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Slutsky et al.

[11] **3,770,137**

[45] **Nov. 6, 1973**

[54] **OVERHEAD TRANSPORTER AND RELOADER**

[76] Inventors: **Ivan Ivanovich Slutsky,** ulitsa akademika Komarova, 13, kv. 12; **Oleg Petrovich Poyarkov,** Orlovo-Davydovsky pereulok 2/5, kv. 98, both of Moscow, U.S.S.R.

[22] Filed: **Sept. 1, 1972**

[21] Appl. No.: **285,859**

[52] **U.S. Cl.** **212/12,** 198/38, 212/49

[51] **Int. Cl.** **B66c 7/00**

[58] **Field of Search** 212/10, 11, 12, 49; 198/38

[56] **References Cited**

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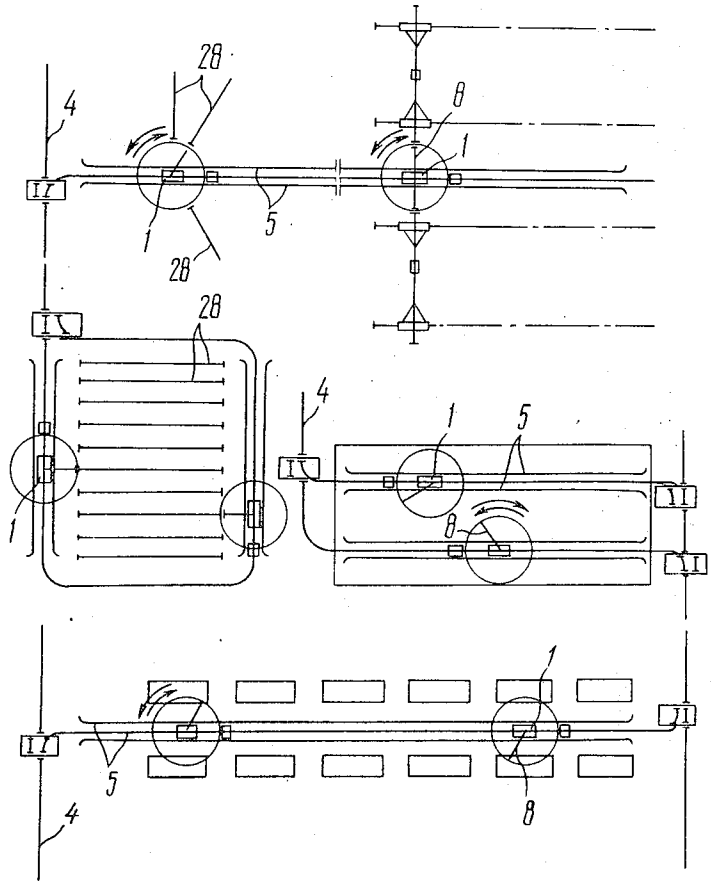
Assistant Examiner—H. S. Lane
Attorney—Eric H. Waters et al.

[57] **ABSTRACT**

A transporter and reloader comprise an overhead rail track and a driven trolley travelling on said track. The over-head rail track consists of a central rail laid through-out the entire course of the trolley travel and of auxiliary rails provided at places of reloading of cargoes at both sides from the central rail but lower than the latter, the trolley resting on said auxiliary rails during reloading and swinging of the boom. Said trolley is provided with a boom turnable horizontally and a locator keeping said boom along the central rail when the trolley is running on the latter.

