Aug. 26, 1924. 1,506,431

A. KÉGRESSE

FLEXIBLE TRACTION APPARATUS

Filed Aug. 23, 1921 4 Sheets-Sheet 1

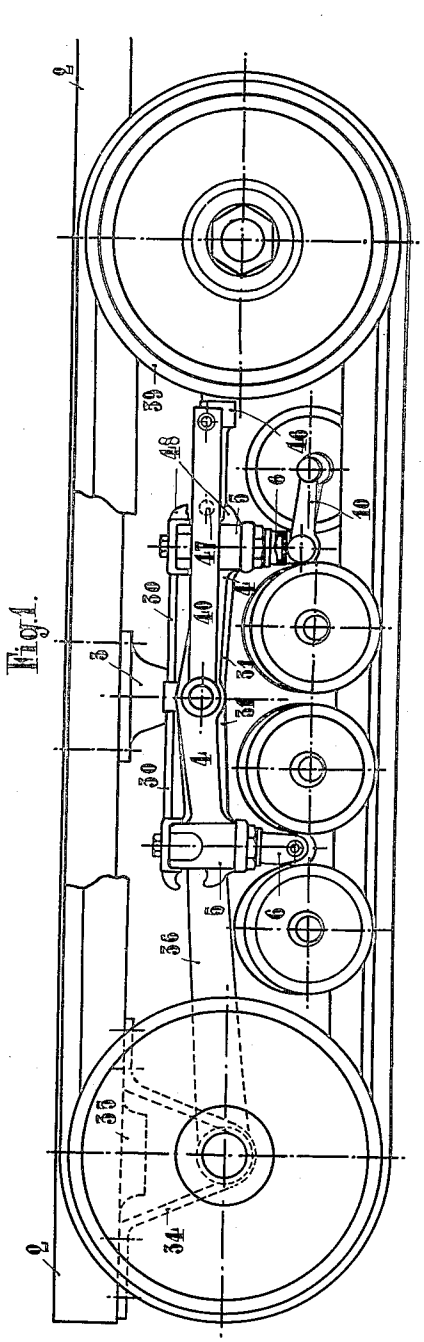

Fig. 1.

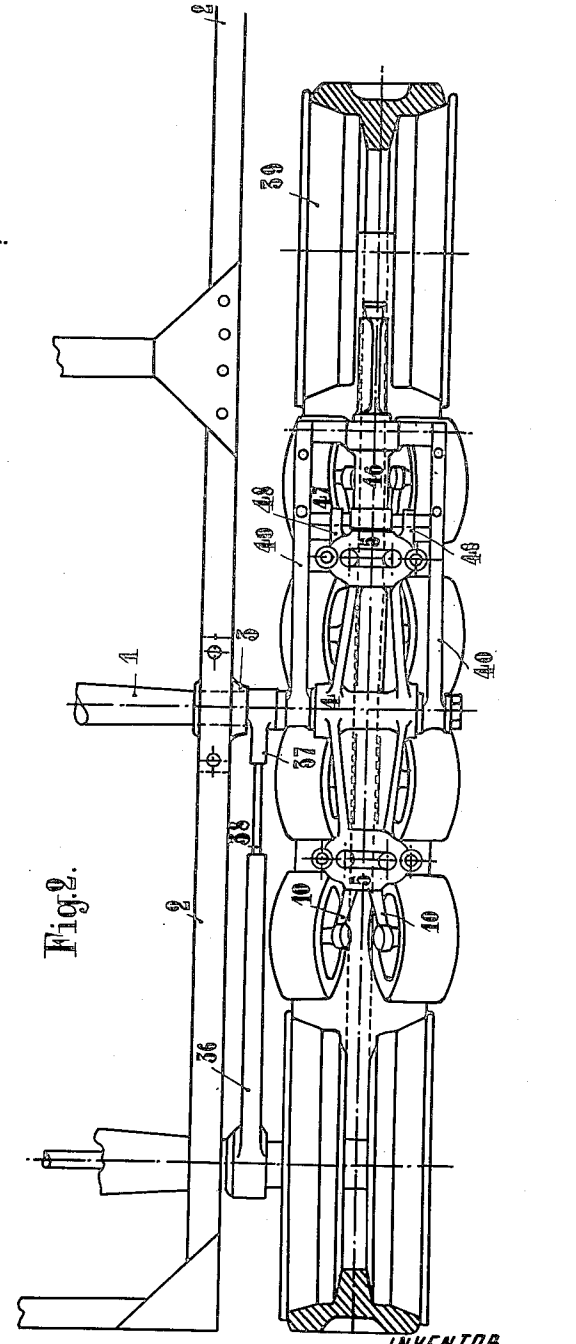

Fig. 2.

