Oct. 6, 1936. H. W. SHONNARD 2,056,541

DRIVING MECHANISM FOR CONVEYERS OR MOVING STAIRWAYS

Filed June 11, 1935 4 Sheets-Sheet 1

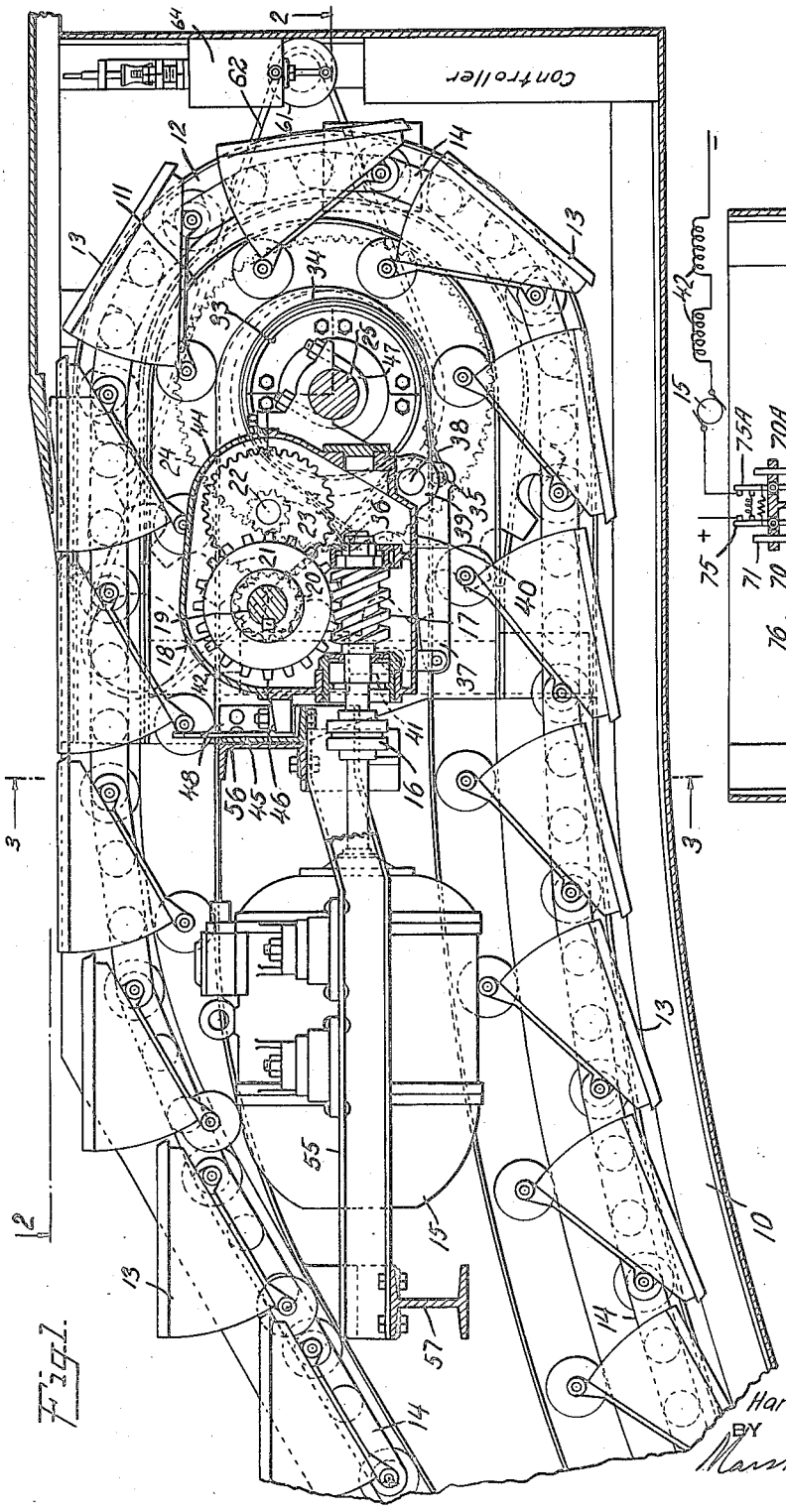


Fig. 1.

