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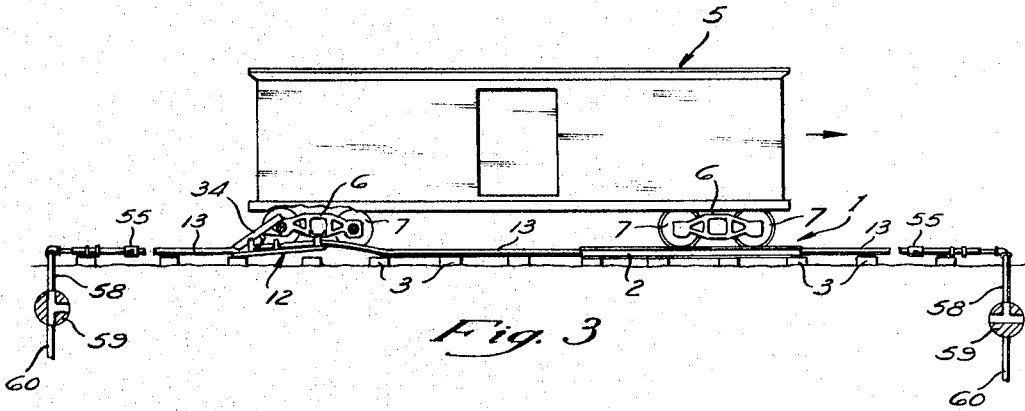


Fig. 3

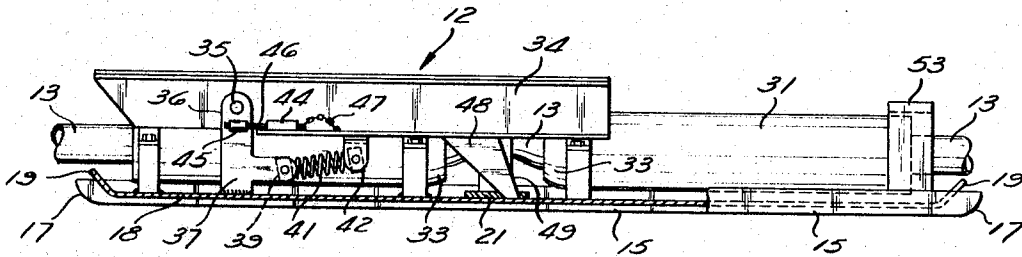


Fig. 4

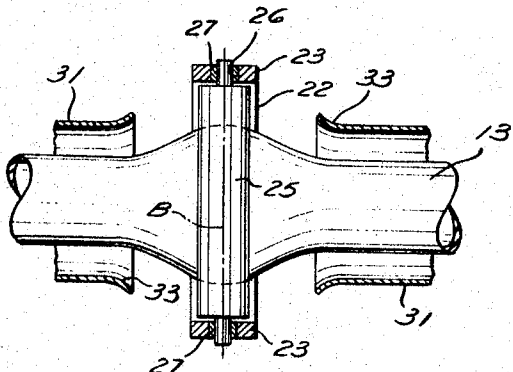


Fig. 5

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**FLUID ACTUATED MOVING APPARATUS**

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**ABSTRACT OF THE DISCLOSURE**

Apparatus for moving a vehicle comprising a length of hose anchored at one end, and a carriage adapted to move under the hose and having means to compress the hose so that the compressing means and the carriage move in response to fluid supplied at the anchored end of the hose. The carriage has means that can be raised to engage the vehicle to push it and to be lowered to permit the carriage to move under the vehicle without interference.

This invention relates to apparatus for moving wheeled cars along a track, and more particularly to fluid actuated apparatus for such purpose.

While the invention is useful for moving and spotting various types of cars on tracks, including mine cars, it will be described in connection with the moving of railroad cars in which it provides exceptional advantages.

It is often desirable to move railroad cars for short distances along a track, and to spot or accurately locate them. Thus, for example, it is desirable to move railroad cars into and out of repair shops or other repair locations. It may also be desirable to move railroad cars into loading or unloading stations. Often the distances that the cars are moved are short. Usually it is desired to move them on short notice. These factors can render it uneconomical to move the car by a locomotive, which often involves the necessity for waiting for a considerable time until the locomotive can be made available or can come from a different location; in such case a repair or unloading crew could be kept waiting with consequential loss of productive time.