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FLEXIBLE TRACTION APPARATUS

Filed Aug. 23, 1921 4 Sheets-Sheet 2

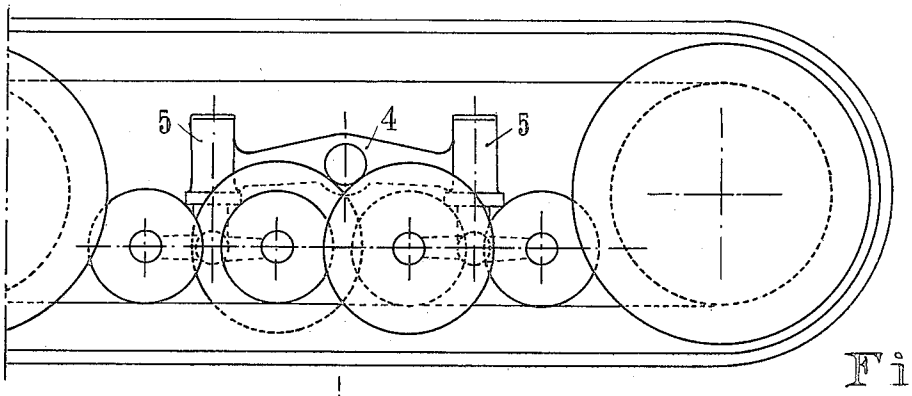

Fig.7.

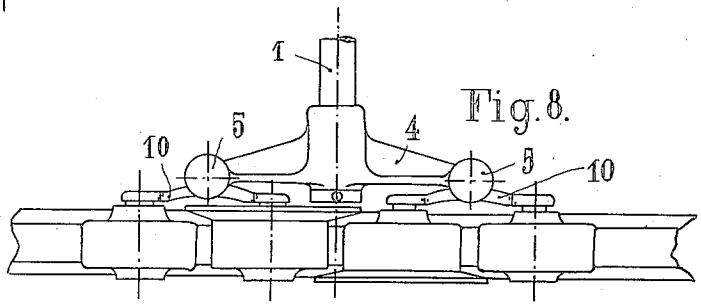

Fig.8.

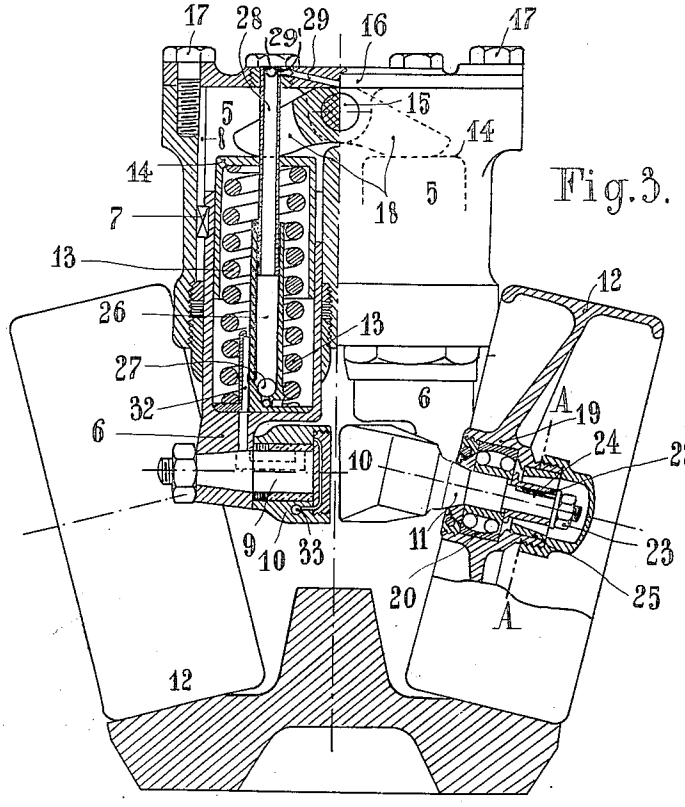

Fig.3.

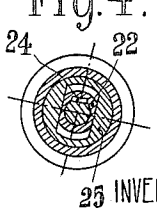

Fig.4.

