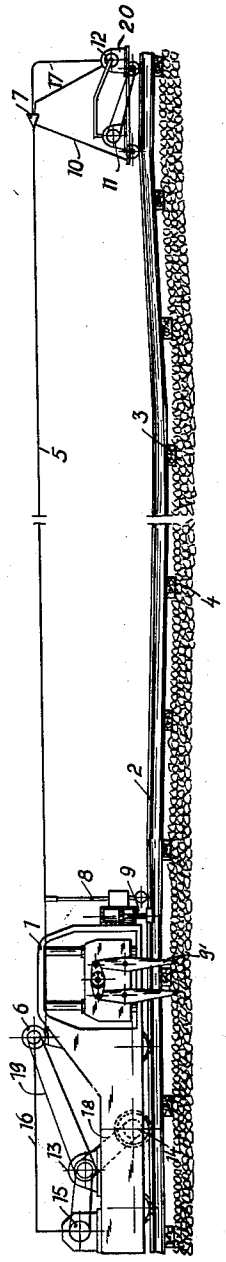
July 6, 1965 F. PLASSER ETAL 3,192,870

TRACK ALIGNING ARRANGEMENT

Filed March 3, 1961



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United States Patent Office 3,192,870 Patented July 6, 1965

3,192,870

TRACK ALIGNING ARRANGEMENT

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Filed Mar. 3, 1961, Ser. No. 93,082
Claims priority, application Austria, Mar. 7, 1960, A 1,771/60
7 Claims. (Cl. 104—7)

This invention relates to the aligning of tracks for railroads and the like, and is more particularly concerned with a method for establishing lines of reference for track alignment, and with apparatus for performing the method.

In aligning a railroad track which has shifted in use, it is known to employ track lifting and ballast tamping machines which travel along the track. Such machines are equipped with track lifting or shifting devices which raise the tracks or shift them laterally. Tamping tools associated with the machine then tamp the ballast under the adjusted track section to fix the position of the latter. Operation of the machine is guided by a reference line which is laid out parallel to the desired course of the track. By measuring the distance between a track section and the reference line, the deviation of the track position from the desired position is readily established and the aligning operation may be controlled accordingly.

In a known arrangement which has been widely accepted because of numerous advantages over the earlier state of this art, a relatively heavy vehicle carries track lifting or shifting devices, which are designated as "track moving means" in the claims, and ballast tamping tools on a frame portion which overhangs the front wheels of the vehicle. While the vehicle wheels stand on a corrected or aligned track section, the lifting or shifting devices and the tamping tools are spacedly superposed on a track section still requiring alignment. A measuring device mounted on the overhanging frame portion may indicate the spacing between a fixed member of the vehicle and the track underneath, and thus provide guidance as to the amount of track alignment needed.

While a fixed index mark on the vehicle frame may serve as a point of reference since the wheels of the vehicle stand on the corrected track section, it has been found that a more precise adjustment of the track position results from establishing a reference line one end of which is at a point of the vehicle frame spaced backwardly from the tamping tools and the lifting or shifting devices. In the known arrangement, provisions are therefore made for a reference line which extends from a rearwardly displaced frame portion to a second vehicle placed well forward on the unadjusted track section. The reference line may be provided by a beam of light but it is simplest to provide a flexible tension member such as a wire or cable under tension which extends between the two vehicles.

The second vehicle may be normally stationary on the tracks and the first vehicle which is a movable tamping machine moves toward the second vehicle. The latter has to be shifted from time to maintain a minimum distance between the two vehicles. This mode of operation usually requires two operators, one to remain at the controls of the tamping machine at all times and the other one to shift the second vehicle as required. It has also been proposed to interpose rigid push rods between the two vehicles so that the second vehicle will move at all times ahead of and with the tamping machine.