Car-moving apparatus is desired that does not require the use of locomotive equipment, that can be operated by one or two persons, that can be used to move a car when desired without advance notice, that can move the car for an accurately determined distance, and that is simple and safe to operate. It is also desirable that such apparatus does not damage the car while moving it or require any special attachments on the car, and that it does not require any substantial modification of the track or trackbed, such as excavations in or special rails on the trackbed. It is also desirable that such apparatus be capable of being moved from one location to another without excessive labor or other costs. It is preferable that such apparatus be simple and rugged in construction and require little maintenance, and that it be capable of being manufactured at low cost.

It is an object of the present invention to provide car-moving apparatus that can satisfy all, or as many as required, of the above desiderata.

The objects and advantages of the invention will become apparent from the following discussion of a preferred embodiment in connection with accompanying drawings in which:

FIGURE 1 is a perspective showing a preferred form

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of car-moving apparatus embodying the invention, with its car-engaging arms raised, parts being broken away for clarity;

FIGURE 2 is a side elevation in section, showing the movable member of the apparatus of FIGURE 1 in car-engaging position ready to move a car, only a portion of the truck of the car and one wheel and axle being shown, and parts of the apparatus and the track being shown for clarity;

FIGURE 3 is a side elevation showing a railroad box-car being moved by apparatus embodying the invention;

FIGURE 4 is a sectional elevation of a portion of the movable member of the apparatus of the invention, with the car-engaging arms in their lowermost position; and

FIGURE 5 is a plan section along line 5—5 of FIGURE 2, showing how the hose that supplies fluid power is compressed.

In the illustrated apparatus, the track 1 comprises conventional rails 2 supported by ties 3 buried in ballast 4. A railroad car 5, having conventional trucks 6 in which are journaled wheels 7, travels along the track 1. Each pair of coaxially aligned wheels on each truck is fixed to an axle 8 which is journaled in the side frames 9 of the truck. A conventional bottom cross member 10, shown in FIGURE 2, is fixed to the truck side frames 9.

The car-moving apparatus of the invention comprises a traveling member or carriage 12 that is adapted to engage the car 5 and be propelled by the hose 13 to move the car along the track. This member 12 in the illustrated embodiment takes the form of a sled that slides along the bed of the track between the rails 2.

Member 12, as is shown in FIGURES 1, 2 and 4, comprises a base 14 that is adapted to contact and slide on the trackbed between the rails 2; when the ties 3 project slightly above the ballast, the base 14 travels along the tops of the ties. Illustrated base 14 comprises two stiff siderails 15, preferably formed of channel members with their flanges 16 facing downwardly and having their ends 17 shaped to curve upwardly to facilitate sliding of the base. Base 14 also includes a stiff web or sheet of metal 18, welded or otherwise fixed to the siderails 15 slightly above their bottom edges, to form a structural member that supports other parts and also aids the base in sliding over the trackbed. This web 18 has its end portions 19 turned upwardly, as shown in FIGURES 1, 2, and 4, to aid such sliding of the base, and also to overlap the siderails and stiffen the structure. A generally centrally located cross member 21 extends between and is fixed to the siderails, and is also fixed to the bottom web 18.

Rigidly mounted on cross member 21 is a bracket 22 having two upstanding side legs 23. A lower roller 24 is rotatably supported in these side members about an axis A that is preferably fixed in bracket 22 and is generally parallel to the bottom of base 14 and that also extends transversely of the base and transversely of its direction of travel. An upper roller 25 is also supported by the legs 23 of the bracket 22 for rotation about an axis B essentially parallel to axis A of the lower roller. Rollers 24 and 25 are preferably formed of smoothly finished steel, although they could be formed of other materials having the requisite strength and other characteristics.

Preferably, as shown in FIGURES 1 and 2, the upper roller is adjustably mounted so that it can be moved toward and away from the lower roller while it is essentially parallel to the lower roller. The illustrated means

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making this possible comprises upright slots 26 in the upright legs 22, in which are slidably mounted bearing blocks 27 in which the axle ends of the upper roller 25 are rotatably mounted. These bearing blocks 27 are urged downwardly and located so that axis B of the upper roller is urged toward axis A of the lower roller by screws 28 threaded into cross members 29 fixed to the upper ends of the legs 23 of the bracket 22, and engage the upper surfaces of the bearing blocks 27. By rotation of the screws, the space between rollers 24 and 25 can be adjusted.

