PATENT SPECIFICATION

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480,639

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COMPLETE SPECIFICATION

Improved Vehicle for Combined Propulsion by Wheels and Endless Tracks

I, ADOLPHE KEGRESSE, a French Citizen, of 36, Avenue Hoche, Paris (Seine), France, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The endeavour to increase the output of vehicles which are required to travel both over rough ground and upon roads has led to the provision of vehicles for combined propulsion by wheels and endless tracks.

Hitherto it has been proposed either to add a train of endless tracks to the rear driving wheels while retaining the front steering wheels, or to substitute for the four wheels of the vehicle a complete train of endless tracks.

If the first of these two arrangements is satisfactory for running on roads it is not entirely so for rough ground where it does not ensure sufficient adhesion.

The second arrangement gives a vehicle with satisfactory adhesion on rough ground but for running on roads it is handicapped with respect to the first arrangement owing to its greater weight. Furthermore, the second arrangement presents the great disadvantage that it is of greater complexity and of a prohibitive cost price.

The present invention has for its object to provide a vehicle which is adapted to travel on roads or on rough ground with satisfactory adhesion in each case.

To this end and contrary to what has been hitherto proposed, the invention provides a vehicle, for combined propulsion by wheels and endless tracks, having front driving and steering wheels and rear wheels and endless tracks adapted for alternative use, which vehicle is characterised by the fact that the said rear wheels are carrier and not driving wheels.

A mechanism designed for the purpose permits of raising the rear carrier wheels from the ground and replacing them automatically by driving endless tracks, the propulsion by the front wheels still continuing.

In addition to this fundamental characteristic the invention comprises novel constructional features which will be hereinafter described and specifically pointed out in the appended claims.

The accompanying drawings show, by way of example, one method of carrying out the invention.

In these drawings:—

Figure 1 is an elevation, the frame being partially removed for clearness,

Figure 2 is a plan view,

Figure 3 shows, on a larger scale and in elevation, the design of the single carrier axle and its connection on the one hand with the chassis and the mechanism for controlling the lifting, and on the other hand with the loose pulleys of the endless track.

Figure 4 shows the same device in plan and in partial section.

Figure 5 is a partial section on the line A—B of Figure 3.

Figure 6 is a section on the line C—D of Figure 3.

Figure 7 shows in section a mechanism for controlling the lifting.

As shown by Figures 1 and 2, if the train of endless tracks is removed there is left an ordinary automobile chassis with front drive. This vehicle comprises a chassis 1, the form of which is suitable to requirements. The motor 2 transmits its power to the change speed gear box 3 provided with a reducing gear represented by its casing 4 which has *inter alia* the characteristic already known of giving at the same time as the coupling of the endless track motor axle, the reduction of speed necessary for the front driving wheels for running on rough ground.

The change speed gear box 3 comprises a driving member 5 (Figures 1 and 2) serving to control, by means of a shaft 6, the lifting mechanism indicated diagrammatically at 7 on Figures 1, 2, 3 and 4 and the section of which is shown by Figure 7.

The speed reducer drives, either directly at a high speed, the differential 8 of the front driving axle, or, through the intermediary of a suitable train of reducing gears, the differential 8 and the driving axle 9 of the endless track.

The endless track train is of usual type.

[*Price* 1/-]

It has a driving pulley 10, a loose pulley 11 and a set of rollers 12—with four rollers in the example shown—connected two by two by rocking levers 13, which levers are connected to the carrier cylinder 14 of the endless track train by a principal rocking lever 15.

The rear wheels 16 are idle and are freely mounted on journals 17.

It will be seen that these wheels 16 are only carrier wheels when on the road, on rough ground they are lifted and have no longer any action on the running of the vehicle.

The two journals 14 and 17 (endless track journal and wheel journal) are integral with a common part or rocking lever 18 the hub 19 of which (Figure 4) is freely mounted on a carrier axle 20. This axle 20 is connected to the chassis 1 through two leaf springs 21, arranged one at each of its extremities. These springs are mounted on the axle 20 by means of the supporting parts 22, the head of which is adjusted with slight friction on the hub 19 of the rocking lever 18.