14 Claims, 15 Drawing Figures



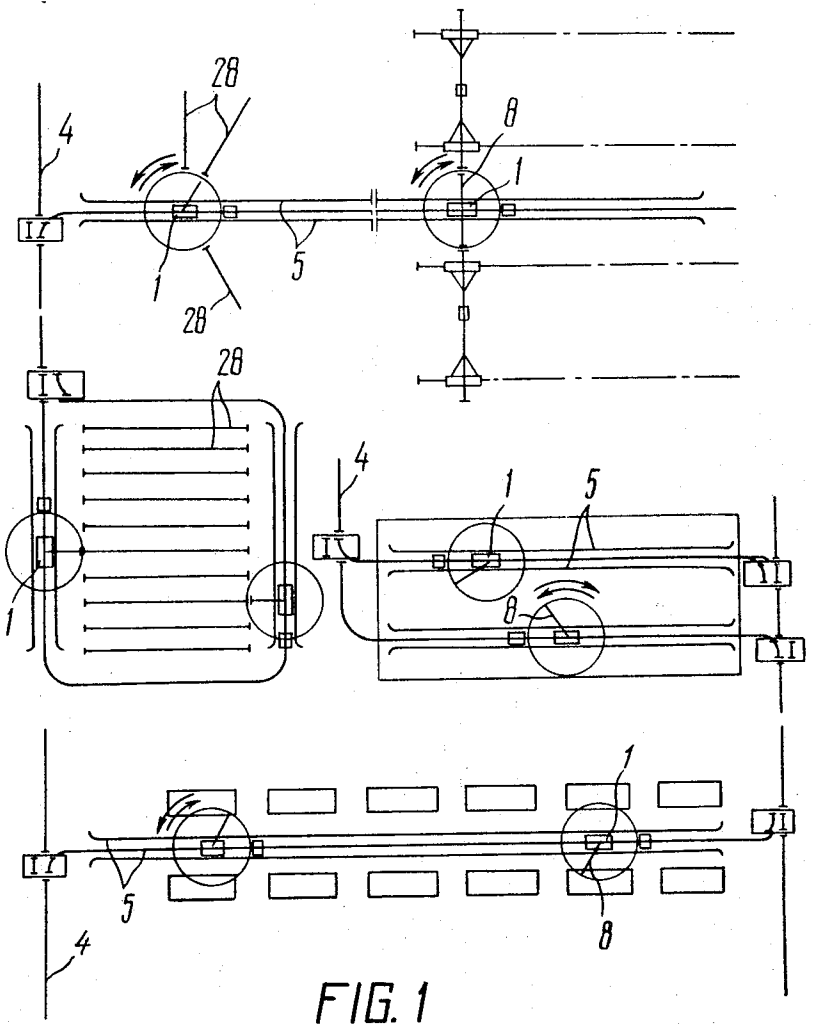


FIG. 1

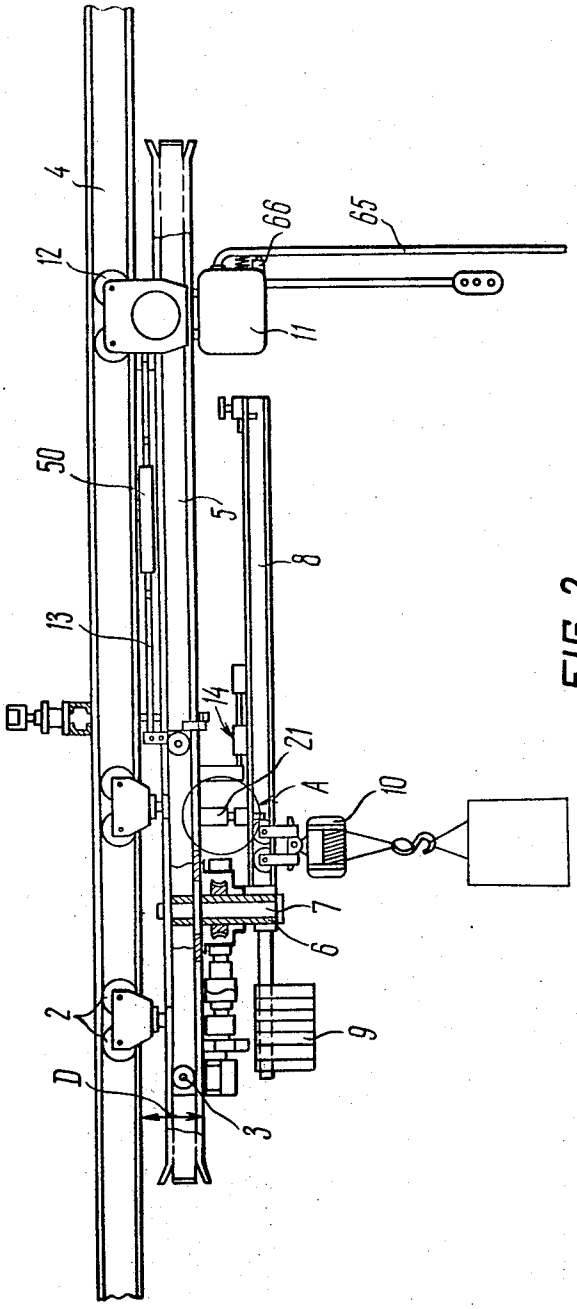


FIG. 2

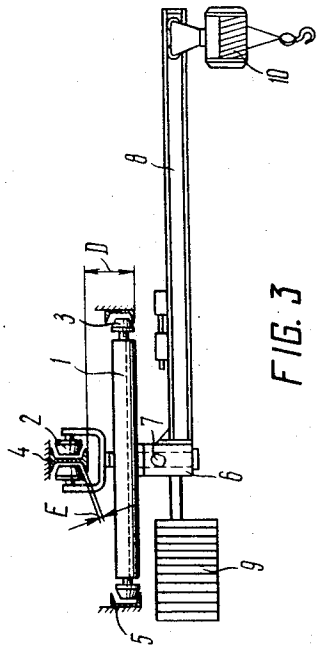


FIG. 3

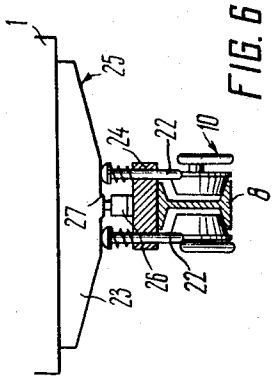


FIG. 6

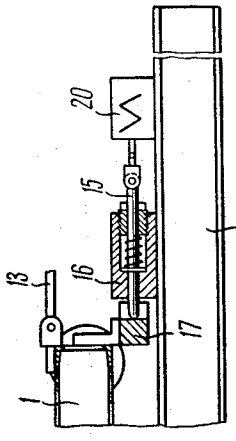


FIG. 4

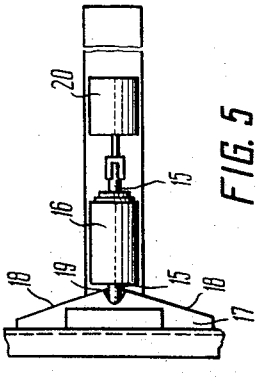


FIG. 5

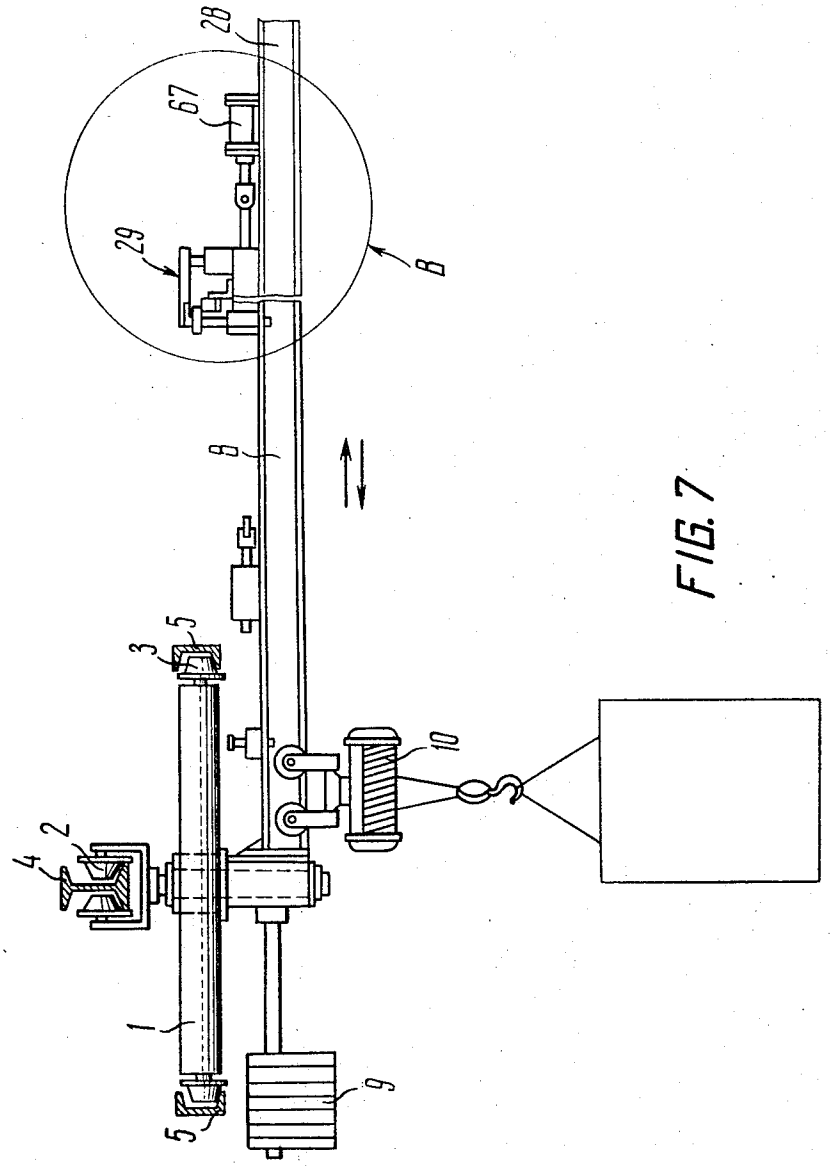


FIG. 7

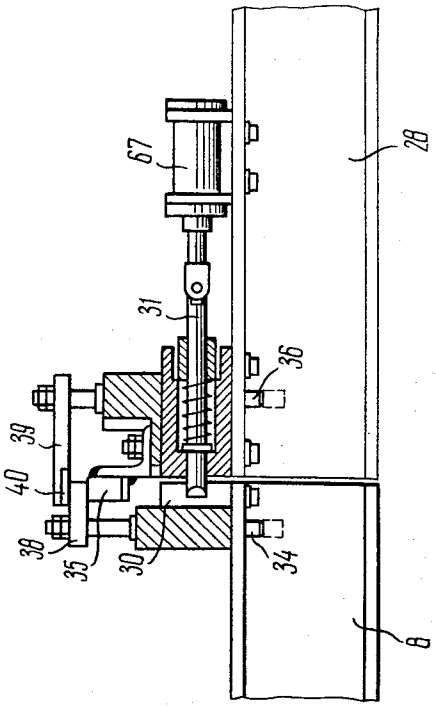


FIG. 8

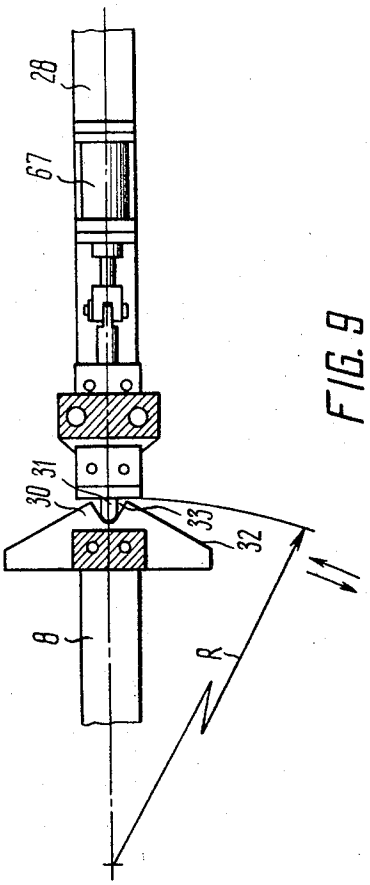


FIG. 9

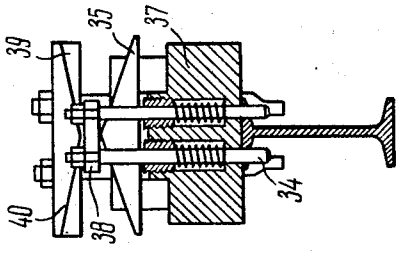


FIG. 10

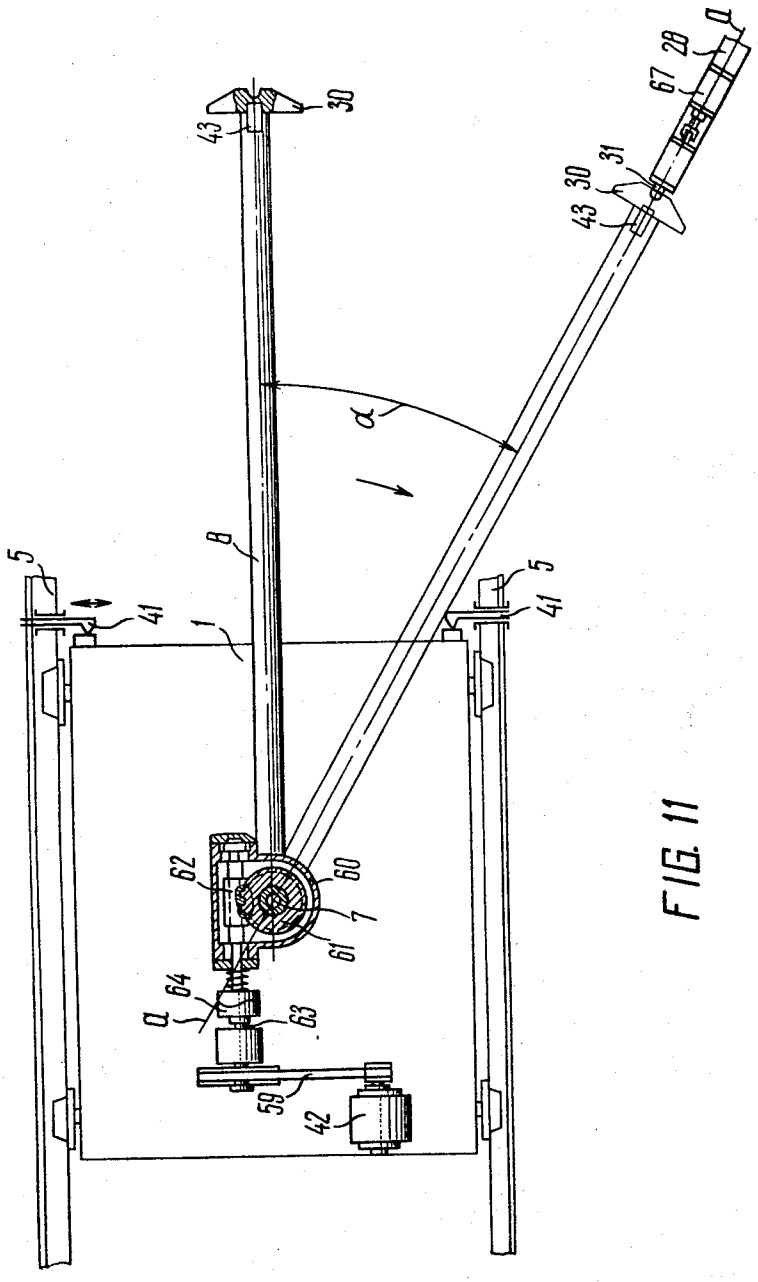


FIG. 11

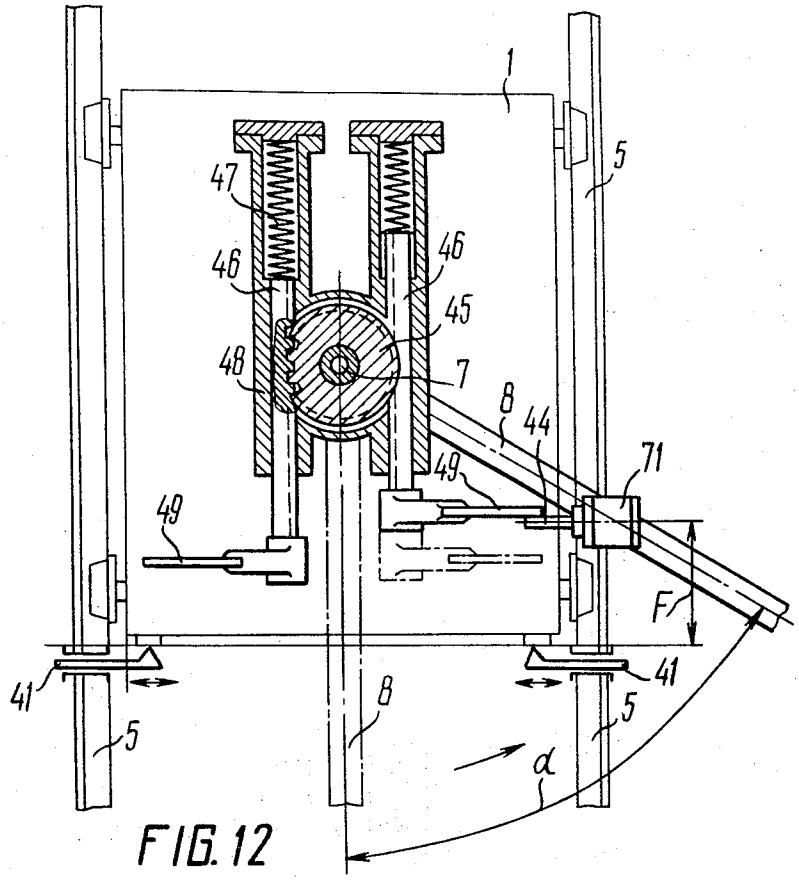


FIG. 12

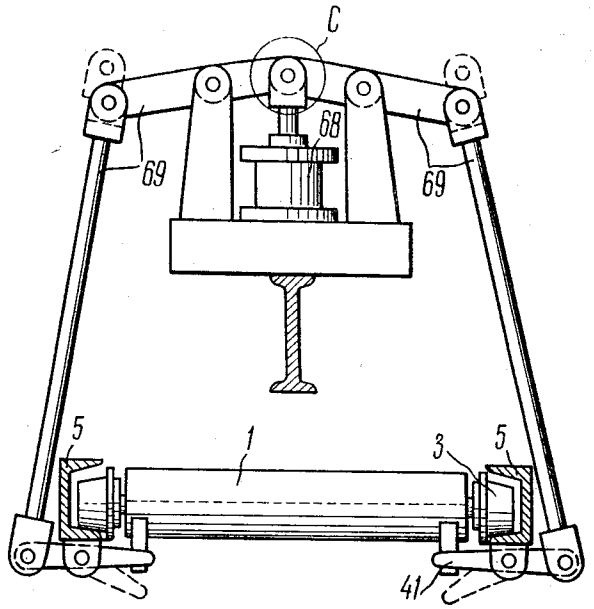


FIG. 14

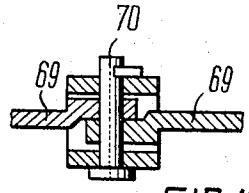


FIG. 15

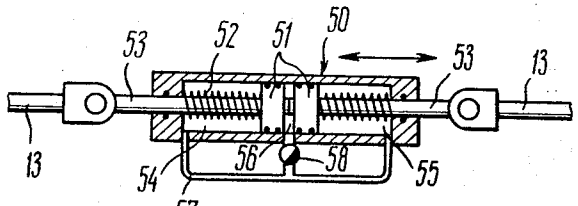


FIG. 13

OVERHEAD TRANSPORTER AND RELOADER

The present invention relates to overhead inter- and intra-shop means of transportation and, more particularly, to transporters and reloaders used for transportation of loads at shops, depots, etc.

Used commonly nowadays are overhead monorails with a load-carrying trolley running therealong.

However, such overhead monorails service but a line running parallel to their course, not an area. Therefore, to feed loads to machines, presses, etc., other transportation and loading facilities have to be used, which is both expensive and inconvenient in use.

Known in the art are transporters and reloaders comprising overhead trirails and drive-fitted trolley, which is equipped with a horizontally swinging boom and rail-running rollers. Yet, the provision of a trirail track throughout the whole course of the trolley leads to a great consumption of metal and makes unavoidable the provision of intricate switch-overs. Furthermore, it is not feasible to provide a trolley as would be borne by three rails at a time, as the emerging system cannot be defined statically, and when the trolley drive rollers run on a midrail, there must be some clearance between the side rollers and the side rails to secure gearing of said drive rollers. Therefore, every swing of the loaded boom wil result in the trolley rollers pressing alternately against either of the side rails, which causes impacting between and higher loads on the trolley and the rails.

Moreover, during the trolley travel, the swinging boom cannot be fixed in a definite position, this affects the safety of the mechanism in operation, while the provision of a load hook for suspension of cargoes at the boom end makes it possible to service but a line in the form of a circumference with a radius equal to the boom length, not an area.

It is an object of the present invention to provide a device for transporting and reloading of cargoes, that would retain all the advantages inherent in overhead monorail means of transportation, such as simplicity in use high, operating efficiency, and non-intricacy of switch-overs and, at the same time, would permit the delivery of loads to any place of the transportation system, regardless of its complexity and invelvement of automatic cycles, and the servicing of the area around operators' positions without using there additional reloaders.