In the latter arrangement, the distance between the two vehicles is of necessity limited and fixed. Because the second vehicle stands on a track section which has not yet been corrected, and one end of the tension wire is

fixedly fastened to the second vehicle, there is an inherent error in the position of the tension member. A deviation of the end portion of the wire on the second vehicle from the desired position results in a deviation of the wire portion which serves as an index mark for indicating the desired position of the tracks adjacent the first vehicle. The latter deviation will be smaller than that of the end portion and its magnitude decreases inversely with the distance from the second vehicle. It is thus desirable that the second vehicle be as far as possible from the first vehicle and further than would be practical with rigid rod connections.

Even where a relatively great length of track separates the two vehicles, significant errors will result if the second vehicle is positioned on a track portion which deviates to an exceptional extent from the desired position, and a worthwhile improvement in track alignment precision can be achieved by choosing the location of the second vehicle judiciously. This is not possible in an arrangement in which the first vehicle, namely the tamping machine, moves continuously in steps from tie to tie, as it must, and the distance between the two vehicles is fixed by a rigid member.

It is the general object of the invention to combine the advantages of the several known arrangements briefly described above while avoiding their inherent shortcomings, and a more specific object to permit track alignment of high precision with relatively simple means operated by a single man.

Another object is the provision of a track alignment arrangement of the two-vehicle type described, in which the second vehicle may be moved at will by the single operator without leaving the tamping machine.

The exact nature of this invention as well as other objects and advantages thereof will be readily apparent from consideration of the following specification relating to the annexed drawing in which:

FIG. 1 is a side-elevational view of a preferred embodiment of the track aligning arrangement of the invention.

The vehicular track shifting and ballast tamping machine 1 rolls on rails 2 which rest on ties 3 and ballast 4. The section of the track under the wheels of the tamping machine 1 was previously aligned by the machine which moves from the left toward the right, as viewed in the drawing, during its operation.

The desired position of the track is established relative to a tensioned wire or cable 5 which is wound on a pulley or winch 6 on the tamping machine approximately above the front wheels. The wire 5 extends forwardly from the machine 1 and is fastened to a clamping block 7 on a second vehicle 10 which is also movable on the rails 2.

The front portion of the tamping machine 1 overhangs the front wheels and carries a sliding vertical indicator rod 8. The bottom end of the rod rests on the track. The relative position of its top end and of the wire 5 is thus a measure of the deviation of the position of the track from the desired position. A hydraulic jack 9 is mounted on the front wall of the machine 1 and is equipped with clamping jaws for gripping and lifting a rail together with the ties attached thereto until the proper vertical position of the track is indicated by the rod 8. Additional jacks (not shown) laterally shift the tracks and this movement can also be followed by observing the relative position of the rod 8 and the wire 5. The adjusted position of the track is secured by the tamping tools 9' which push ballast under a tie adjacent the lifted track section. The lifting device and tamping arrangement are well known and will not be further discussed.

The second vehicle 10 is equipped with an electrically driven pump 12 which provides pressure fluid at constant

pressure. The pump draws oil from a sump 20 and delivers it to a hydraulic motor 11. The means for providing constant pressure may be of any known kind. If the pump 12 is a centrifugal pump driven at constant speed, pressure fluid will be delivered to the motor 11 at constant maximum pressure, or at a pressure which reaches a fixed value when the motor 11 stands still. If so desired, a constant displacement pump equipped with a by-pass and a pressure relief valve set for a predetermined pressure may be substituted for the centrifugal pump to deliver pressure fluid at fixed maximum pressure to the motor 11. Alternatively, a pressure reducing valve may be installed in the conduit connecting the pump and the motor if the latter is of the turbine type so that only a predetermined adjustable amount of pressure fluid is delivered to the motor. Many other devices are well known for providing a substantially constant maximum torque at the output shaft of the motor 11 which is coupled to a set of driven wheels of the second vehicle 10 by a pulley and belt transmission, thereby maintaining a substantially constant tension in the wire or cable 5.

It will be understood that the second vehicle 10 may be equipped with conventional rail gripping clamps to arrest movement of the vehicle 10. The clamps, if provided, are preferably either electrically operated or fluid-operated by the pressure fluid output of the pump 12, and admission and release of the pressure fluid is controlled by a solenoid valve, or other electrically operated control valve.