The carrier axle 20 furthermore has permanently secured thereon and close to each of its extremities, a three-branch lever 23, 24, 25 (Figures 3 and 4) and at one of its extremities only, a lever 26 (Figures 3, 4) also integral with the said axle. The lever 26 is actuated by a connecting rod 27 the other extremity of which is mounted on a lever 28 forming part of the lifting mechanism represented diagrammatically in Figure 7.

The arm 25 of each of the three branch levers 23, 24, 25 is connected to a sliding axle 29 by means of a connecting rod 30 fixed on the axle 28. This axle 29 has close to each of its extremities a plate sector 31 (Figures 3, 5) provided with holes along its curved edge. The axle 29 has furthermore, at each extremity, and mounted idly thereon, a part 32 (Figures 3, 5) having a journal 33 serving as an axle for the idle pulley of the endless track train. The part 32 is terminated by a manipulating handle 34. The part 32 between the handle 34 and the journal 33 comprises a hole 35 which corresponds to the holes of the plate sector 31, and is provided to allow the passage of a locking bolt. The axle 29 is supported at each extremity by a part 36 forming a slide.

Each journal 14 of the carrier trains is extended on the inner side by a trunnion 37, integral, like the journal with the rocking lever 18 (Figures 2, 4, 6). The journal 17 of the wheel is also terminated by a similar trunnion 38 also forming part of the rocking lever 18 (Figure 4).

The trunnion 37 is intended to engage in a part 39, hinged on the chassis (Figures 3, 6), and the trunnion 38 can be engaged in a similar part 40 also hinged to the chassis.

The lifting system represented in section in Figure 7, receives its movement from the change speed gear box through the intermediary of the shaft 6, which drives a shaft 41. The latter carries a gear wheel 42 which can be engaged with a pinion 43 integral with another pinion 44 which engages with a wheel 45 fixed on a screw 46 of suitable pitch. The latter rotates in a nut 47 provided with two collars 48 which take bearings 49 sliding in the branches of a lever 50 fixed on the axle 51 of the lever 28 arranged on one of the outer sides of the casing 7.

The wheel 42 is slidably mounted on the shaft 41 and can also be engaged with another pinion 52 which is arranged and operatively connected to the pinion 43 by any convenient gear wheel transmission (not shown) such that the latter pinion will be thereby rotated in the direction opposite to that in which it will be rotated when the wheel 42 is engaged therewith.

It will be seen that the position of the gear wheel 42, engaging either the pinion 43 or the pinion 52, determines the direction of rotation of the screw 46 thus giving a movement in the desired direction to the levers 50 and 28, integral with the same axle, and through the intermediary of the connecting rod 27 to the lever 26. The latter by its movement actuated the three-branch lever 23, 24, 25 integral like itself with the axle 20.

Figures 3, 4 and 6 represent the mechanism of the carrier axle 20 and of the journals of the wheels and endless track, the vehicle resting on its wheels. The system of lifting fixes the trunnion 37 of the journal 14 on the hinged part 39, through the intermediary of the arm 24 of the three-branch lever.

In this position the weight of the vehicle is transmitted to the wheels 16 through the intermediary of the suspension springs 21, the support 22, the axle 20, the rocking lever 18 and finally the wheel journal 17.

On the other hand the connecting rod 30 of the arm 25 has displaced the sliding axle 29 of the idle endless track pulleys, to bring it into the position for running on roads, shown on Figures 1, 2 and 3.

If now the lifting system 7 is made to operate to bring the lever 28 into its opposite position, the whole of the three-branch levers 23, 24, 25 will oscillate with the axle 20, disengaging the arm 24 from the trunnion 37.

On assuming the extreme position, opposite to that of Figures 1, 2 and 3, the arm 23 will raise the trunnion 38 of the wheel journal 17 to seat it in the hinged part 40. The arm 25 will follow the movement, and through the intermediary of the connecting rod 30 it will move forward the axle 29 supporting the idle pulley, with which it is integral, thus slackening the endless band and permitting the carrier train to assume the position shown dotted in Figure 1, which is the normal position of running when driven by the endless track.