In accordance with this and other objects, in the overhead transporter and reloader of the present invention, provided with a system of automatic addressing of cargoes and made up of overhead rails, a drive-fitted trolley with its rollers travelling on said rails, and a horizontally swinging boom secured on said trolley, according to the present invention, the overhead rail track consists of a central rail laid along the whole course of the trolley and two auxiliary rails laid at both sides of the central rail and lower than the latter at places of cargo reloading, said auxiliary rails being designed to bear, during reloading and boom swinging, the trolley which is fitted with a locator keeping the boom along the central rail when the trolley is travelling along the latter.

It is expedient that the distance between the auxiliary rails and the central rail be smaller than the vertical distance between the axles of the trolley rollers travelling on the central rail and the axles of the rollers running along the auxiliary rails, the ends of said rails being preferably bent outwardly and the drive of the trolley being hinged via connecting rods to the latter and fitted with rollers for travelling on the central rail.

Thus, such an embodiment of the transporter and reloader makes them more versatile as compared with conventional mechanisms, as said transporter and reloader permit the servicing of any place within the complicated transportation system whose trolley travels alternately on the central rail and the auxiliary ones, the position of said trolley at the places of boom swinging being quite stable because it rests on the auxiliary rails alone.

Provision of the locator keeping the boom along the central rail during the trolley travel along the latter precludes the trolley's tipping and makes its operation safer, as there is no chance of cargo's encounter with equipment stored indoors.

The out-ward bending of the ends of the auxiliary rails enables unimpeded fitting of the side rollers of the trolley on the auxiliary rails and hoisting of the trolley relative to the central rail, while the hinge joint of the drive with the trolley and its provision with rollers for travelling on the central rail secures a reliable travel of the trolley both on the central rail and the auxiliary rails.

It is preferable that the locator keeping the boom along the central rail be made as a spring-loaded pin travelling within its holder secured on the boom and a feeler mechanism fastened to the trolley, the lateral sides of said feeler mechanism being tapered outwardly to help press out the pin, said feeler mechanism also having a depression coaxial with the pin and intended for fixation of the latter therein; to remove the spring-loaded pin from the depression, provision is make for an electromagnet connected electrically with the system of automatic addressing of cargoes, the core of said electromagnet being coupled with the pin.