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FLEXIBLE TRACTION APPARATUS

Filed Aug. 23, 1921 4 Sheets-Sheet 3

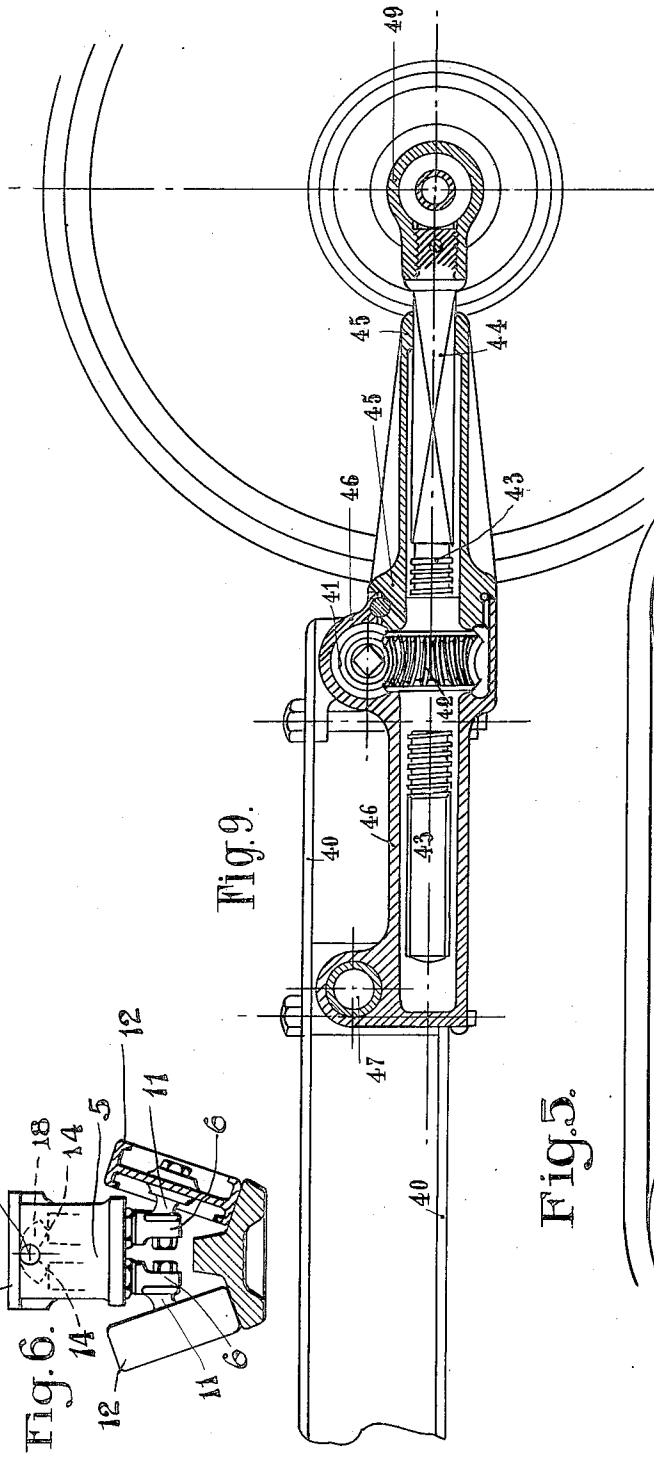

Fig. 9.

Fig. 6.

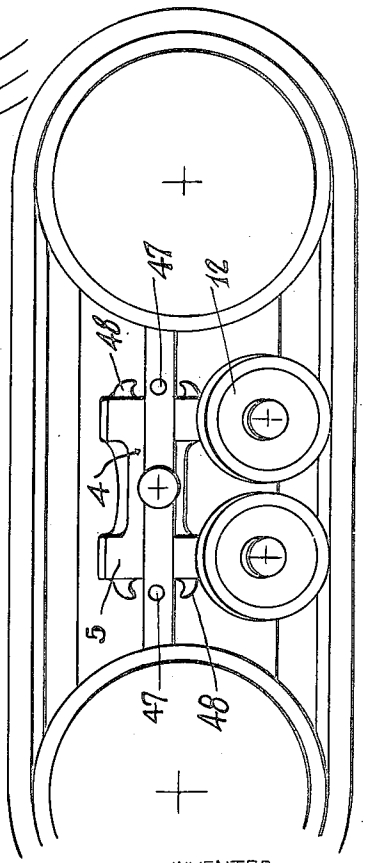

Fig. 5.