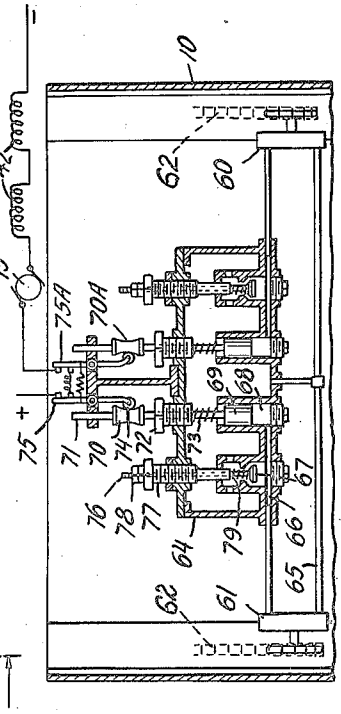


Fig. 7.

INVENTOR
Harold W. Shonnard
BY
Marshall & Hawley
ATTORNEYS

Oct. 6, 1936. H. W. SHONNARD 2,056,541

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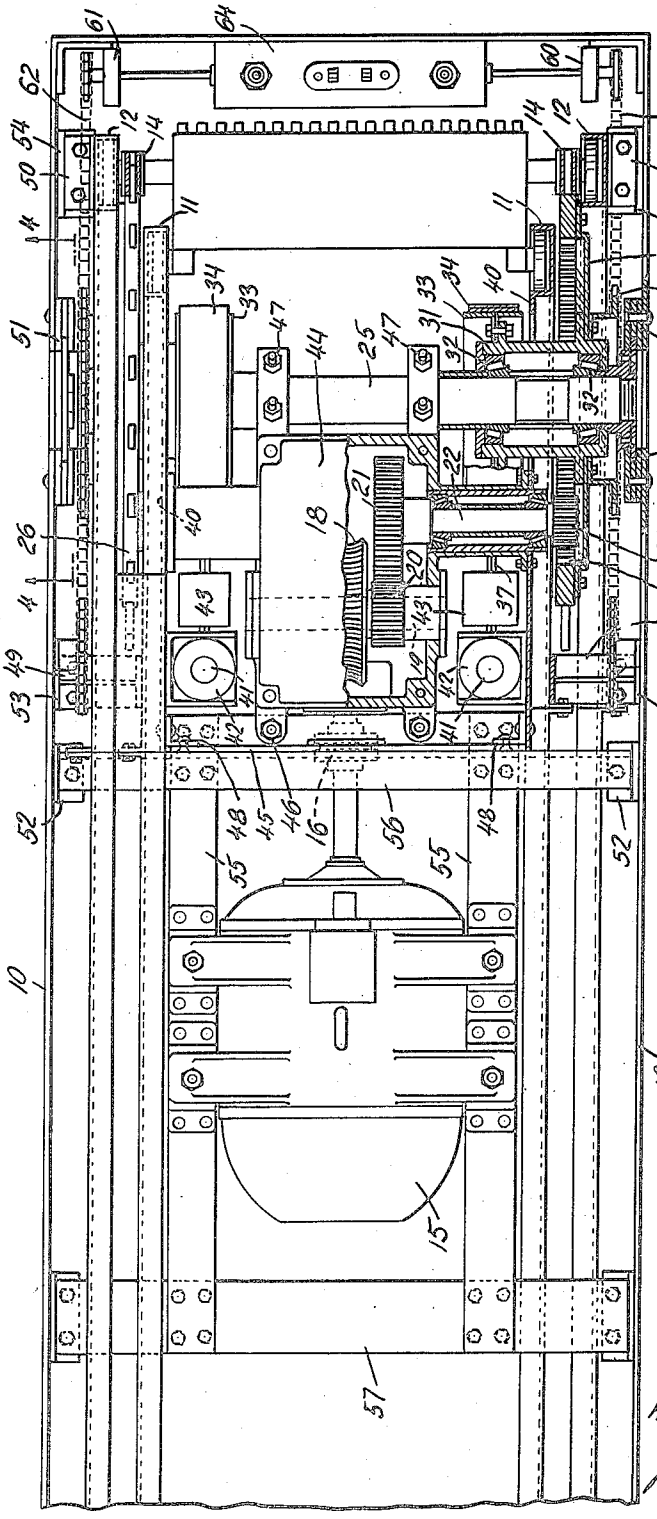


Fig. 2.

INVENTOR
Harold W. Shonnard
BY
Marshall & Stanley
ATTORNEYS

Oct. 6, 1936. H. W. SHONNARD 2,056,541

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Fig. 3.