Rollers 24 and 25 receive between them the collapsible hose 13. The illustrated hose has walls stiff enough to maintain the shape of the hose when it contains no fluid, but flexible enough to permit the hose to be compressed between the rollers so that substantially no air can pass through the compressed portion of the hose. The exterior surface of the hose is smooth enough to permit the rollers to roll and travel lengthwise of the hose.

The traveling member 12 also has two hose guides 31 each comprising a length of metal tubing rigidly fixed coaxially along an axis C that is equidistant from the side edges of the base 14 and passes between rollers 24 and 25, and is spaced above the lower roller so that the hose 13 may be compressed between the rollers, as indicated above. These guides 31 are clamped by straps 32 to the base 14. Preferably, as shown in FIGURES 1 and 2, the ends 33 of the guides 31 adjacent the rollers are bent inwardly at their upper and lower portions, and are flared outwardly at their side portions as shown in FIGURE 1, to conform more closely to the shape of and to guide the hose 13 in this area.

The traveling member 12 also has retractable car-engaging means, comprising a pair of arms 34, each of which is pivotally mounted near one end at 35, between upwardly-extending legs 36 of a support 37 fixed to the base 14 near one of its ends. Each of these legs 36 also has laterally-extending portion 38 pivotally supporting a member 39 receiving the lower end of a spring 41. The upper end of the spring is received by a member 42 that is pivotally connected to a bracket 43 connected to the associated arm 34 at a location spaced from its pivot 35. Consequently, each arm 34 is biased upwardly by its spring 41, which is a compression spring exerting enough force to urge the arm 34 to the upper limit of its travel, which limit is determined by contact of the lower end of the arm with base 14 as shown in FIGURE 1. The spring force, however, permits each arm 34 to be moved to its retracted position by moderate manual force.

The illustrated means for holding each car-engaging arm 34 in its retracted position, as shown in FIGURE 4, comprises a sleeve 44 welded to the arm and another sleeve 45 welded to the associated bracket 37, so that when the arm is in its lowermost position the sleeves are aligned and can be held there by a pin 46 that is manually inserted into both sleeves. This pin is preferably attached to the arm by chain 47.

Each arm 34 also rigidly carries a lug 48 that projects forwardly of the arm when it is raised. This lug is so positioned and shaped that when the arm is in its retracted position the lug clears the web 18 and when the arm is in its raised position the upper surface 49 of the lug forms with the adjacent surface 51 of the arm a niche or pocket 52 that engages the axle 8 of the rearmost pair of wheels on a car to be moved, as shown in FIGURE 2.

The forward portion of the traveling member 12 has two buffer or stop members 53, one on each side of the end of the associated hose guide 31 and higher than such hose guide. These buffers are adapted to bear against the underside of the central bottom cross member 10 of the car truck the axle of which is engaged by the arms 34, as shown in FIGURE 2.

The hose 13, which may be several hundred feet long if desired, rests on the trackbed between the rails 2, except

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where it passes over base 14, through the guides 31, and between the rollers 24 and 25 of the traveling member 12. Each end of the hose is suitably anchored to prevent longitudinal movement of the hose relative to the rails. One of the anchoring means 54 of the illustrated embodiment is shown in FIGURE 1 in some detail; it comprises a collar 55 that is fixed to the hose near its end and that is anchored to one of the ties 3 by steel cables 56 fixed to the collar and connected to eyes 57 bolted to the tie. If desired the cables 56 could be fixed to the rails 2. The anchoring means at the other end of the hose may be the same.

Each end of the hose is connected to a pipe 58, one of which is shown in FIGURE 1, which pipe passes under one of the rails and communicates with a three-way valve 59 (FIGURE 3). Each three-way valve is adapted to be connected to an air supply pipe 60 connected to conventional means, not shown, for supplying air under suitable pressure to the pipe. Each three-way valve 59 also is adapted to be turned to a position in which it connects its associated hose pipe 58 to its corresponding air supply pipe 60, as shown by lefthand valve 59 of FIGURE 3, or to be turned so that it connects its hose pipe 58 to the atmosphere as shown by the valve 59 at the right of FIGURE 3.

Both pipes 60 may supply air at the same pressure; actually, however, air at a relatively high pressure need be supplied only at the end of the hose away from which the car is being pushed, since the greatest force is required under such conditions; less force, hence less air pressure, is required to return the movable member alone.