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FLEXIBLE TRACTION APPARATUS

Filed Aug. 23, 1921 4 Sheets-Sheet 4

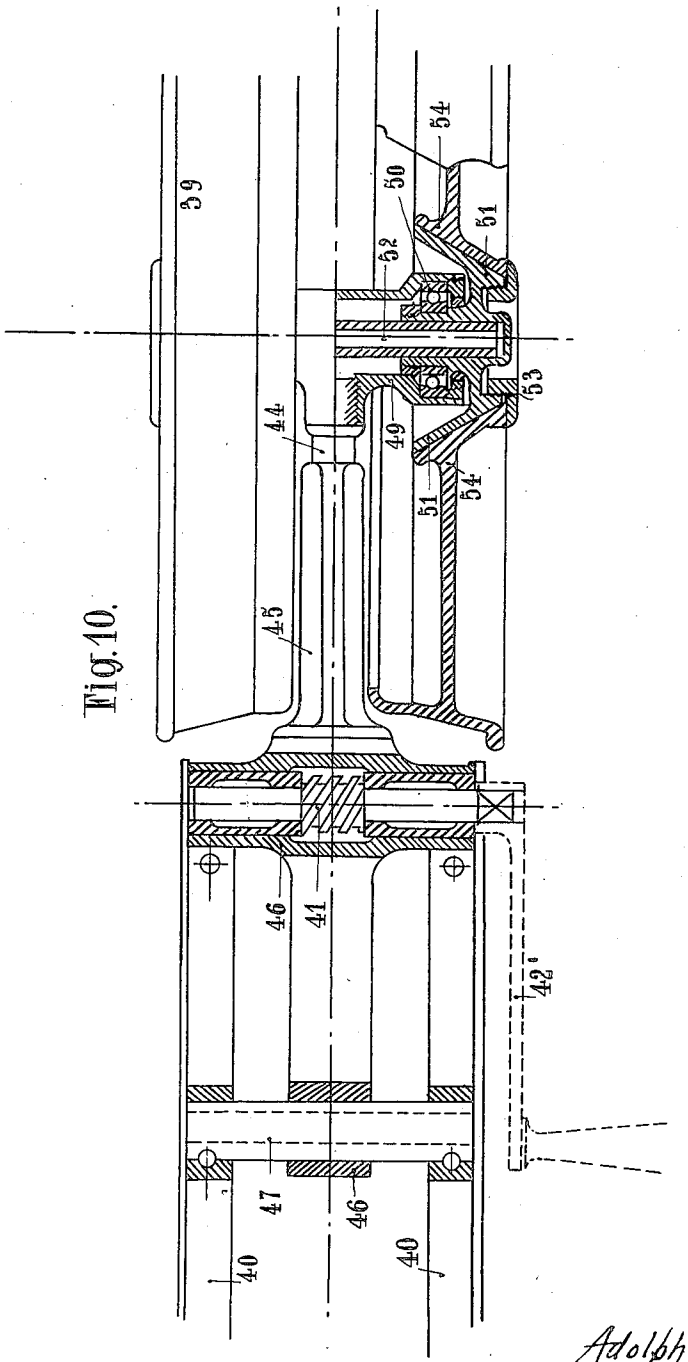

Fig. 10.

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Patented Aug. 26, 1924. 1,506,431

UNITED STATES PATENT OFFICE.

ADOLPHE KÉGRESSE, OF PARIS, FRANCE.

FLEXIBLE TRACTION APPARATUS.

Application filed August 23, 1921. Serial No. 494,473.

To all whom it may concern:

Be it known that I, ADOLPHE KÉGRESSE, citizen of the Republic of France, and resident of Paris, France, have invented a new and useful Flexible Traction Apparatus, which improvements are fully set forth in the following specification.

This invention relates to improved devices for enabling the practical use of flexible track belts on vehicles of any kind.

Figure 1 is an elevation of the general arrangement of one of the systems suggested, with four twin rollers.

Figure 2 is a plan of the same.

Figure 3 shows in section one form of bearing train.

Figure 4 is a section on line A—A of Figure 3.

Figure 5 shows in elevation a modified construction with two twin rollers.

Figure 6 illustrates in end view the bearing train of Figure 5.

Figures 7 and 8 show a bearing train with four single rollers for narrow track belts.

Figures 9 and 10 show in elevation and in plan, partly in section, one means for mounting and tightening the free pulley.

(By twin rollers are designated here those, the axes of which intersect or are extended.)

In the construction shown in Figures 1 and 2, the weight of the vehicle is transmitted to the bearing system of each of the track belts by an axle 1 rigidly secured to the chassis 2 by means of a suitable bracket 3 and a balance beam 4 pivoted to the axle 1. This balance beam 4 terminates at each end in two cylinders 5 connected in parallel to the axle (Figures 1–3).

In the said cylinders travel hollow plungers 6 (Figures 1 and 3) to which are secured rectilinear guiding keys 7 (Figure 3) which can slide in grooves 8 provided for the purpose in the cylinder walls.

The lower parts of the plungers 6 carry either the axle pins 9 of the balance beams 10 (Figures 1–3) or, in the case of Figures 5 and 6, the spindles 11 of the rollers 12.

As will be seen from the drawing, the axes of the twin rollers are not parallel, but intersect each other and form an angle, the apex of which is directed to the side opposite to the ground.

In the interior of each of the plungers 6 is mounted a spring 13 (Figure 3) surmounted by a guide pot 14.

The latter, under the action of the spring 13, presses against one of the ends of a small balance beam 18 in one piece, which can oscillate about a pin 15 permanently secured in the walls of the upper part of the cylinders 5 and at right angles to the axis of the axle of the vehicle. The cover 16 could be provided with special lugs through which also passes the pin 15. The screws 17 which secure the cover 16 to the cylinders 5 give the necessary rigidity to the whole.

It will be seen that the load received by each roller will be one eighth of the load transmitted by each end of the axle, that is to say one sixteenth of the total load supported by the axle. On an uneven ground, as is almost always the case, the distribution of the load on the rollers will be practically constant owing to the pivoted balance beams 10 and 4, and to the transverse balance beam 18.