This embodiment of the locator makes it possible to swing the boom in the places of reloading only, i.e. at the points where the auxiliary rails are provided.

In order to transport loads along the boom, the latter must be preferably equipped with a carriage, while the trolley should be provided with an arrangement for holding said carriage close to the axle of the boom swinging when the trolley is travelling along the central rail.

It is expedient that the arrangement for holding the carriage close to the boom swinging axle have spring-loaded rests moving vertically within guides secured on the boom and a feeler mechanism secured on the trolley perpendicularly to the boom, the lateral sides of said mechanism, tapered outwardly, extending said rests to hold the carriage when the boom is being kept along the central rail.

This arrangement increases the reliability of the transporter and reloader in operation, as keeping the carriage with a load close to the axle of the boom swinging precludes the emergence of extra loads acting on the construction of the trolley during its travel both along straight and curved sections of the overhead course and raises the safety of operation.

It is also preferable to provide a protrusion on the feeler mechanism of the arrangement, holding the carriage, and to install, on the boom a terminal switch connected electrically with the trolley drive and interacting with the protrusion to disconnect said trolley drive dur-

ing the trolley's travel on the central rail, the boom being kept at an angle to said central rail.

It is desirable to provide branch monorails at places where auxiliary rails are laid, said branch monorails being joined with the swinging boom by mean of a coupling device.

Owing to the provision of the branch monorails joined with the swinging boom and the carriage, the load can be transported to any place off the main course without help of any additional reloaders or switch-overs, which helps provide intricate transportation systems and both overhead and low-ground stores.

It is preferable that the coupling device be fashioned as a feeler mechanism which is mounted on the boom end, with its lateral sides tapered outwardly and having a groove in its central part, and a spring-loaded latch secured on a branch monorail with the possibility of travelling horizontally to enter the feeler mechanism groove when the boom joins said branch monorail.

For a smooth pass-over of the carriage from the boom onto a branch monorail, the butt ends of said monorail and boom should be preferably made along the arches of two respective concentric circumferences with a center coinciding with the axle of the boom swinging.