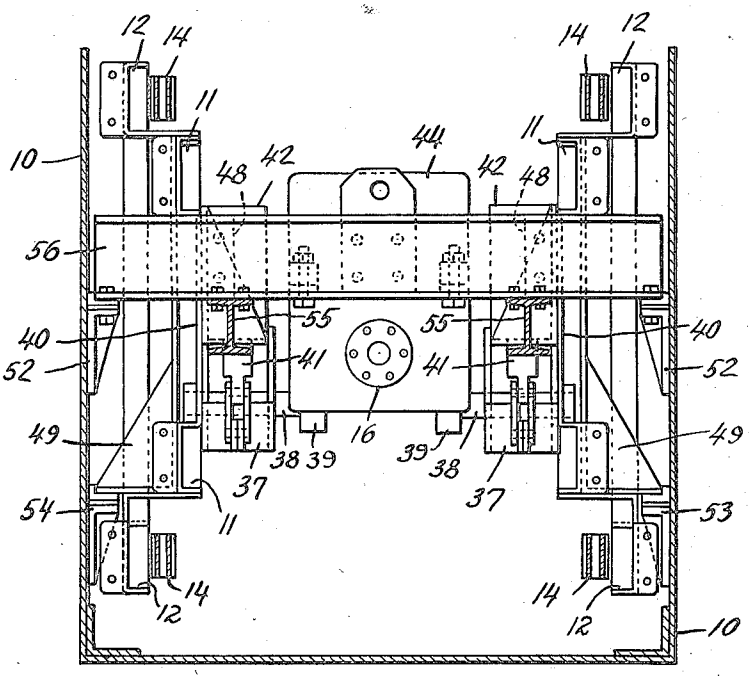
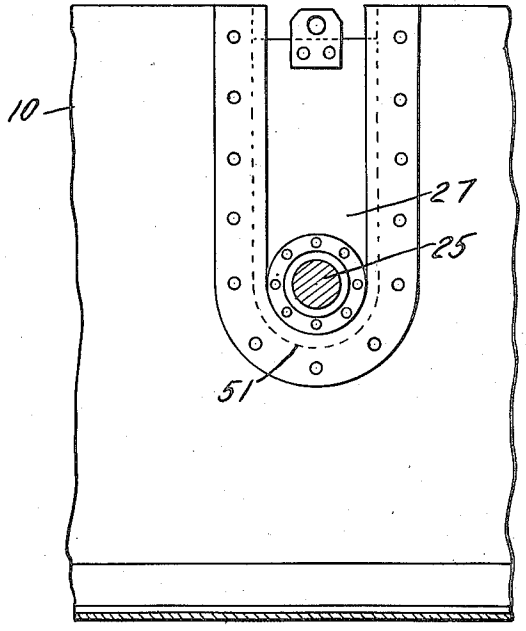


Fig. 4.



INVENTOR
Harold W. Shonnard.
BY
Marshall C. Hawley
ATTORNEYS

Oct. 6, 1936. H. W. SHONNARD 2,056,541

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Fig. 5.