An illustrative embodiment of the invention and an illustrative mode of operating it are as follows. The traveling member or carriage 12 was of the construction illustrated; its base 14 was 81" long and 30" wide; it rollers 24 and 25 were 2 1/4" diameter steel rollers 10 1/4" long. Its arms 34 were 41" long overall. The hose 13 was a reinforced rubber hose of 4" outside diameter, having a 1/4" thick wall of circular cross section that was stiff enough to hold its shape when not subjected to air pressure, but flexible enough to be collapsed by the rollers to seal the compressed portion of the hose against substantial passage of air; the hose was capable of withstanding over 250 p.s.i.g. air pressure, and was 300 feet long. It was anchored at both ends by means similar to that disclosed. The pipe 60 at the left of FIGURE 3 supplied air at 250 p.s.i.g.; the pipe 60 at the right supplied air at 70 p.s.i.g.

The car was initially in a position near the lefthand end of the hose 13 when viewed as in FIGURE 3, and it was desired to move it to a position near the righthand end of the hose in such figure. The traveling member or carriage 12 was initially located adjacent the lefthand end of the hose and away from the car. The pin 46 for each of the arms 34 was first manually removed and the arms allowed to swing to their uppermost positions so that the carriage 12 and its arms were as shown in FIGURE 1. The valves 59 were then arranged as shown in FIGURE 3 so that the interior of the portion of the hose 13 to the right of the rollers 24 and 25 of carriage 12 were exposed to atmosphere, while the portion of the interior of the hose to the left of these rollers communicated with the lefthand pipe 60 constituting a source of air at 250 p.s.i.g.

The rollers 24 and 25 were caused to move along the hose 13 by the force exerted on them by the hose 13 from the pressure of air in the hose to the left of the rollers, thus causing the carriage 12 to move along the trackbed until its arms 34 and their lugs 48 engaged the axle 8 of the rearmost wheels of the car in the niches 52, as shown in FIGURE 2. The forces transmitted from the hose 13 to the carriage 12, and by the car axle through the arms 34 to the base 14 of carriage 12, caused the front end of the base to rise until its buffer members 53 contacted the cross member 10 of the car truck, as shown in FIGURE 2, thus limiting the tilt of the member 12 and

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protecting the hose 13 from touching member 10 or any part of the car. The car then moved along the track to the right in FIGURE 3 so long as the left end of the hose was in communication with the source of air under pressure and the right end of the hose was open to the atmosphere. Since the hose was anchored at its righthand end, the end to which the car traveled, the car was moved along the track by the pressurized air in the hose through the agency of the carriage 12; the pressurized air acting as a pneumatic piston which forced the hose through the rollers 24 and 25. The pushing force imparted to the car, an empty standard box car, by the carriage 12 was about 2000 pounds, which was ample to move the car. When the car reached a predetermined position along the track, the lefthand valve 59 was then turned to the position shown in FIGURE 3 for the righthand valve, thus cutting off the supply of air and causing the interior of the lefthand portion of the hose to communicate with the atmosphere. The brakes of the car were manually set to hold the car in the desired location.

When it was desired to return the carriage 12 to its original position near the end of hose where it could engage another car, the valve 59 at the lefthand end of the hose was turned, so it opened the interior of the portion of hose 13 to the left of the rollers to the atmosphere, while the valve at the righthand end of hose 13 was turned so that it caused the interior of the portion of the hose to the right of the rollers to communicate with the righthand air supply pipe 60. Carriage 12 was then moved from right to left along the track until it cleared the car, after which it was halted by cutting off air through righthand valve 59. The pivoted car-engaging arms 34 were then manually moved downwardly to their retracted positions shown in FIGURE 4, and locked in such positions by pins 46. The righthand valve 59 was then opened, and the carriage 12 moved from right to left under and clearing any cars on the track, since its arms were retracted.

Preferably, trackway 1 is inclined gently upwardly from left to right in FIGURE 3 so that when it is desired to move the car from right to left and away from the lefthand portion of hose 13, as to switch it to another track, it is merely necessary to release the car brakes and allow it to pass down the track by gravity. In such case the arms 34 of carriage 12 should be retracted before the car brakes are released so that the car can pass over member 12 without touching it. This is a preferred mode of operation, although it is apparent that the carriage could be provided with two sets of car-engaging arms 34 facing in opposite directions so that the apparatus could move the car in either direction.

It is apparent that the apparatus described above provides all of the desired advantages and features indicated in the forepart of this specification.

Modifications of the invention other than those indicated above will be apparent to those skilled in the art. It is intended that the patent shall cover, by suitable expression of the appended claims, whatever features of patentable novelty reside in the invention. The terms and expressions which have been employed are used as terms of description and not of limitation; there is no intention of excluding such equivalents of the invention described or of portions thereof as fall within the purview of the claims.