This embodiment of the butt ends of the monorail and the boom would help narrow the gaps between the boom and the branch monorails being joined, which reduces impacting of the carriage rollers at the joints and, consequently, decreases the dynamic loads acting on the rails and the trolley.

It is desirable that the transporter and reloader of the present invention be provided with an accessory preventing the carriage from falling out of the boom or a branch monorail after said boom disjoins said branch monorail, said accessory being fashioned as two spring-loaded pins connected to each other in their upper part by means of an iron and mounted on the boom end with the possibility of vertical travel, a wedge-shaped feeler mechanism interacting with the iron to lift said pins, and two spring-loaded rests connected to each other in their upper part by means of a cantilever plate tapered to interact with the iron of the spring-loaded pins and to ensure their lift at the moment when the carriage is passing over from the boom onto a branch monorail, the spring-loaded rests and the wedge-shaped feeler mechanism being secured on the latch of the coupling device.

The provision of said accessory helps preclude the carriage from falling out of the boom or a branch monorail and, thus, contributes to the safety of operation of the transporter and reloader as a whole.

Also feasible is the provision of turnable stops disposed at the places of location of the auxiliary rails perpendicularly to the latter, said turnable stops interacting with the carriage to discontinue its movement relative to a branch monorail; the drive turning said stops should be connected electrically with the system of automatic addressing of cargoes, the location of said turnable stops being selected so that, at a place where the trolley stops, the imaginary line of continuation of the branch monorail cross the axle of boom swinging.

Mounted on the rail tracks and turnable by a command signal from the system of automatic addressing of cargoes, the turnable stops help ensure a precise fixation of the trolley in the place of its joining with the branch monorail, what is required for a reliable operation of the transporter and reloader.

In order to smooth by stop the trolley or to accelerate its movement, the rods connecting said trolley and its travel drive should be preferably linked via a shock absorber.

The provision of the shock absorber helps preclude strong impacting of the trolley against the turnable stops at places where it stops and, likewise, sharp jerks during its acceleration. All this decreases dynamic loads and increases the reliability and service life of the whole device.

The feeler mechanism of the coupling device may carry a terminal switch connected electrically with the boom swinging drive to disconnect the latter when the boom is joining a branch monorail.

In case the trolley's travel is made use of for turning the boom, the latter is expedient to be fitted with a gear-rack mechanism; and at the places of location of the side rails it is preferable to provide extensible stops whose travel drives are connected electrically with the system of automatic addressing of cargoes, the gear of the gear-rack mechanism being secured on the boom swinging axle and the racks being-loaded, accommodated in the guides fastened to the trolley, and equipped with elastic stops interacting with the extensible stops, the latter being separated from the turnable stops by a distance determining the angle of the boom swinging.

Thus, this embodiment of the transporter and reloader helps service not only the course line but the operators' floor space as well: ensures a marked economy thanks to avoiding the necessity of additional reloading mechanisms, at places of reloading for feeding loads to the operators' positions and to the work areas of machines; reduces the time required for reloading; provides better conditions for operating process equipment and transportation facilities, as passage-ways are not blocked by additional reloading mechanisms; permits the carriage pass-over from the trolley boom on the branch monorails without using switch-overs, said branch monorails being arranged within the operating range of the trolley boom, which appreciably extends the sphere of efficient operation of the proposed machine.

The invention will be more apparent from the following description of an exemplary embodiment of the transporter and reloader, given with reference to the accompanying drawings, in which:

FIG. I is a key diagram of the transporter and reloader, according to the invention.

FIG.2 shows a trolley, a side view;

FIG.3 shows the trolley, a front view, with a boom turned perpendicularly to the rail track;

FIG.4 shows a locator for keeping the boom along the central rail, a side view;

FIG.5 shows said locator, a plan view;

FIG.6 is a cutaway view of unit A shown in FIG. 2;

FIG.7 shows the position of the trolley with the boom joined with a branch monorail;

FIG.8 is a cutaway view of unit B shown in FIG. 7;

FIG.9 is a plan view of unit B;

FIG.10 is a cross-sectional view of unit B;

FIG.11 is a showing of one of the embodiments of the drive of the boom swinging;

FIG.12 shows another exemplary embodiment of the drive of the boom swinging;

FIG.13 shows a longitudinal section of a shock absorber;

FIG.14 is a showing of a coupling of the turnable stops with a pneumatic cylinder;

FIG.15 is a cutaway view of unit C shown in FIG. 14.

A transporter and reloader of cargoes comprises overhead rail tracks and a driven trolley I (FIG. I) provided with rollers 2 and 3 (FIG.2).

The overhead rail track consists of a central rail 4 laid along the whole course of the trolley and two auxiliary rails 5 provided at places of reloading at both sides of the central rail 4 (FIG.3), at a lower level and at a distance thereof "D." These auxiliary rails 5 serve as support for the trolley I during reloading.

The trolley I travels along the central rail 4 with its rollers 2 secured in the upper central part of said trolley I, and on the auxiliary rails 5 with its rollers 3 secured along the edges of said trolley but lower than the rollers 2.

The distance "D" between the auxiliary rails 5 and the central rail 4 is about 2 to 3 mm smaller than the vertical distance between the axles of the rollers 2 running along the central rail 4 and the axles of the rollers 3 moving along the rails 5. This arrangement of the central and the auxiliary rails ensures a stable position of the trolley I at places of reloading, as during reloading said trolley I rests on the rails 5 by its rollers 3 only, while the rollers 2 travelling along the central rail 4 are elevated above the rail 4 over a distance "E." Furthermore, as shown in FIG.2, the ends of the auxiliary rails 5 are bent outwardly to facilitate unimpeded fitting of the rollers 3 onto the rails 5.

Provided in the lower central part of the trolley I is a boom 8 secured as console on a bush 6 and made turnable horizontally about an axle 7, said boom being fashioned as an I-shaped beam and said bush 6 carrying a mass balance 9 counterbalancing the loaded boom 8.

The boom 8 is equipped with a carriage for displacing a load along said boom. The carriage may be essentially a telpher 10 which is adapted for hoisting and lowering cargoes in addition to travelling along the boom.

Provided as a drive for moving the trolley is an electric tractor 11 fitted with rollers 12 for travelling along the central rail 4 and with the system of automatic addressing of cargoes, said system being not discribed herein as it is commonly used in overhead transportation.

The electric tractor 11 is coupled with the trolley 1 via a hinge joint and rods 13, what ensures reliable travel of the trolley along both the central rail 4 and the auxiliary rails 5.

To preclude any skewness of the trolley during its travel along the central rail 4, it is equipped with a locator 14 keeping the boom along the central rail 4. Said locator 14 is fashioned as a spring-loaded pin 15 (FIG.4) moving within a holder 16 secured on the boom 8, and a feeler 17 fastened on the trolley 1. The feeler 17 has lateral sides 18 tapered outwardly (FIG.5) for pressing out the pin 15, and a depression 19 disposed coaxially relative to the pin 15 and intended for fixation of the latter therein. To withdraw the spring-loaded pin 15 from the depression 19, provision is made for as electromagnet 20 fastened on the boom 8 and connected electrically with the system of automatic addressing of cargoes, the core of said electromagnet being coupled with the pin 15.

To preclude tipping of the trolley 1 during its travel along the central rail 4 (FIG.2), it is necessary to arrange that the loaded telpher 10 be close to the axle 7 of the swinging of the boom 8; therefore, the trolley 1 is fitted with an arrangement 21 adapted to hold the carriage 10 near the axle 7 of the boom swinging.