Whilst ensuring constant distribution of the load on the various rollers, whatever be the differences of level of the ground in both directions, this combination renders the twin rollers completely independent of each other and enables one to be moved without its neighbour, being in the least affected. Moreover, the vertical movement of each roller takes place in a straight line, vertical or inclined at a suitable angle, and, consequently, without lateral friction against the guide rib of the endless track belt or band.

On very rough ground, in order not to expose the traction mechanism to excessive tension, stops may be provided for limiting the travel of all the parts in accordance with the differences of level of the ground.

On the other hand, the amplitude of movement of the lower balance beams 10 will be limited by the bottoms of the plungers, against which the balance beams 10 will contact. It is obvious that the positions of all these stops will have to be judiciously calculated so as not to interfere with the movements of all the parts even on very rough ground.

The bearing train shown in Figures 5 and 6, has only two pairs of twin rollers 12. In this construction, the pin or spin-

dle 11 of each roller is mounted directly on the lower part of the corresponding plunger 6. There are therefore four bearing surfaces per traction unit, that is to say eight per bearing axle. The main balance beam 4 ensures here, by itself, longitudinal oscillations, whilst the transverse compensating system obtained by means of the balance beams 18 remains the same as in the previous construction.

Figures 7 and 8 show, also by way of example another construction of the bearing train for narrow track belts, this time without any necessity for a transverse compensating system. There are therefore no twin rollers. The figures are sufficiently clear to show that this system is derived from the preceding ones.

In this modification, in order to bring the rollers as close to each other as possible, and to reduce the total length the two central rollers for instance have only one flange each, and are arranged reversely, so that the flange of one roller is on the outer side thereof, while the other roller has its flange on its inner side, as shown. The two outer rollers have no flanges at all, and project slightly into the spaces between the flanges of the large front and back pulleys or drums.

In all the constructions above described, the rollers 12 could be mounted in the ordinary manner by means of two ball bearings per roller or on plain bearings, on roller bearings with large bearing surfaces etc. Here by way of example is shown a practical construction of a roller mounted on a single swivel bearing.

To that end, in the hub 19 (Figure 3) of the roller 12 is mounted the outer ring or race of the swivel bearing 20. The inner race is keyed to the spindle 11 through the intermediary of a part 22 (Figures 3 and 4) held in place by a nut 23 and key 24. This part 22 has two flat faces with which engages, with a slight amount of friction, a ring 25 provided for the purpose with an opening of suitable shape which prevents the ring 25 from turning, but allows it to rock up and down in said opening. The corresponding end of the hub 19 fits with a slight amount of friction on the part 25.

The advantage of this construction is that the axis of rotation of the roller is automatically maintained parallel to the rolling track belt at all times.

In fact, the part 25 allows the roller to oscillate on its swivel bearing only in the vertical direction, and allows it therefore, under the action of a part of the weight of the vehicle, to follow the variations of the rolling track belt. The travel itself in the direction of the oscillation is limited by the length of the recess in the part 25 so that the balls cannot come out from their race. In normal running, the whole weight being supported by the ball bearing 20 (Figure 3), the friction between the hub 19 and the part 25 is practically nil. Where the ground is very rough or uneven, the part 22 on the outer portion of the spindle 11 will contact alternately with the top and bottom of the recess of the ring 25. In this case, part of the load will be taken up by the guide ring 25 and the corresponding part of the hub 19. It will be seen that, owing to the inclination of the axis, the lubricating oil will not tend to escape, whereby proper lubrication of the system will be insured.

Lubrication of the complete bearing train is ensured automatically and in proportion to the number and magnitude of the oscillations caused by the road.

To that end there is provided a special device utilizing the reciprocating motion of the plungers 6 in the cylinders 5 (Figure 3), and comprising the following:

In the interior of each plunger 6 and held in place for instance by the spring 13, is arranged a tubular body 26 (Figure 3) which communicates at its base with the inner chamber of the plunger 6 in which, and to a height of a few centimeters, is the oil required for the lubrication.

In the bottom of the tubular body 26 is arranged a ball valve 27 which could be replaced by any other desired valve.

A tube 28 secured to the cover 16 projects slidably into the tubular body 26 but forms a tight joint therewith. The upper portion of the said tube is formed with a hole or holes 29′ for communication with the oil conveying conduits or grooves.