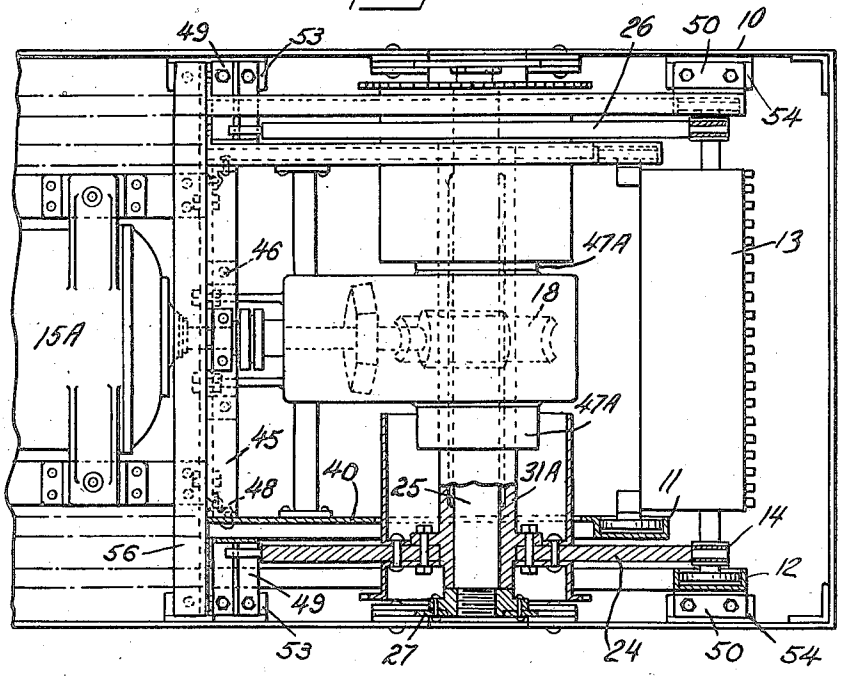
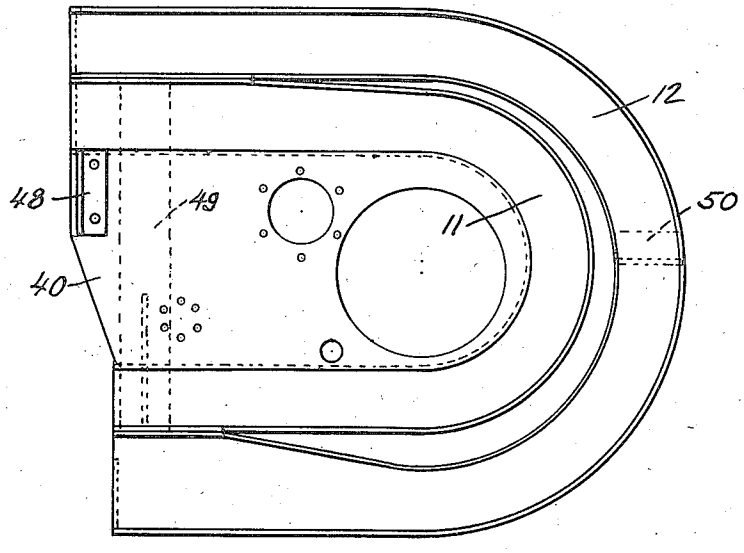


Fig. 6.



INVENTOR
Harold W. Shonnard
BY
Marshall & Hawley
ATTORNEYS

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UNITED STATES PATENT OFFICE

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DRIVING MECHANISM FOR CONVEYERS OR MOVING STAIRWAYS

Harold W. Shonnard, Montclair, N. J.

Application June 11, 1935, Serial No. 25,969

15 Claims. (Cl. 198—16)

This invention relates to improvements in driving mechanism for conveyers or moving stairways.

Its object is to provide a simple and efficient equipment which may be constructed at less cost and which will occupy less space than that heretofore available.

Another object is to provide a unitary power unit which can be shop assembled and moved as a whole into a space between the end loop guides of a conveyer or moving stairway.

Another object is to provide an arrangement which will prevent that portion of the panels of the stairway truss which support the step chain sprocket axle from spreading.

A still further object is to provide means for stopping the driving mechanism in the event of a change in speed beyond predetermined limits, unintentional reversal, or in the event of any change that may occur in the relative speed of the step chain sprockets.

According to this invention the driving mechanism required to maintain the steps or carriers in motion, including the controller and governor, is accessibly contained within that portion of the frame or truss in which the steps or carriers travel, and the driving motor, transmission gear train, and brakes are likewise accessibly contained in the space between the usual series of steps or carriers and between the elongated pairs of loops at the sides of the steps or carriers. By positioning the motive mechanism within the said loop, it becomes possible to combine the step or carrier chain sprockets, the transmission gear train, the brakes and the guides for the steps, into a single shop assembled unit, having transverse members attached thereto for supporting the aforesaid unit on seats in the truss, which seats, being previously prepared, support and accurately locate the unit in proper alinement in the truss.

Heretofore, in moving stairways of the type herein described, it has been the practice to position the driving motor, the controller and the governor, together with most of the speed reducing gear train outside to the rear or below the upper end of the stairway truss, which practice unnecessarily occupies much valuable space. The reduction in overall length of this structure, effected by placing the driving mechanism within the loop of steps and the reduction in width, effected through the use of a dead axle for supporting the step chain sprockets in the manner herein described, is of distinct advantage in premises wherein space is limited.

These and other objects will be apparent from the following specification in which the invention will be described and its novel features pointed out in appended claims.