Said arrangement 21 consists of spring-loaded rests 22 (FIG.6) and a feeler 23.

The rests 22 travel vertically inside guides 24 secured on the boom 8, while the feeler 23 is fixed on the trolley 1 perpendicularly to the boom 8 and has lateral sides 25 tapered outwardly to extend said rests 22 when the boom is being kept along the central rail 4, and to prevent the telpher 10 from displacement. To preclude the possibility of the travel of the trolley 1 with the boom 8 being not turned in line with the central rail 4, i.e, when the boom is positioned at an angle to the central rail, provision is made for a terminal switch 26 secured on said boom to be electrically connected with the electric tractor 11 and to interact with a protrusion 27 provided on the feeler 23 to prepare the electric circuit of said electric tractor for disconnection.

The proposed transporter and reloader can service both the floor space adjoining the course proper and pass over the telpher 10 on to monorails 28 or to a boom crane (FIGS. 1 and 7), if said monorails are arranged at places where the auxiliary rails 5 are provided at the level of the boom 8.

The joining of the swinging boom 8 (FIG.7) with a branch monorail 28 is achieved by means of a coupling device 29 made up of a feeler 30 mechanism (FIG.8) mounted on the end of the boom 8 and a spring-loaded latch 31 secured on the branch monorail 28. The feeler mechanism 30 has lateral sides 32 (FIG.9) tapered outwardly and a groove 33 made in its central part. The latch 31 enters a groove 33 of the feeler mechanism 30 when the boom 8 joins the branch monorail 28, said feeler mechanism 30 and latch 31 being arranged within one horizontal plane parallel to the plane of location of the boom 8 and the branch monorail 28.

For protection of the carriage against falling out from the boom 8 when the latter disjoins the branch monorail, the transporter and reloader are fitted with an accessory preventing the carriage from falling out, said accessory comprising two spring-loaded pins 34 (FIG.8), a wedge-shaped feeler mechanism 35, and two spring-loaded rests 36.

The pins 34 are mounted on the end of the boom 8 with the possibility of vertical travel in guides 37 (FIG.10) and interconnected by means of an iron 38 in their upper part.

The wedge-shaped feeler mechanism 35 is secured on the body of the latch 31 of the arrangement 29 to interact with the iron 38 of the pins 34 for elevating the latter. The spring-loaded rests 36 (FIG.8) are also secured on the latch 31 and are connected in their upper part, by means of a cantilever plate 39 having tapers 40 (FIG.10) for interaction with the iron 38 of the pins 34 and for their simultaneous elevation when the boom is joining the branch monorail to ensure the pass-over of the carriage-telpher 10 (FIG.7) from the boom 8 onto the branch monorail 28.

To provide a minimum gap between the boom 8 and the branch monorail 28, the butt ends of the monorails 28 and the boom 8 are made to comply with the arches of two respective concentric circumferences lying within a common horizontal plane and having their

center coinciding with the axle 7 of the swinging of the boom 8 (as shown on FIG.9) and with a radius "R."

For a precise stoppage of the trolley 1 relative to the branch monorail 28, turnable stops 41 (FIG.11) are provided at the places where the auxiliary rails 5 are arranged to be perpendicular to the latter, said turnable stops interacting with the trolley 1 for its stoppage relative to the branch monorail. The drive (not shown in the drawing) turning said stops 41 is connected electrically with the system of automatic addressing of cargoes. The stops 41 are positioned along the rails 5 so that at a place where the trolley stops, the imaginary line "a — a" (shown in the drawing as a dotted line) continuing, as it were the branch monorail 28 crosses the boom swinging axle.

The swinging of the boom 8 can be effected by the electric motor 42, or may take place as a result of the travel of the trolley 1 proper.

In the first instance when the boom 8 is swung by means of the electric motor 42, the feeler mechanism 30 of the arrangement 29 carries a terminal switch 43 connected electrically with said electric motor 42 for its disconnection when the boom 8 joins the branch monorail 28.

In the second instance when the boom is swung as a result of the trolley travel, said trolley is to carry a gear-rack mechanism, and extensible stops 44 (FIG.12) are to be provided close to the auxiliary rails 5 and perpendicularly to the latter, the drives of the travel of said stops being connected electrically with the system of automatic addressing of cargoes. A gear 45 of the gear-rack mechanism is fixed on the axle 7 of the swinging of the boom 8, while racks 46 enveloping the gear 45 of both sides are loaded with a spring 47 and arranged within guides 48 secured on the trolley 1. Provided on the ends of the racks 46 are elastic stops 49 interacting with the extensible stops 44, the latter being separated from the turnable stops 41 by a distance "F," determining the swinging angle "α" of the boom 8.

For a smooth stoppage of the trolley 1 (FIG.2) and its acceleration, the rods 13 connecting said trolley 1 with the electric tractor 11 are interconnected via an oil shock absorber 50 whose casing encloses two pistons 51 (FIG.13) pressed against each other by springs 52. Secured to said pistons 51 are rods 53 hinged to the connecting rods 13. In case the normal tractive efforts are supplemented with dynamic loads developing during the acceleration of the electric tractor 11, the pistons 51 retreat under the action of the connecting rods 13 to the walls of the casing and squeeze the springs 52, while the pressure fluid (oil) passes over from extreme cavities 54 and 55 to a middle one 56 via a pipe 57 and a throttle 58.

When the load is eliminated, e.g. during braking, the pistons 51 are returned by the forces of inertia to their original position, and the oil is poured over from the cavity 56 to the cavities 54 and 55.

For a smooth stoppage of the shaft of the electric motor 42 (FIG.11) at the moment the boom 8 joins the branch monorail 28 and for reducing the dynamic loads acting on the trolley 1 and the rails 5, the shaft of the electric motor 42 is coupled with a worm reducer 60 by means of a belt drive 59, a worm wheel 61 of said reducer 60 being secured on the axle 7 of the boom 8 and a worm 62 being connected with an intermediate shaft 63 via a sleeve 64 of the limiting moment.

The overhead transporter and reloader operate as follows:

At a section where sets of loaded suspensions are completed, the control device of the automatic system of cargo addressing of the electric tractor 11 (FIG.2) is given an address indicating a specific operator's position to which the trolley is to proceed. All the operators' positions — machines, presses, stands, ets., — as well as all the mechanisms of the course branches, i.e. the switchovers, hoisting sections, etc., are provided with corresponding numbers. By setting certain numbers to the control device of the automatic addressing system, we thereby assign the trolley certain routes to a required operator's position. Communication (light signal, telephone, etc.) should be established between the control panel of the transportation system and the operators' positions. On its route the control device issues command signals for operating this or that mechanism of the course branching or for stopping the trolley at a required operator's position.

With the trolley 1 loaded, i.e. when the loaded suspension is elevated by the telpher 10, the latter travels along the boom 8 to the axle 7 of the boom swinging. Thereafter, the boom 8 makes a turn to set along the central rail 4, which is necessary to preclude the tipping of the trolley 1 during its travel along the central rail.

Once the boom 8 is set along the central rail 4, its position is fixed by the locator 14. At the moment of swinging of the boom 8, the pin 15 (FIG.5) is pressed out by one of the lateral sides 18 of the feeler mechanism 17 to fall into its depression 19 and, thus, fix the position of said boom. At the same time, the feeler mechanism 23 (FIG.6) of the arrangement 21 sinks the spring-loaded rests 22 that block the way to the telpher 10 along the boom 8. Provided in the center of this feeler mechanism is a protrusion 27 pressing on the terminal switch 26 when the boom 8 takes its position along the rail 4, said terminal switch preparing the drive of the electric motor 11 for connection. Thus, the trolley 1 turns out to be prepared to proceed unaided to a preset operator's position along both the central rail 4 and the auxiliary rails 5. The operator pushes the button "Start," and the loaded trolley takes the way along the preset route.

