 2 and 3.

In casings 10, 11, 16, 17 are nonreturn flap valves 20 having pivotal flaps cooperating with the sidewalls 2A and 3A and urgeable by fluid under pressure to close the inner ends of the pipe bends. Also, each transverse feed and exhaust conduit means includes at each end an inlet duct 21 (FIGS. 4 and 5) extending between the casing and the pipe bend to enable fluid under pressure to bypass the nonreturn valve, and a pressure-regulating one-way ball valve in the duct 21 for controlling the flow therethrough and including a ball 22, a spring 23, and a screw-threaded abutment 23A for adjusting the spring tension. This ball valve ensures that there is always a working pressure maintained in the trunking so that the first barrel placed on the apparatus will be conveyed.

Nipples 24 (FIG. 5) on the ends of the tubes 4 and 5 are screwed into the outer ends of the pipe bends 8, 9, 14, 15 and have conical flanges 24A engaging corresponding conical seatings 25 (FIG. 4) at the outer ends of the pipe bends to provide fluidtight connections between the tubes and the pipe bends.

Elastic cover strips 26 engage over the tubes 4 and 5 to protect same and retain same on the rails 2 and 3, and bollards 27 on the sidewalls of the rails engage in holes at the edges of the strips to maintain the strips in position while permitting inflation of the tubes to the broken line position shown in FIG. 3.

The conveyor sections A, B and C have fluidtight joints formed between the ends of their trunks, each joint consisting of a pair of opposed annular concave seatings 28 and 29 in the opposed ends of the trunks, a pair of O-rings 30 and 31 in grooves in the seatings, a ball member 32 on the seatings and having therein a through aperture 33, and a clamping bolt 34 engaging lateral flanges 35 on the trunk ends to interconnect the trunk ends and maintain the seatings in tight sealing engagement with the ball. In one modification each joint includes an aperture ball formation on one trunk end and a concave annular seating on the adjacent trunk end and engaged by the ball formation.

In another modification the clamping bolt is replaced by a pivotal-hook coupling which facilitates quick dismantling of the apparatus for removal to another location.

The joints thus formed have some degree of torsional flexibility and so are capable of adjusting to suit barrels of different convexity.

Convex bearers 37 on the bottom of the rails 2 and 3 engage the floor to provide for inward rocking of the rails and bending of the crossties convexly downwards when the axially convex barrel wall is deposited on the tubes.

The rails of one endmost conveyor section have their outer ends closed and the rails of the other endmost conveyor section have their outer ends connected in a closed air-supply circuit including a compressor or air pump 38, pump suction and discharge ducts 39 and 40 respectively, a four-way control valve 41 actuable to reverse the airflow in ducts 42 and 43 connecting the ducts 39 and 40 with the outer end of the endmost conveyor section A, an air receiver 44 enabling quick reversal of airflow, an adjustable reducing valve 45, a relief valve 46, and an auxiliary air pump 47 for replacing any air leakages in the circuit. Thus, one end-to-end series of trunk sections forms air supply trunking and the other end-to-end series forms air exhaust trunking.

In use of the apparatus, with the springs 23 of the ball valves appropriately adjusted and the pump or compressor 38 in operation, air under pressure flows from the supply trunking 2 through the apertures 12 into the casings 10 of the feed conduit means 6, closes the flap valves 20 in the casings 10, and branches from each casing 10, one set of branch flows being through the inlet ducts 21, and pipe bends 8 into the ends of the tubes 4, and the other set of branch flows being through the pipes 13 into casings 11 to close the flap valves, and thence through the inlet ducts 21 and pipe bends 9 into the ends of the tubes 5. The tubes 4 and 5 of the several sections are thus simultaneously inflated. The air under pressure flows from the tubes 4, through the pipe bends 15 and the flap valves 20 into the casings 17, and thence through the pipes 19, casings 16, and apertures 18 into the exhaust trunking 3. The air under pressure flows from the tubes 5, through the pipe bends 14 and flap valves 20 into the casings 16, and thence through the apertures 18 into the exhaust trunking 3. The tubes 4 and 5 of all sections A, B and C of the apparatus are thus maintained in an inflated condition.

On depositing a barrel on the tubes at the upstream end of the apparatus, the rails tilt inwards until the tube-bearing top faces thereof are substantially tangential to the axial convexity of the barrel wall so that the tubes are sealingly nipped between the barrel and the rails. The pressure difference at

opposite sides of the nips results in the application of a rolling torque to the barrel which then travels along the tubes in the downstream direction so that the barrel is rapidly and efficiently conveyed from end to end of the apparatus. By providing for both air inlet and air outlet ducting at each end of the conveyor section, the barrel may be conveyed in the reverse direction simply by operating the control valve 41 to reverse the direction of circulation of the air.