What is claimed is:

1. Apparatus for moving a vehicle along a track bed, said apparatus comprising a length of elongated collapsible hose that is anchored at one end to prevent longitudinal movement of said hose relative to said track bed while permitting the remainder of the hose length to be unanchored, and a carriage adapted to move along said track bed and be propelled along said hose, said carriage including a base adapted to move along said track bed under said hose and to support the portion of the hose extending over said base, means on said base adapted to compress said hose, car-engaging means carried by said

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base between said compressive means and one end of said base, said car-engaging means being adapted to be raised to a position in which said means can engage said car and to be lowered to a position in which it clears said car, and buffer means carried by said base between said compressive means and the other end of said base, said buffer means being located adjacent said hose and having a portion extending above said hose to prevent said hose from contacting said car; and means for supplying fluid under pressure to the interior of said hose at a location therein at the side of said carriage facing said anchored end of said hose length so that said fluid produces a propellant force acting on said compressive means through the hose to move said carriage along said hose.

2. The apparatus of claim 1 comprising guide means for said hose, said guide means being carried by said base and located on each side of said compressive means.

3. The apparatus of claim 1 in which said car-engaging means comprises arm means pivotally mounted on said base, said arm means being adapted to be raised to an elevated position in which it extends at an angle to said base, said arm means including means adapted to engage the car when said arm means is in its elevated position, said arm means being adapted to be lowered to a position in which it clears the underside of said car.

4. Apparatus of the character described and comprising a base adapted to move along a track bed adapted to have a car travel therealong, roller means located generally centrally of said base and adapted to exert a compressive force on a hose passing over said base and supported from said base, said base being adapted to move along said track bed under said hose; hose guide means extending longitudinally of said base on each side of said roller means; arm means pivotally mounted on said base adjacent one end thereof and adapted to be raised to an elevated position in which it extends at an angle to said base, said arm means including means defining a niche adapted to engage an axle of a car traveling along said track bed when said arm means is in its elevated position and said carriage is traveling along said hose, and buffer means carried by said base adjacent the other end thereof and extending above and adjacent the path through which said guide means guides said hose, to protect said hose from contact with portions of the car above said base.

5. Apparatus for moving along a track having spaced parallel rails with a trackbed therebetween, a car having a truck having side frames rotatably supported on wheels that travel on said track and that have axles that extend between corresponding wheels on said rails, said truck also including a cross member extending between said side frames adjacent one of said axles, said apparatus comprising an elongated collapsible hose that is anchored to prevent longitudinal movement thereof relative to said rails; and a carriage adapted to move along said trackbed between said rails and to be propelled along said hose, said carriage comprising a base adapted to slide on said trackbed between said rails and under said hose, means on said base adapted to compress said hose and to move along said hose, car-engaging means connected to said base between said compressive means and one end of said base, said car-engaging means being adapted to be raised to a position in which said means can engage said axle of said car truck to move said car and to be lowered to a position in which it clears said axle, and buffer means carried by said base between said compressive means and the other end of said base for engaging said truck cross member when said other end of said base lifts as said carriage moves the car, to prevent said hose from contacting said car truck and limit the amount said end lifts; and means for supplying fluid under pressure to the interior of said hose at a location therein such that said fluid produces a propelling force acting upon said compressive means through the hose to move said carriage along said hose.

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6. The apparatus of claim 5 comprising guide means for said hose extending from said compressive means toward each end of said base.

7. The apparatus of claim 5 in which said compressive means includes a roller below and a roller above said base, said rollers being rotatably carried by said base about axes extending transverse to said hose.

8. The apparatus of claim 7 in which the distance between said rollers is adjustable.

9. The apparatus of claim 5 in which said car-engaging means comprises arm means pivotally mounted on said base, said arm means being adapted to be raised to an elevated position, in which it extends at an angle to said base with its unsupported end in the direction of travel of said base, said arm means including means defining a niche adapted to engage the car axle when said arm means is in its elevated position, said arm means being adapted to be lowered to a position in which it clears said axle.

10. The apparatus of claim 9 in which said arm means comprises two pivotally mounted arms located on opposite sides of said hose passing over said base, and in

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which there are two hose guide means mounted on said base, one extending from said compressive means to between said arms, and the other extending from said compressive means into close proximity to said buffer means.

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