Prevention of the trolleys from running into each other is achieved with the aid of guiding trolleys (not shown in the drawing), while prevention of encounter of cargo into the operator or parts of equipment protruding upwardly is effected with the aid of spring-loaded levers 65 (FIG.2) hinged to the trolley 1. When striking against an obstacle, these levers 65 make a turn and press on the terminal switch 66, thereby disconnecting the drive of the electric tractor 11. When approaching its destination, said trolley 1 enters with its lateral rollers 3 the side rails 5, the latter providing support for the trolley when the swinging boom 8 is in operation.

When rolling with its rollers 3 onto the bent ends of the auxiliary rails 5, the trolley 1 is elevated to form a gap "E" (FIG.3) between the rollers 2 and the central rail 4. This enables the trolley to rest on the auxiliary rails 5 alone; as a result, a statically determined system emerges, which precludes vibration of the trolley 1 when the boom 8 is making turns.

The swinging boom 8 together with the telpher 10 delivers cargoes to any place within the radius of said boom (as shown in FIG. 1).

The trolley 1 stops on its own nearby a preset operator's position (when a number issued on the control device of the automatic addressing system coincides with that of the operator's position).

The operator presses the button on the control panel of the electric tractor 11 (FIG.2), cuts in the electromagnet 20 (FIG.5) which withdraws the spring-loaded pin 15 from the depression 19 of the feeler 17, and the boom 8 (FIG.3) becomes free to swing about the axle 7. Note should be made that the cutting-in of the electromagnet 20 and the swinging of the boom 8 are possible only when the trolley rests on the auxiliary rails 5.

Thereafter, the telpher 10 lowers the load to a required place and another load is suspended by the telpher's hook.

A new address is issued to the control device of the system, the operator moves the telpher 10 toward the axle 7 of swinging of the boom 8 and turns said boom into a position fit for transportation (along the central rail 4). This actuates the locator 14 (FIG.2) locking the boom 8 in a position along the central rail 4 and the arrangement 21 intended for keeping the telpher 10 close to the axle 7 of swinging of the boom 8, while the terminal switch 26 (FIG.6) prepares the drive of the electric tractor 11 for cutting-in.

By pressing the button "start" the operator sends the trolley to a new address.

To facilitate servicing of the equipment with protruding parts and to reduce the length of the trolley, the boom 8 can be made collapsible, e.g. consisting of two sections hinged to each other with a vertical axis of rotation (not shown in the drawings as it is commonly used in hoisting vehicles). The end of such a boom carries a hoisting mechanism. By rotating around the axle 7 and the hinge joint, the collapsible boom is ready to service the whole area within a circumference of a radius equal to the whole length of the unfolded beam.

In those instances when it is necessary to feed a cargo to sections located far away from the main course without using switch-overs and extra reloaders, the boom 8 of the trolley 1 is joined with the branch monorail 28 by means of the coupling device 29 (FIG.7).

Prior to joining, the trolley 1 stops at a place where joining is to take place. Then, by pressing the button on the trolley control panel, the operator cuts-in the electromagnet 20 (FIG.5) which withdraws the pin 15 from the depression 19 of the feeler mechanism 17, releasing the boom 8 for swinging.

When the boom 8 thereby (FIG.7) is approaching the monorail 28 for joining, the feeler mechanism 30 (FIG.9) secured on the end of said boom 8 with one of its tapered sides 32 presses out like a wedge the spring-loaded latch 31 to make the latter enter the groove 33 of the feeler mechanism 30, thus joining the boom 8 with the branch monorail 28. Simultaneously, the accessory gets in operation, thereby preventing the telpher 10 from falling out of the boom. When actuated, this accessory makes the spring-loaded pins 34 (FIG.8) and the spring-loaded rests 36 secured on the boom end rise and, thus, free the way for the telpher 10 to travel from the boom to the branch monorail 28 and back. Elevation of the spring-loaded pins 34 occurs when the boom 8 makes a swing and when the tapered sides of the wedge-shaped feeler mechanism 35 secured on the latch 31 interact with the iron 38 coupling the fingers 34. Elevation of the spring-loaded rests 36 fastened on the latch 31 is a result of interaction of the iron 38 of the pins 34 with the tapers 40 (FIG.10) of the cantilever plate 39 of the rests 36.

With joining of the boom 8 with the branch monorail 28 over, the telpher 10 is switched over onto the branch monorail and back.

The movement of the telpher 10 (FIG. 7) along the boom 8 and the branch monorail 28 can be controlled both manually, e.g. by pulling the connecting rod, and from the electric motor. When controlled from the electric motor, the telpher, in its turn, can be triggered both manually by pressing buttons "start" and "stop" and automatically as provided for by the adopted system of automatic addressing. Automatic addressing of the trolleys and the telphers is also feasible by using logical diagrams that permit most rational use of the transportation system.

Then, the power cylinder 67 (FIG.8) helps to withdraw the latch 31 of the feeler mechanism 30 from the groove 33, thus disjoining the boom 8 from the branch monorail 28.

During the boom disjoining, the spring-loaded pins 34 and the rests 36 on the branch monorail 28 get lowered under the action of the springs, thus blocking the way to the telpher 10 and precluding its falling out from the end of the boom 8 or from the branch monorail 28.

Thereafter, the telpher 10 moves toward the axle 7 (FIG.2) of swinging of the boom 8, while the boom 8 makes a turn to occupy a position along the central rail 4. As a result, the fixation of the boom 8 and the fixation of the telpher 10 about the swinging axle 7 take place.

The trolley thus prepared proceeds to a next point, for which purpose a corresponding number (address) is selected on the control panel of the trolley and the button "start" is pressed.

The precise stoppage of the trolley 1 at the place of joining is made possible by the turnable stops 41 (FIG.11) secured at the places where the auxiliary rails 5 are located and extended perpendicularly to the rail 5, once an appropriate address is preset.

With the trolley 1 approaching the stops 41, the axle 7 of the boom swinging crosses the imaginary line "a — a" of the continuation of the branch monorail. The turning of the stops 41 for their interaction with the trolley (for the trolley stoppage), or their return to the initial position for unimpeded movement of said trolley along the auxiliary rails 5 is effected by the pneumatic cylinder 68 (FIG.14) whose rod is coupled via a system of the hinged levers and the connecting rods 69, with the stops 41.

The control of the pneumatic cylinders 68 is carried out both by the system of autmoatic addressing of cargoes and manually through a press-button system. The hinger joining of the leverage 69 and the rod of the pneumatic cylinder 68 is made possible via an axle 70 (FIG.15).

To avoid impacting and the resultant great dynamic loads during the stoppage of the trolley 1 by means of the stops 41, the shock absorber 50 (FIG.13) gets in operation, whose pistons 51 are connected with the connection rods 13 linking said trolley 1 with the electric tractor 11.

The swinging of the boom 8 (FIG.11) during its joining with the branch monorail 28 can be effected either by the electric motor 42, or as a result of movement of the trolley proper along the auxiliary rails 5.