Referring to the drawings,

Fig. 1 is a longitudinal sectional elevation of a moving stairway provided with internal driving mechanism which is made according to and embodies the present invention;

Fig. 2 is a plan view, partly in section, of the parts shown in Fig. 1, the section being taken on the irregular line 2—2 of Fig. 1;

Fig. 3 is a sectional end elevation of some of the parts shown in Fig. 1, showing the principal elements which constitute the herein described removable unit equipment of the stairway. The section in this figure is taken on the line 3—3 of Fig. 1;

Fig. 4 is a sectional side elevation showing a detail of construction. The section in this figure is taken on the line 4—4 of Fig. 2;

Fig. 5 is a plan view, partly in cross section, showing a modified arrangement of some of the parts;

Fig. 6 is a perspective view of the stair roller guide assembly; and

Fig. 7 is a sectional end elevation of a safety control device.

Like characters of reference designate corresponding parts on each of the figures.

10 designates the side frames or truss plates upon which the moving stairway is supported. 11 and 12 are guides for the steps or carriers 13 which are provided with rollers which run in these guides. These guides are interconnected by a web 40. Such steps or carriers form an endless loop extending between two terminals between the truss plates. Chains 14, driven by a motor 15, are the propelling means for the steps. The motor 15 is situated, according to this invention, in the space between the guides at the sides of the steps and between the upper and lower run of steps. The motor shaft is connected with the chains through a coupling 16, worm 17, worm gear 18 on a transverse shaft 19, pinion 20 in mesh with gear 21 on shaft 22, pinion 23 on shaft 22 in mesh with an internal gear on sprocket 24 which drives one of the chains 14. Sprocket 24 is mounted on a transverse stationary axle 25 on the other end of which another sprocket wheel 26 which drives the other chain 14 is similarly mounted. A similar train of gearing between motor 15 and an internal gear within sprocket 26 is provided within the casing 44. Flanges 27 are rigidly affixed to the ends of the

axle 25. The sprocket 24 is carried by a disc 30 which extends from a hub 31 rotatably supported on axle 25 by anti-friction bearings 32.

33 is a brake drum on the hub 31. 34 is a brake strap, the ends of which are secured to pins 35 and 36 on a pair of bell crank levers 37 on a shaft 38, one end of which is supported by a lug 39 and the other end by a web 40 which interconnects the step wheel guides 11 and 12. 41 is the plunger of a solenoid 42 attached to the web 40, which plunger is connected with the end of the brake levers 37 which are connected together at this point. 43 is a weight on these connected brake levers 37.

The parts thus described are shown in the lower part of Fig. 2. Similar parts, including the brake mechanism, interconnect the worm shaft 19 with the sprocket 26.

The gear assembly or transmission, from the shaft of worm 18 to the shafts 22 inclusive, is contained in a casing 44. One end of this transmission casing is affixed to a transverse beam 45, as at 46. Its other end rests upon and is affixed to the transverse axle 25 by shackles 47. The lug 39 is on this transmission casing.

One end of each of the stair wheel guides is attached to the transverse beam 45 by angle brackets 48. This guide assembly is also provided with braces 49 and 50.

By means of this construction, the transmission casing 44, transverse axle 25, sprocket wheels 24 and 26, the stair wheel guides 11 and 12, the brake assembly and the transverse beam become a complete unit which can be assembled prior to its installation in the truss.

The manner in which these assembled parts are supported between the truss plates 10 will now be described.

51 designates axle guide seats which receive the flanges 27 on the ends of axle 25. Seats 52 are provided for the ends of a transverse beam 56 adjacent beam 45. Seats 53 and 54 are provided on each truss plate for the stair wheel guide assembly braces 49 and 50, respectively.

The motor 15 is supported on a pair of beams 55 which are parallel with the side plates 10 and run between the beam 56 on seats 52 and another transverse beam 57. The beam 45 is supported on the ends of beams 55.

In the modification shown in Fig. 5 the sprocket 24 is mounted upon a sleeve 31A which extends across to the other side of the structure and bears the other sprocket 26 and rotates on stationary shaft 25. In this case a motor 15A with a self-contained reduction gear is used to drive worm wheel 18, mounted directly upon the sleeve 31A and the shackles 47A are constructed to form bearings for this sleeve. The motor is mounted upon the transverse beam 56 in this case.