The working is as follows: When under the action of differences of level of the road, the spring 13 (Figure 3) is compressed, in the interior of the plunger is produced a slight pressure which results in raising ball 27 and forcing a certain quantity of oil into the tubular body 26. When the pressure on said spring is relieved, the ball drops back on its seat, and the oil introduced into the tubular body cannot escape through the valve seat. During the running, the alternate movements of the plunger 6 taking place without interruption and in proportion to the bad state of the road, will therefore send the oil in proportional quantities to the upper part of the tube 28, whence it passes, on the one hand, through the hole 29′ to the conduits 29 leading to the spindle 15 of the balance beam 18 which it lubricates, in order to drop down again on the pot 14, the walls of which are lubricated as well as those of the plunger 6; on the other hand, through the conduits 30 (Figure 1) which bring it to the central balance beam 4 which is thus

lubricated. Here it is collected in grooves provided for the purpose to which are connected other conduits 31 which return it to the point of departure, that is to say to the plungers 6. Each of the latter is provided at its base with an outlet 32 for the oil, which outlet communicates with conduits 33 leading to the balance beam 10. Each cylinder 5 is furnished with a stuffing box preventing oil from escaping and also forming a stop for the key 7 (Figure 3) in the event of an excessive expansion of the spring 13.

It may be advantageous to utilize a flexible traction apparatus of the above or other suitable type on an ordinary motor car, with the least possible expenditure. This may be effected as follows, according to the invention:

The rear axle of the machine is utilized merely as a driving axle. It does not carry any weight. Its wheels are replaced by suitable driving pulleys which can be suspended at a suitable height by means of an open bracket or strap 34, Figure 1. In any case, these pulleys, and consequently the axle, will be able to rise to a certain height under the action of differences of level of the ground, without affecting the rest of the vehicle.

The vertical travel of the driving axle can be limited by an elastic buffer 35 (Figure 1) secured to the chassis.

The connection of the driving axle to the rest of the machine can be obtained by means of a semi-rigid torque rod pivoted to the bearing axle 1 or around a spindle adjoining it. This thrust rod is constituted by two rigid parts 36 and 37 (Figure 2) securely connected together by a spring blade 38 mounted edgewise.

It will be seen that in normal running the torque rod 36, 37, 38 will work only in compression. The elastic portion can undergo a certain torsion necessitated by angular movements of the driving axle relatively to the fixed axle, under the action of uneven ground.

The front pulley of the system could be connected to the fixed axle in the same way as the rear or driving pulley. It could also be utilized as the driving pulley, whilst the rear pulley would then merely carry the track belt. These different arrangements are of course within the scope of the invention.

The front pulley 39 is connected to the bearing axle 1 by a system constituted by two symmetrical or non-symmetrical girders 40 (Figures 1, 2, 9 and 10) pivoted to the bearing axle 1 (Figures 1 and 2). The other ends of the girders 40 (Figures 9 and 10) carry the tension device for the track belt which device also ensures a rigid connection between the girders which it connects, by means of an arrangement hereinafter described, to the hub of the pulley in question.

Transverse rigidity of the girders 40 is further assured by a stay 47 of any desired cross-section (Figures 1, 2, 9 and 10) which is here shown of tubular shape. This stay has further for its object to limit the travel of the front pulley relatively to the bearing train. To that end stops 48 (Figures 1 and 2) have been provided on the cylinders 5. These stops could be adjustable, and the lower ones could be so arranged that the front pulley would be suspended at a certain height above the ground, whilst still being capable of executing, under the action of unevenness of ground, independent ascending movements. The ascending movements of great amplitude are limited by the upper stop.

The front pulley may consist of two half-pulleys 39 (Figures 9 and 10) mounted in a special manner on the hub 49 which in its turn is of a very special construction.

The body of the hub 49 of each front pulley, Figures 9 and 10, is rigidly connected to the tension system. Each end of the hub body 49 has inside it a ball bearing 50 (Figure 10) on which fits the rotating hub 51 of special shape. In order to avoid any jamming in the two bearings 50 (one for each half-pulley), whilst keeping the two pulleys loose relatively to each other, the two rotating hubs have passing centrally through them, with a slight amount of friction, a single spindle 52. It will be seen that this arrangement permits independent rotation of the two half-pulleys 39 relatively to each other, whilst at the same time ensuring normal working of the two bearings.

The two half pulleys 39 are mounted on the rotating hubs 51 in such a manner as to facilitate the operations of putting on and taking off the track belt, which operations are controlled solely by the outer front half-pulley, for when the latter has been removed, the putting in place of the track belt will not offer any difficulties. The half-pulleys 39 are held in place by an ordinary locking nut (Figure 10); and when this nut has been removed, the pressure exerted by the track belt on the pulleys will be sufficient to automatically disengage the conical hub 54 of the half-pulley from the rotating hub 51. This conical mounting also facilitates the attachment of the pulley.

The device for tensioning the track belt is of a very special construction.

It is constituted by a worm 41 (Figures 9 and 10) the shaft of which carries on its outer end a crank handle 42'. The worm 41 operates a nut or worm wheel 42 (Figure 9) mounted on an endwise movable tension screw 43, the portion 44 of which in front of the worm is made square. This square

part is mounted to slide in a fixed guide 45 permanently locked to the casing or body 46 of the tension system (Figures 9 and 10) in which are hermetically enclosed the parts described. The rod 43—44 is locked on the fixed central hub 49 of the loose pulley.