As will be seen, the wheel 16 will thus be raised interfering in no way with the operation of the endless band drive.

By the intervention of the speed reducer 4 the vehicle may be driven by the endless track, with a suitable reduction in speed of the front wheels. The propulsion of the machine is thus complete, by wheels in front and by endless track at the rear.

If necessary it would be easy to take off the wheels 16, to convert the vehicle into one having front driving wheels and rear driving endless tracks.

The regulation of the tension of the endless band is ensured, independently of the sliding of the axle 29, by the oscillation about the axle 29 of the journal 33 integral with the part 32. A simple bolt introduced into the hole 35 permits of fixing the part 32 at the desired position to obtain the tension of the endless band which is suitable. The handle 34 serves to facilitate the manipulation of this tension.

It will be noted that the replacement, at the rear of the vehicle, of the idle carrier wheels by the train of endless tracks, modifies the distribution of the load in the sense desired, that is to say that it is greater on the train of endless tracks than on the carrier wheels. This variation of the load will be all the greater the longer are the arms of the rocking lever 18 (Figures 1, 3 and 4). These arms represented approximately equal on the Figures may naturally be of different lengths according to the uses intended.

Furthermore, as the journals of the train of the endless track carrier system and the journals of the rear carrier wheel system are integral with the rocking lever which is pivoted on the axle 20 and as the latter is connected resiliently by the spring 21 to the chassis, the vertical movement of said axle relatively to any similar movement imparted to the particular system in operation is reduced, with a consequent reduction of the oscillations of the spring 21 in a direct ratio with the length of the arms of the oscillatory rocking lever.

Furthermore the mounting described ensures the independence of the carrier wheels when they are in operation and the independence of the carrier trains of the endless track system when this is operating. This independence is obtained by the free oscillation of each of the rocking levers 18 which carry journals, on the axle 20, whatever may be the system in contact with the ground.

The important advantage presented by the mounting of one of the carrier pulleys of the endless band on an axle sliding automatically with the lifting system is in the fact that it is only the lower loop of the endless band which is raised for running on roads, thus limiting the space taken up in height and which is very troublesome for designing the carriage work of any kind with which this class of vehicle is equipped. In certain known vehicles, either the entire endless track train is raised, or at least the upper and lower runs of the endless track are raised. Constructions according to this invention require less vertical space for said endless tracks than these known constructions.

It is quite evident that the system described here applied to the idle pulleys carrying the endless band may equally well be applied to the driving pulleys. It would in this case be sufficient to make the driving axle either sliding, or oscillating, or to connect it either directly to the lifting system or to an axle controlled thereby.

It would also be possible by making use of the invention to act at the same time on the two pulleys, the driving and the idle ones, supporting the endless band. It would be sufficient for this purpose to make the axles of these two pulleys to slide and to connect them by connecting rods to a rotating axle controlled by the lifting system.

It will also be noted that the regulation of the tension of each endless band is ensured independently of the sliding of the axle 29 connecting the two idle pulleys, by a simple manipulation, which consists in shifting a bolt in holes, acting, to effect this, on a handle which may be extended by means of a simple tube forming a lever.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A vehicle, for combined propulsion by wheels and endless tracks, having front driving and steering wheels and rear wheels and endless tracks adapted for alternative use, characterised by the

fact that the said rear wheels are carrier and not driving wheels.

2. A vehicle according to Claim 1, in which the rear wheels and the carrier trains of endless tracks are connected by a rocking lever oscillating about a common axle, characterised by the said axle being elastically connected to the chassis, this single suspension being thus common to the wheels and to the carrier trains, in order to act in all cases of propulsion.

3. A vehicle according to Claims 1 and 2, characterised by two free rocking levers rotatably mounted on the rear axle carrying by their front extremities the supporting and oscillation axes of the carriers of the endless track trains, and by their rear extremities the supporting axes of the rear carrier wheels.