The structure thus far described has the advantages herein set forth, of being capable of shop-assemblage, of easy installation and of occupying no space outside of the moving stairway structure. The specific design is capable of modifications which would come within the scope of the invention as defined in the appended claims.

Structures of this type are usually equipped with safety and control devices, and those which form a part of this invention are shown in Figs. 1, 2 and 5 and illustrated in more detail in Fig. 7.

60 and 61 are duplicate oil pressure pumps respectively connected by chains, such as 62, to be driven from sprockets 63 on the disc 30. Each of these pumps is arranged to draw oil or other suitable liquid from a tank 64 through a pipe 65 and to return it under pressure through a passage 66, past an adjustable by-pass valve 67 to a pressure cylinder 68. The by-pass valve discharges directly into the tank 64.

69 is a plunger in pressure cylinder 68. A cam 70 is connected by a rod 71 with plunger 69. This rod passes through a threaded collar 72 by means of which the compression of a spring 73 bearing on the plunger may be adjusted. 74 is a roller bearing on cam 70 arranged to actuate a switch arm 75 to open the motor and brake solenoid circuits. This circuit is shown diagrammatically in Fig. 7. These parts are so adjusted that when the fluid pressure in cylinder 68 is at a predetermined amount, the cam 70 will be positioned to allow the switch arm 75 to close the motor and brake circuit, but when the pressure drops below or exceeds the predetermined amount the circuit will be broken.

70A is another cam similarly actuated by the pump 60 to control a switch arm 75A, the contacts of which are connected in series with those controlled by the switch arm 75.

When the sprocket wheels 24, 26 and the two chains 14 are running at desired and equal speeds the pumps 60 and 61 will force liquid into the pressure cylinder 68 and a similar cylinder under cam 70A at sufficient pressures to cause the plunger 69 and the similar plunger under cam 70A to raise the cams 70 and 70A to their central positions. During this operation the pump pressures are not sufficient to close the by-pass valves 67 onto their seats. These valves are provided with a double adjustment, in that each of them is supported on a rod 76 which passes through a sleeve 77, a part of which is threaded and adjustable in the cover of the tank 64. The position of this sleeve determines the distance between the valve 67 and its seat. The upper end of rod 76 is threaded and provided with lock nuts 78 by means of which the compression of a spring 79 may be adjusted.

This valve arrangement is so adjusted that during the normal run of the apparatus the oil circulation will pass through the by-pass valve into the tank 64.

If the step drive chain 14, which is operatably connected with the pump 61, attains a speed in excess of that which it is intended to run, the pressure in cylinder 68 will rise and cause plunger 69 to ascend. This, through the connection shown, will open the motor and brake circuit. As soon as the pump pressure in passage 66 rises above normal it will cause valve 67 to be raised against its seat so that the full pressure generated by pump 61 will go into the pressure cylinder 68. The same thing will happen if the chain 14, which is associated with pump 60, exceeds its normal speed in which case the cam 70A will be raised to open the motor and brake circuit.

It is to be noted that if one of the pumps, for example pump 61, is not maintained at its normal speed, it will not generate sufficient pressure to maintain plunger 69 in the position in which it is shown in Fig. 7 of the drawings. As soon as the pressure in cylinder 68 drops below normal, plunger 69 will descend and through cam 70 will cause the switch arm 75 to be moved out of the contacts which it bridges, to open the motor and brake solenoid circuit.

This speed safety arrangement is used with the

driving arrangements shown in Figs. 1–3. When the main drive sprockets **24**, **26** are driven from a common sleeve, according to the arrangement shown in Fig. 5, but one pump is needed. This safety device is shown more or less diagrammatically, as the specific construction and arrangement can be varied widely within the scope of the invention.

What I claim is:

1. In a conveyer comprising a series of movable carriers interconnected to form an endless vertically disposed train, guides for the carriers forming end loops, a transverse member interconnecting the guides near one of said loops, propelling means for the carriers, and means supported by said transverse member positioned between the guides and within one of said loops for driving the propelling means.

2. In a conveyer comprising a series of movable carriers interconnected to form an endless vertically disposed train, guides for the carriers forming end loops, a transverse member interconnecting the guides near one of said loops, propelling means for the carriers, a transverse axle for the propelling means, and power transmission means supported by said transverse member and by said axle.