The tension mechanism constituted by the worm, worm wheel or nut and tension screw, could be replaced by other mechanical parts whilst retaining the same arrangement.

It will be apparent from the foregoing that the casing 46 of the tension system forms a connection between the girders 40. Moreover, owing to its rearward extension, the said casing may also be connected to the stay 47, a very rigid whole thus being formed.

I claim as my invention:—

1. In a tractor, the combination of an endless, flexible track belt; front and rear drums around which the belt passes; and a bearing train for said belt comprising a pivotally-mounted balance beam, a pair of cylinders connected side by side to each end of the beam, a spring-controlled plunger in each cylinder, and rollers supported by said plungers and arranged to bear upon the inner surface of the lower stretch of the belt.

2. In a tractor, the combination of an endless, flexible track belt; front and rear drums around which the belt passes; a centrally-located axle; and a bearing train for said belt comprising a rocking beam arranged longitudinally between the stretches of the belt and having a central pivotal connection with said axle, a pair of cylinders connected side by side to each end of the beam, a spring-controlled plunger in each cylinder, and rollers supported by said plungers and arranged to bear upon the inner surface of the lower stretch of the belt.

3. In a tractor, the combination of an endless, flexible track belt; front and rear drums around which the belt passes; a bearing train for said belt comprising a pivotally-mounted balance beam, cylinders at opposite ends thereof, a spring-controlled plunger in each cylinder, and rollers supported by said plungers and arranged to bear upon the inner surface of the lower stretch of the belt; and a closed lubricating system embodying a set of ducts leading to and from the cylinders to enable the reciprocatory movements of the plungers to effect the circulation of the lubricant through the system.

4. In a tractor, the combination of an endless, flexible track belt; front and rear drums around which the belt passes; a bearing train for said belt comprising a pivotally-mounted balance beam, cylinders at opposite ends thereof, a spring-controlled, hollow plunger in each cylinder, a guide cap for each plunger forming a tight joint therewith and normally raised by the action of the corresponding controlling spring, and rollers supported by said plungers and arranged to bear upon the inner surface of the lower stretch of the belt; and a closed lubricating system embodying a set of ducts leading into the bottoms of the plungers and from the tops of the cylinders, a vertical tube mounted on the bottom of each plunger and communicating with the interior of the plunger at its lower end, and a depending tube secured at its upper end to the top wall of each cylinder and having an outlet at said end, each pair of tubes being slidably interfitted and forming a tight joint between them, thereby to enable the reciprocatory movements of the plungers to effect the circulation of the lubricant through the system.

5. In a tractor, the combination of an endless, flexible track belt; front and rear drums around which the belt passes, each drum having an axle; a centrally-located main axle; a bearing train for said belt supported from the main axle and including rollers arranged to bear upon the inner surface of the lower stretch of the belt; and a connection between said main axle and the axle of one drum comprising a pair of rigid members each attached at one end to one of said axles, and a spring blade between said members and connecting the same.

6. In a tractor, the combination of an endless, flexible track belt provided on its inner surface with a continuous median rib; front and rear drums around which the belt passes; each drum embodying a pair of half-drums spaced apart to receive the belt rib therebetween, one pair of half-drums being detachably mounted on a single spindle to permit the removal of the ribbed belt; and a tensioning device connected with said spindle for moving it bodily parallel to itself in one or the other direction.

7. In a tractor, the combination of an endless, flexible track belt provided on its inner surface with a continuous median rib; and front and rear drums around which the belt passes, each drum embodying a pair of half-drums spaced apart to receive the belt rib therebetween, one pair of half-drums being detachably mounted on a single spindle to permit the removal of the ribbed belt, said spindle having a frusto-conical hub at each end, and each half-drum of said pair having a frusto-conical hub which fits over the adjacent spindle hub.

8. In a tractor, the combination of an endless, flexible track belt provided on its inner surface with a continuous median rib; front and rear drums around which the belt passes, each drum embodying a pair of half-drums spaced apart to receive the belt rib therebetween, one pair of half-drums being detachably mounted on a single spindle to permit the removal of the ribbed belt, said spindle having a frusto-conical hub at each end, and each half-drum of said pair having

a frusto-conical hub which fits over the adjacent spindle hub; and a tensioning device connected with said spindle for moving it bodily parallel to itself in one or the other direction.

9. In a tractor, the combination of an endless, flexible track belt; front and rear drums around which the belt passes; and a bearing train for said belt comprising a pivotally-mounted balance beam, a pair of cylinders connected side by side to each end of the beam, a spring-controlled plunger in each cylinder, and twin rollers supported by said plungers and disposed at opposite sides of the median line of the lower stretch of the belt in position to bear upon the inner surface of said stretch, each roller at one side of said median line being movable vertically relatively to the corresponding roller at the other side of the line.