4. A vehicle according to Claims 1, 2 and 3, characterised by the provision of two rocking arms fixedly mounted on the rear axle, itself rotatably mounted and of which the arms form each a lower half bearing, co-operating with an upper half bearing fixed rigidly to the chassis in such a manner that either the supporting axes of the carrier trains of endless tracks or the supporting axes of the rear carrier wheels are held at the raised position at which the endless tracks or the wheels are inoperative but nevertheless able to oscillate in order to follow the suspension movements.

5. A vehicle according to Claim 4, characterised by the rear endless track pulleys being idle and being mounted fixed in the vertical direction whilst their axis slides in horizontal guides under the effect of two connecting rods hinged respectively to two lever arms integral with the rear carrier axle in such a manner that on the raising of the lower loops of the endless tracks their tension is maintained, the upper loop thereof remaining stationary.

6. The vehicle for combined propulsion by wheels and endless tracks substantially as shown on the accompanying drawings.

Dated this 29th day of May, 1937.

ADOLPHE KEGRESSE,
Per: Boult, Wade & Tennant,
111/112, Hatton Garden, London, E.C.1,
Chartered Patent Agents.

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Fig. 1

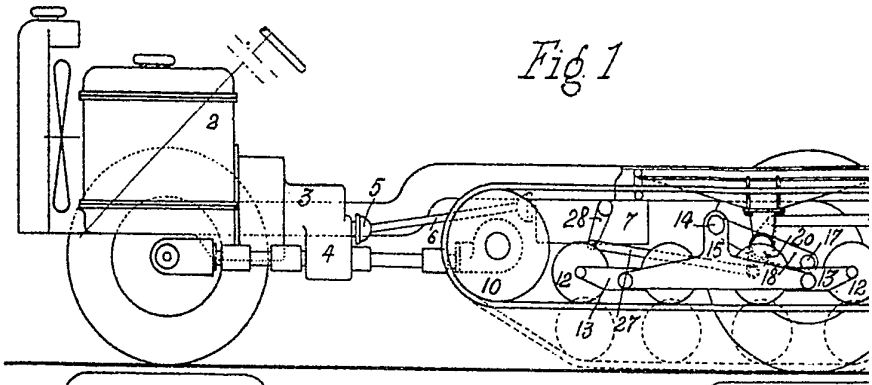
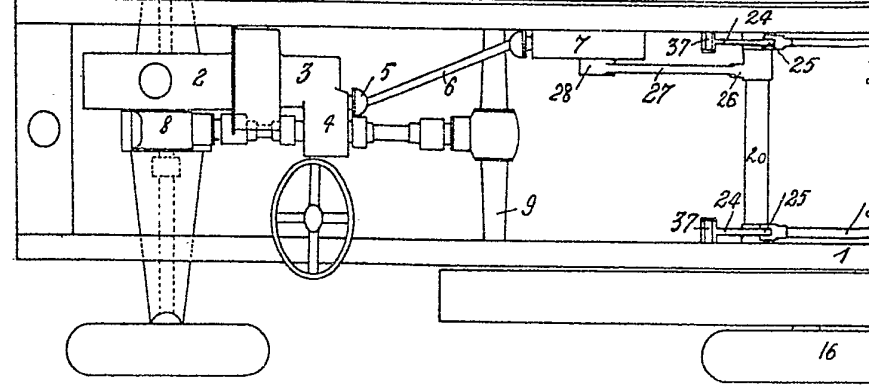


Fig. 2.



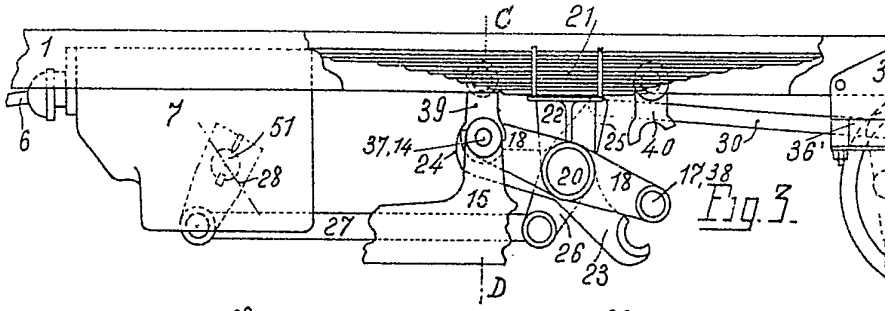


Fig. 3.