It is clear that a series of barrels may be progressed simultaneously along the track, the number so progressed being limited by the barrel weight, as any lifting of the barrel by the pressurized fluid will open the nips and allow pressure equalization at the sides of the barrel.

The conveying apparatus may include curved sections to enable conveyance of the load-carriers around bends.

In another embodiment of the invention, not shown, the runs of tubes or hoses on the rail track are sealingly nipped by the rollers of a load in the form of a roller carriage on which is mounted a pallet to receive material to be conveyed.

Advantages of the conveying apparatus of the present invention are:

a. It has a low capital cost.

b. It is easily installed, and is readily dismantled and transported from site to site on a suitable vehicle.

c. The conveying surface can be located in a very low level.

d. It can be used to form a series or accumulation of barrels on the tubes without modifying its structure, so that barrels may be thereafter released at any time in the first-on first-off sequence or vice versa. In other words there is provided a so-called accumulation conveyor of a very simple, safe, and economic construction.

e. The power requirements are minimal due to the closed-circuit system.

f. It is safe in operation, as there are no dangerous moving parts.

I claim:

1. A conveying apparatus for a rolling load comprising two parallel laterally spaced rails each of which is formed of end-to-end tubular rail sections, each rail forming a trunk which is part of a pressure fluid supply system and a length of elongated inflatable tubing mounted on each rail section to receive thereon the rolling load and receiving pressure fluid from said system so that there is a through flow of pressure fluid through the tubes to cause movement along the rails of the rolling load resting on the inflatable tubing, said inflatable tubing including a pair of closed tubes mounted on the rails so as to be nipped between the load and the rails, and the pressure fluid supply system being connected to the inflatable tubes and including transverse feed conduit means interconnecting one pair of inflatable tube ends, and transverse exhaust conduit means interconnecting the other pair of tube ends and connected in closed circuit with the transverse feed conduit means.

2. Conveying apparatus according to claim 1, wherein each end of each transverse conduit means includes inlet and outlet ducting connected to the adjacent tube end, and nonreturn valves for controlling fluid flow through the outlet ducting and a control valve in the fluid supply means is operable to reverse the fluid flow so that the feed and exhaust trunks respectively serve as exhaust and feed trunks.

3. Conveying apparatus according to claim 2, wherein in each transverse conduit means the outlet ducting is disposed in the trunks and extends from the tubes to the inner sidewalls of the trunks, a pair of casings on the exterior of the inner sidewalls enclose the inner ends of the outlet ducting, one casing communicates with the adjacent trunk, a transverse pipe interconnects the casings, a pair of nonreturn valves in the respective casings include valve members urgeable by fluid under pressure to close the inner ends of the outlet ducting, and the inlet ducting bypasses the nonreturn valves.

4. Conveying apparatus according to claim 3, wherein a pair of one-way pressure-regulating valves are provided in the inlet ducting to enable control of flow of pressure fluid into the tube ends.

5. A conveying apparatus for a rolling load comprising two parallel laterally spaced rails each of which is formed of end-to-end tubular rail sections, each rail forming a trunk which is part of a pressure fluid supply system and a length of elongated inflatable tubing mounted on each rail section to receive thereon the rolling load and receiving pressure fluid from said system so that there is a through flow of pressure fluid through the tubes to cause movement along the rails of the rolling load resting on the inflatable tubing, the load being a barrel, wherein the rails have flat tube-bearing faces, convex bearers support the rails for transverse rocking movement, and the transverse conduit means are resiliently bendable convexly downwards, the arrangement being such that the barrel on being deposited on the tubes with its peripheral wall bridging the rails tends to rock the rails inwards to a position in which the tube-bearing faces thereof are substantially tangential to the axial convexity of the peripheral wall of the barrel.

6. A conveying apparatus for a rolling load comprising two parallel laterally spaced rails each of which is formed of end-to-end tubular rail sections, each rail forming a trunk which is part of a pressure fluid supply system and a length of elongated inflatable tubing mounted on each rail section to receive thereon the rolling load and receiving pressure fluid from said system so that there is a through flow of pressure fluid through the tubes to cause movement along the rails of the rolling load resting on the inflatable tubing, each joint formed by the rail sections consisting of annular means at the ends, a through-apertured ball formation engaging the seating means, and coupling means interconnecting the rail section ends to maintain the seating means in sealing engagement with the ball formation.