10. In a tractor, the combination of an endless, flexible track belt; front and rear drums around which the belt passes; and a bearing train for said belt comprising a pivotally-mounted balance beam, a pair of cylinders connected side by side to each end of the beam, a spring-controlled plunger in each cylinder, and twin rollers supported by said plungers and arranged to bear upon the inner surface of the lower stretch of the belt at opposite sides of the median line of said stretch, said rollers having their axes intersecting to form an upwardly-directed angle.

11. In a tractor, the combination of an endless, flexible track belt; front and rear drums around which the belt passes; and a bearing train for said belt comprising a pivotally-mounted balance beam, a pair of cylinders connected side by side to each end of the beam, a spring-controlled plunger in each cylinder, and twin rollers supported by said plungers and disposed at opposite sides of the median line of the lower stretch of the belt in position to bear upon the inner surface of said stretch, each pair of rollers having the axes thereof intersecting to form an upwardly-directed angle, and each roller of each pair being movable vertically relatively to the other roller of the pair.

12. In a tractor, the combination of an endless, flexible track belt; front and rear drums around which the belt passes; and a bearing train for said belt comprising a pivotally-mounted balance beam, a pair of cylinders connected side by side to each end of the beam, a spring-controlled plunger in each cylinder, and twin rollers supported by said plungers and disposed at opposite sides of the median line of the lower stretch of the belt in position to bear upon the inner surface of said stretch, each roller at one side of said median line having a mounting which renders it independent of the corresponding roller at the other side of the line.

13. In a tractor, the combination of an endless, flexible track belt; front and rear drums around which the belt passes; and a bearing train for said belt comprising a pivotally-mounted balance beam, and a pair of twin rollers associated with each end of the beam and adapted to bear upon the inner surface of the lower stretch of the belt, the rollers of each pair being disposed at opposite sides of the median line of said stretch, and each roller of each pair being mounted for vertical movement independently of the other roller thereof.

14. In a tractor, the combination of an endless, flexible track belt; front and rear drums around which the belt passes; and a bearing train for said belt comprising a pivotally-mounted balance beam, and a pair of twin rollers associated with each end of the beam and adapted to bear upon the inner surface of the lower stretch of the belt, the rollers of each pair being disposed at opposite sides of the median line of said stretch with their axes intersecting to form an upwardly-directed angle, and each roller of each pair being mounted for vertical movement independently of the other roller thereof.

15. In a tractor, the combination of an endless, flexible track belt; front and rear drums around which the belt passes; and a bearing train for said belt comprising a pivotally-mounted, longitudinally-arranged balance beam, a pair of cylinders connected side by side to each end of the beam and disposed at opposite sides of the median line of the belt, a spring-controlled plunger in each cylinder, rollers supported by said plungers and arranged to bear upon the inner surface of the lower stretch of the belt, and a transversely-disposed balance beam extending across the tops of each pair of cylinders for maintaining a practically constant distribution of the load on the rollers.

16. In a tractor, the combination of an endless, flexible track belt; front and rear drums around which the belt passes; and a bearing train for said belt comprising a pivotally-mounted balance beam, a pair of twin rollers associated with each end of the beam and arranged to bear upon the inner surface of the lower stretch of the belt at opposite sides of the median line of said stretch, and means for maintaining a practically constant distribution of the load on the rollers.

17. In a tractor, the combination of an endless, flexible track belt; front and rear drums around which the belt passes; and a bearing train for said belt comprising a pivotally-mounted balance beam, a pair of cylinders connected side by side to each end of the beam, a plunger and a guide cap in each cylinder in opposed relation to each other, an interposed expansible spring in each cylinder between the plunger and cap therein, a pair of twin rollers carried by each pair of

plungers and arranged to bear upon the inner surface of the lower stretch of the belt at opposite sides of the median line of said stretch, and a pivotally-mounted balance beam extending across the tops of the caps and bearing thereon at opposite ends to maintain a practically constant distribution of the load on the rollers.

18. In a tractor, the combination of an endless, flexible track belt; front and rear drums around which the belt passes; and a plurality of pairs of twin rollers adapted to bear upon the inner surface of the lower stretch of the belt, the rollers of each pair being disposed at opposite sides of the median line of said stretch, each roller at one side of said median line being mounted for rocking movement in a vertical plane independently of the corresponding roller at the other side of the line.

19. In a tractor, the combination of an endless, flexible track belt; front and rear drums around which the belt passes; and a plurality of pairs of twin rollers adapted to bear upon the inner surface of the lower stretch of the belt, the rollers of each pair being disposed at opposite sides of the median line of said stretch with their axes intersecting to form an upwardly-directed angle, each roller at one side of said median line being mounted for rocking movement in a vertical plane independently of the corresponding roller at the other side of the line.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

ADOLPHE KÉGRESSE.

Witnesses:
CHARLES LÉON LOISEL,
LEÓN POLART.