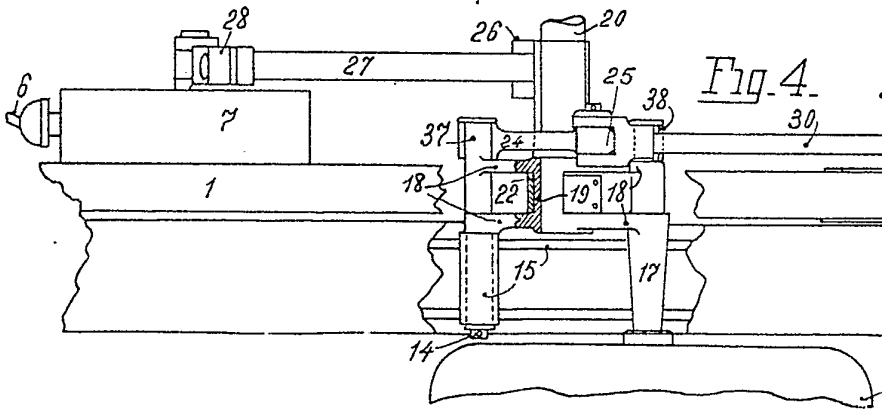
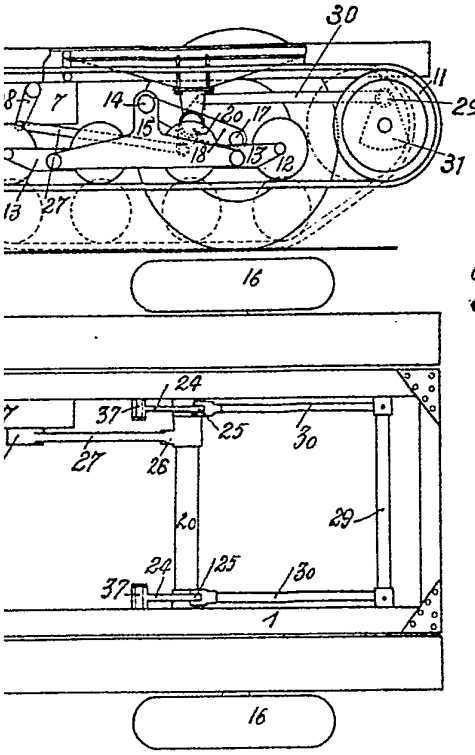


Fig. 4.

Fig. 1



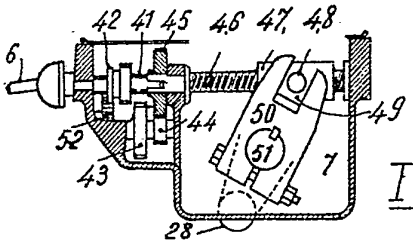


Fig. 7.

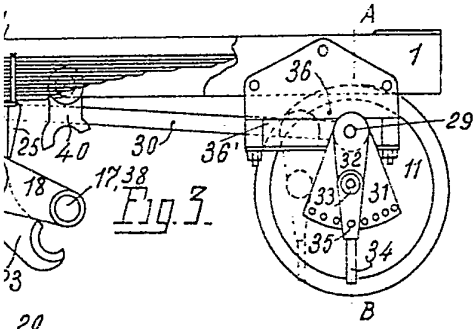


Fig. 3.

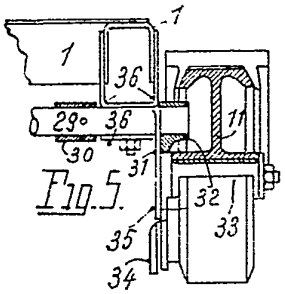


Fig. 5.