Thus, when the boom 8 is swung by means of the electric motor 42 and when it is joined with the branch monorail 28, the spring-loaded latch 31 of the arrangement 29 squeezes the terminal switch 43 secured on the feeler mechanism 30 and connected electrically with the electric motor 42, and cuts-in the latter.

To suppress inertia forces of the rotating parts of the electric motor 42 during the instantaneous stoppage of the boom 8 after its swinging, the sleeve 64 of the limiting moment enables said electric motor 42 to make several rounds after the boom comes to a stop.

In case the swinging of the boom 8 is effected as a result of the trolley movement, the extensible stops 44 are extended, in addition to the turnable stops 41 (FIG. 12), on the trolley course along the auxiliary rails 5, the extension of said stops 44 being made by pneumatic cylinders 71 connected electrically with the system of automatic addressing of cargoes. Said stops 44 are extended either from the right-hand or left-hand side, depending upon the side to which the boom 8 is to be swung.

The swinging of the boom 8 begins in the course of the trolley travel when the elastic stops 49 of the racks 46 of the gear rack mechanism interact with the extensible stops 44.

During the further travel of the trolley 1 in relation to the extensible stops 44, the racks 46 whose elastic stops 49 interact with the stops 44, are moving to turn the gear 45 secured on the boom axle 7, thus swinging the boom 8.

With the trolley 1 reaching the stops 41 (FIG.11) and stopped by the latter, the electric tractor 11 also discontinues its movement due to the automatic addressing system, and the boom 8 stops swinging, the distance "F" between the stops 41 and 44 determining the angle "α" of swinging of the boom 8.

With joining of the boom 8 with the branch monorail 28 over and the telpher 10 transferred onto the branch monorail or back, a command signal is supplied from the system of automatic addressing of cargoes or manually by push-button to the pneumatic cylinders 68 (FIG.14) and 71 (FIG.12) designed to move the stops 41 and 44. The stops 43 are moved in, thus releasing the racks 46 which under the action of the spring 47 return to their initial position and turn the gear 45 and the boom 8 together with it. As a result, said boom 8 is set along the central rail 4. The stops 41 turn to occupy the initial position and free the way for the trolley along the rails 5.

Then, a new address is preset to the control device.

What is claimed is:

1. A transporter and reloader comprising an overhead rail track; a trolley travelling along said track; rollers of said trolley, which run on said track; a boom secured on said trolley to swing horizontally; a central rail comprising said overhead track, said rail being laid throughout the entire course of the trolley, the latter running on said rail; auxiliary rails of said rail track, which are provided at the places of cargo reloading at both sides of said central rail but a little lower, said trolley travelling along said auxiliary rails at the places of cargo reloading and having means for resting on said auxiliary rails when cargoes are being reloaded and said boom is being swung; a locator fastened on said trolley and designed to hold said boom in position along said central rail when said trolley is travelling on it; a drive for moving said trolley; a system of automatic addressing of cargoes; and a drive of said boom swinging.

2. A transporter and reloader as claimed in claim 1, wherein the auxiliary rails are separated from the central rail by a distance smaller than the vertical distance between the axles of the trolley rollers running on the central rail and the axles of the rollers running on the auxiliary rails, the ends of said rails being bent outwardly and the drive of the trolley travel being hinged via connecting rods to said trolley and fitted with rollers to travel on the central rail.

3. A transporter and reloader as claimed in claim 1, wherein the locator holding the boom along the central rail is fashioned as a spring-loaded pin whose holder is fastened on the boom, and a feeler mechanism secured on the trolley and having lateral sides tapred outwardly to squeeze out the pin, and a depression made coaxial with said pin and used for fixation of the latter therein, an electromagnet being provided on the boom for withdrawing the spring-loaded pin from said depression and connected electrically with the system of automatic addressing of cargoes, the core of said electromagnet being coupled with the pin.

4. A transporter and reloader as claimed in claim 1, wherein the boom is fitted with a carriage for moving the cargo along the boom, while the trolley is equipped with an arrangement for holding said carriage close to the axis of the boom swinging during the trolley travel on the central rail.

5. A transporter and reloader as claimed in claim 1, wherein the arrangement for holding the carriage close to the axis of the boom swinging comprises spring-loaded stops moving within a vertical plane in the guides secured on the boom, and a feeler mechanism fastened on the trolley perpendicularly to said boom and having lateral sides tapered outwardly, said lateral sides being designed to extend said stops when the boom is in position along the central rail to hold the carriage.

6. A transporter and reloader as claimed in claim 1, wherein the feeler mechanism of the arrangement for holding the carriage has a protrusion and the boom has a terminal switch connected electrically with the trolley travel drive and interacting with the above protrusion to disconnect said drive when the trolley travels along the central rail, its boom being disposed at an angle relative to said central rail.

7. A transporter and reloader as claimed in claim 1, wherein branch monorails are provided at the places where the auxiliary rails are laid, said branch monorails being joined with the swinging boom by means of a coupling device.

8. A transporter and reloader as claimed in claim 7, wherein, to ensure smooth pass-over of the carriage from the boom onto the branch monorail, the butt ends of said monorail and boom are disposed along the arches of two respective concentric circumferences having their center coinciding with the axis of the boom swinging.

9. A transporter and reloader as claimed in claim 7, wherein the coupling device comprises a feeler mechanism mounted on the end of the boom with its lateral sides tapered outwirdly and a groove in the central part, and a spring-loaded latch secured on the branch monorail with the possibility of travelling horizontally in order to fit the feeler mechanism groove when the boom is being joined with the branch monorail.

10. A transporter and reloader as claimed in claim 9, wherein provision is made for an accessory preventing the carriage from falling out from the boom after the latter has been disjoined from the branch monorail, said accessory being fashioned as two spring-loaded pins connected to each other in their upper part by an iron and mounted on the boom end with the possibility of vertical travel, a wedge-shaped feeler mechanism interacting with the iron intended for elevating the spring-loaded pins, and two spring-loaded rests connected to each other, in their upper part by a cantilever plate with tapers for interaction with the iron of the spring-loaded pins and for their simultaneous elevation when the carriage passes over from the boom onto the branch monorail, the spring-loaded rests and wedge-shaped feeler mechanism being secured on the latch of the coupling device.

11. A transporter and reloader as claimed in claim 9, wherein mounted on the feeler of the coupling device is a terminal switch connected electrically with the boom turning drive for its disconnection when the boom is joining the branch monorail.

12. A transporter and reloader, as claimed in claim 7, wherein the turnable stops provided at the places where the auxiliary rails are located perpendicularly to the latter, interact with the trolley to stop it relative to the branch monorail, the drive turning said stops being connected electrically with the system of automatic addressing of cargoes, the locations of said turnable stops being selected so that at the place of the trolley stoppage an imaginary line of continuation of the boom of the branch monorail crosses the axis of turning.

13. A transporter and reloader as claimed in claim 12, wherein the connecting rods coupling the trolley and the trolley travel drive are connected via a shock-absorber in order to ensure a smooth stoppage or an acceleration of the trolley.

14. A transporter and reloader as claimed in claim 12, wherein provision is made for a gear-rack mechanism mounted on the boom to help swing the trolley, as well as for extensible stops arranged at the locations of the auxiliary rails to be perpendicular to the latter, the drives of movement of said extensible stops being connected electrically with the system of automatic addressing of cargoes, the gear of the gear-rack mechanism being secured on the boom swinging axle and the racks being spring-loaded and arranged in the guides fastened on the trolley and fitted with elastic stops interacting with the extensible stops that are separated from the turnable stops by a distance determining the angle of the boom swinging.

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