The tamping machine or first vehicle 1 has a prime mover 13, such as a diesel or gasoline engine, the output shaft of which is coupled with the wheels 14 of the machine by a transmission arrangement which includes a clutch (not shown) and a chain 18 permitting the operator to move the machine along the track at will. A releasable belt 19 of the transmission arrangement causes rotation of the pulley or winch 6 at a peripheral speed equal to the peripheral speed of the wheels 14 when the machine moves along the tracks so that the effective length of the wire or cable 5 is reduced by a length equal to the distance traveled by the machine when the latter moves toward the second vehicle 10, and the wire remains uniformly tensioned even when the second vehicle is stationary.

Power is continuously transmitted from the motor 13 to an electric generator 15 on the tamping machine. The current output of the generator is fed by a multiple conductor 16 to collector brushes (not shown) which transmit the current to corresponding multiple insulated conductive cores 17 by the cable 5. The current transmitted by the conductive cores 17 energizes the pump 12 on the second vehicle 10.

It will be understood that the electric circuit of the pump 12 also includes conventional switch gear at the operator's station on the tamping machine for control of the pump 12 by the operator. The electrical actuators or electrically actuated control valves for the rail gripping clamps on the second vehicle, if such clamps are provided, are also energized by the generator 15 and controlled by switches at the operator's station on the tamping machine. Additional conductive cores 17 in the wire or cable 5 provide the transmission of an electrical actuating or controlling signal between the two vehicles.

The above described apparatus is operated as follows:

The operator of the tamping machine drives the machine to the desired location. During this movement along the tracks, the vehicle 10 may be pushed by the tamping machine 1. He then starts the generator 15 and sets the controls for the second vehicle 10 so that the latter will move ahead of the tamping machine 1, thereby unwinding a length of the cable 5 from the pulley 6. When the second vehicle 10 reaches a track section the level of which is near the desired level, the motor 11 is stopped and the pulley 6 is arrested by connecting it to the wheels 14 by the belt 19. A brief additional forward movement of the second vehicle 10 then tightens the cable 5 and the position of the vehicle 10 may be fixed by clamps, if desired.

The track section underlying the overhanging front end of the machine 1 is raised by the jack 9 until the top of the rod 8 reaches a desired position relative to the wire 5, for example, touching the wire. The track section is then secured in its adjusted position by tamping ballast under the tie 3 adjacent the jack 9. The jack is then released from the rail 2, the tamping tools 9' are withdrawn from the ballast 4 and the machine 1 is moved toward the right, as viewed in FIG. 1, until the tamping tools 9' are aligned with the next tie.

During this forward movement, the pulley 6 rotates clockwise in such a manner that the length of wire 5 wound on the pulley is equal to the distance traveled by the vehicle 1. The wire 5 thus remains tensioned. If desired and necessary, an additional adjustment of wire tension may quickly be effected by releasing the clamps of the vehicle 10 and briefly actuating the motor 11.

When the apparatus illustrated is not equipped with clamps on the second vehicle, the latter is held in a substantially fixed position by the wire 5 in cooperation with the motor 11 which is kept in continuous driving engagement with the wheels of the second vehicle and thereby longitudinally stresses the wire. Although the friction of the wheels 14 on the rails 2 together with the engagement of the pulley 6 with the wheels 14 by means of the belt 19 and chain 18 is normally adequate to prevent rotation of the pulley 6 by the forces transmitted by the wire 5, it is preferred to equip the pulley 6 with a releasable ratchet (not shown) which prevents unwinding of the wire 5 from the pulley. During forward movement of the tamping machine 1, the wire 5 is wound on the pulley 6 by the torque exerted by the belt 19 which is sufficient to overcome the unwinding forces generated by the motor 11.

If desired, the transmission arrangement of the tamping machine 1 may be provided with additional means, such as a clutch coupling, permitting the wheels 14 to be disconnected from the prime mover 13 while maintaining the operative connection between the latter and the pulley 6. This will permit the tamping machine operator to control movement of the second vehicle 10 toward the tamping machine in a simple manner without ever leaving his control station.