3. In a conveyer comprising a series of movable carriers interconnected to form an endless vertically disposed train, guides for the carriers forming end loops, propelling means for the carriers comprising a sprocket, a sprocket chain and an internal gear to drive the sprocket positioned outside of the guides, a motor and power transmission means for driving the sprocket positioned inside of the guides and within one of said loops.

4. A conveyer comprising spaced stationary frame members, guides spaced from said members and affixed thereto, a series of movable carriers on said guides interconnected to form an endless train, propelling means for the carriers between the guides comprising a supporting stationary transverse axle extending beyond the guides and affixed to the frame members.

5. A conveyer comprising spaced stationary frame members, guides spaced from said members and affixed thereto, a series of movable carriers on said guides interconnected to form an endless train, propelling means for the carriers between the guides comprising a stationary transverse supporting axle extending beyond the guides and affixed to the frame members, sprockets mounted on said axle between the side members and the guides, a motor and power transmission means positioned within the guides.

6. A conveyer comprising spaced stationary frame members, guides spaced from said members and affixed thereto, a series of movable carriers on said guides interconnected to form an endless train, propelling means for the carriers between the guides comprising a stationary transverse axle extending beyond the guides and affixed to the frame members, sprockets mounted on said axles between the side members and the guides, a motor and power transmission means between the motor and each of the sprockets positioned within the guides.

7. A conveyer comprising side frames, a transverse member affixed to said frames, a series of interconnected movable carriers supported by the frames, driving means for the carriers supported at one end by said transverse member, said driving means comprising a transverse axle, and means for detachably securing the axle to the side frames.

8. A conveyer comprising side frames, guides supported thereby, a series of movable carriers on said guides interconnected to form an endless vertically disposed train having end loops, a transverse member affixed to the frames near one of said loops, power transmission means for the carriers supported at one end by said transverse member, said power transmission means comprising a transverse supporting axle, and means for detachably securing the axle to the side frames.

9. A conveyer comprising side frames, guides supported thereby having inner and outer portions forming an end loop and an intermediate connecting web supported by the side frames, a series of movable carriers on said guides interconnected to form an endless vertically disposed train, propelling means for the carriers, a motor and power transmission means positioned between said guides, and a brake for the propelling means supported on the transmission means and on said intermediate web.

10. In a conveyer comprising a series of interconnected vertically disposed movable carriers, propelling means for the carriers, power transmission means for the propelling means, stationary frames outside the propelling means, a transverse member interconnecting the stationary frame members, a transverse axle for the propelling means, and a frame for supporting the power transmission means attached to the transverse member and to said axle.

11. In a conveyer comprising a series of movable carriers interconnected to form an endless vertically disposed train having end loops, guides for the carriers, a transverse member interconnecting the guides near one of the said end loops, propelling means for the carriers, power transmission means for the propelling means, a transverse axle for the propelling means, and a frame for supporting the power transmission means attached to the transverse member and to said axle.

12. In a conveyer comprising a series of movable carriers interconnected to form an endless vertically disposed train, guides at the ends of the carriers, propelling means for the carriers, a brake wheel associated with the propelling means, a frame for the transmission means positioned between the guides, and retarding means for the brake wheel positioned between said guides and the transmission frame.

13. A conveyer comprising a series of interconnected movable carriers, propelling means therefor comprising chains at the sides of the carriers, a sprocket for each chain, a motor, separate transmission mechanisms between the motor and each of the sprockets, an electroresponsive brake for each of said sprockets, circuits for the motor and the brake, and means actuated by each sprocket arranged to open said circuits whenever the speed of either sprocket varies from a predetermined rate.

14. In a conveyer comprising a series of movable carriers interconnected to form an endless vertically disposed loop having two substantially straight sides and two substantially semi-circular ends, a transverse support disposed substantially at the axis of one of the semi-circular ends of the loop, driving means for the carriers comprising driving means within said loop, and a transverse member within said loop, said driving means being supported by said transverse support and by said transverse member.

15. In a conveyer comprising a series of mov-

able carriers interconnected to form an endless vertically disposed loop having two substantially straight sides and two substantially semi-circular ends, guides for the carriers, a transverse axle disposed substantially at the axis of one of the semi-circular ends of the loop, driving means for the carriers comprising power means and transmission means within said loop, a transverse member interconnecting the guides, said transmission means being partially supported by said axle and by said transverse member.

HAROLD W. SHONNARD.