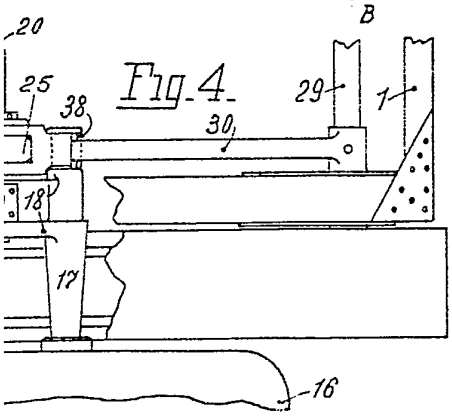


Fig. 4.

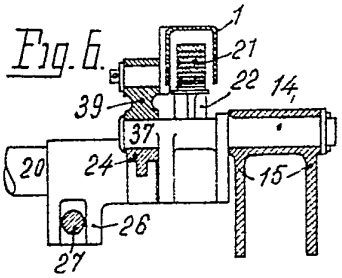


Fig. 6.

Malby & Sons, Photo-Lith.

480,639 COMPLETE SPECIFICATION

1 SHEET

[This Drawing is a reproduction of the Original on a reduced scale.]

Fig 1

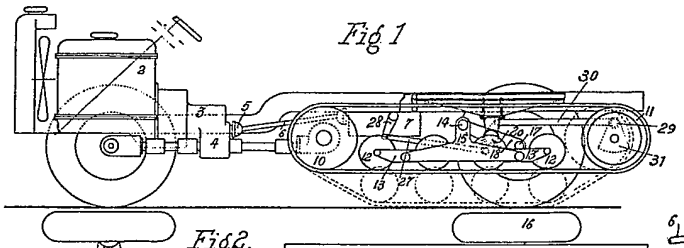
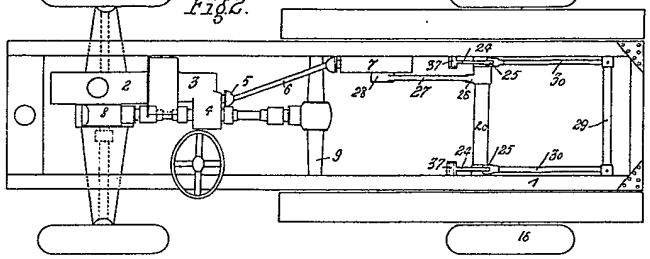


Fig 2.



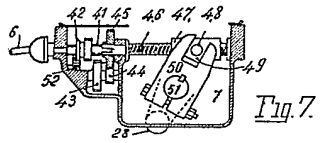


Fig. 7.

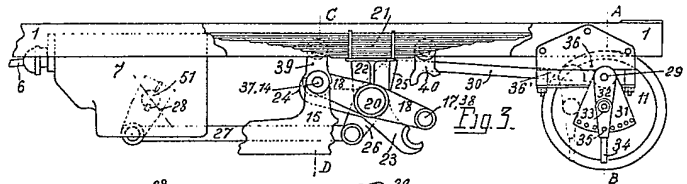


Fig. 3.

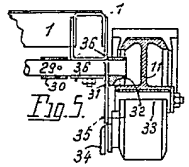


Fig. 5.

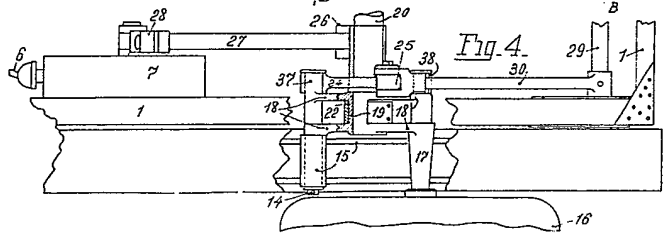


Fig. 4.

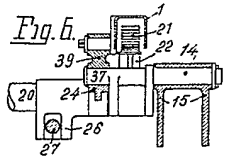


Fig. 6.

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