The arrangement for control of movement of the second vehicle illustrated and described hereinbefore is used to advantage even where the wire 5 does not in itself provide the reference line relative to which the position of the track is adjusted. The otherwise conventional arrangement in which a visual target is arranged on the second vehicle and viewed from the tamping machine to define a line of sight relative to which the track is adjusted is greatly simplified if the movement of the target vehicle is controlled by the apparatus of the invention, including an elongated pliable tension member the two ends of which are secured to the two vehicles each of which is individually driven and under control of a single tamping machine operator.

Obviously, many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than specifically described.

We claim:

1. In a track aligning arrangement, in combination: a first mobile vehicle and a second mobile vehicle, each vehicle being adapted to travel on the track, the first vehicle traveling on an aligned section of the track and the second vehicle being on a track section to be aligned; a track moving means on the first vehicle and spacedly superposed on a track section to be aligned and adjacent the aligned track section; an elongated flexible tension member having two end portions respectively secured to said vehicles; and driv-

ing means on said second vehicle, said driving means being capable of moving the second vehicle at a speed at least equal to that of the first vehicle, and said flexible tension member being maintained under tension between said vehicles.

2. In a track aligning arrangement, in combination; a first and a second mobile vehicle each adapted to travel on the track, the first vehicle traveling on an aligned section of the track and the second vehicle being on a track section to be aligned; an elongated flexible tension member having two end portions respectively secured to said vehicles and tensioned between said vehicles; pulley means on one of said vehicles, said flexible tension member being trained over said pulley means for varying the length of the tension member and thereby to vary the distance between the vehicles; track moving means on said first vehicle and spacedly superposed on a track section to be aligned and adjacent the aligned track section; and means for moving said second vehicle on the track at a speed at least equal to that of said first vehicle.

3. In the track aligning arrangement of claim 2, drive means for the first vehicle and means coupling the drive means and the pulley means for driving the drive means and the pulley means at the same speed.

4. In a track aligning arrangement, in combination; a first and a second mobile vehicle each adapted to travel on the track, the first vehicle traveling on an aligned section of the track and the second vehicle being on a track section to be aligned; an elongated flexible tension member having two end portions respectively secured to said vehicles and tensioned between said vehicles; means on one of said vehicles for varying the length of the tension member and thereby to vary the distance between the vehicles; track aligning means on said first vehicle; a fluid operated motor for moving said second vehicle on the track away from said first vehicle; a source of pressure fluid communicating with said motor; and means for maintaining the pressure of said pressure fluid in said motor substantially uniform.

5. In a track aligning arrangement, in combination: a first and a second mobile vehicle each adapted to travel on the track, the first vehicle traveling on an aligned section of the track and the second vehicle being on a track section to be aligned; an elongated flexible tension member having two end portions respectively secured to said vehicles and tensioned between said vehicles; means on one of said vehicles for maintaining the tension member under tension between the vehicles; track moving means on said first vehicle and spacedly superposed on a track

section to be aligned and adjacent the aligned track section; a fluid operated motor for moving said second vehicle on the track at a speed at least equal to that of said first vehicle; a source of pressure fluid communicating with said motor; an electrically operated pump supplying the pressure fluid from said source to the said motor; and a source of electric current on said first vehicle, said flexible tension member being a conductor means in circuit with said source of current and said pump for energizing the pump.

6. In a track aligning arrangement, in combination: a first and a second mobile vehicle each adapted to travel on the track, the first vehicle traveling on an aligned section of the track and the second vehicle being on a track section to be aligned; an elongated flexible tension member having two end portions respectively secured to said vehicles and tensioned between said vehicles; means on one of said vehicles for maintaining the tension member under tension between the vehicles; track moving means on said first vehicle and spacedly superposed on a track section to be aligned and adjacent the aligned track section; means for moving said second vehicle on the track at a speed at least equal to that of the first vehicle; electrically operated means for arresting movement of said second vehicle relative to the first vehicle; and electrical control means on said first vehicle, said flexible tension member being a conductor means in circuit with said control means and said movement arresting means.

7. In the track aligning arrangement of claim 1, said elongated tension member constituting a reference line for the track alignment.

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