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R. LANG ET AL

REVERSING GEARS FOR MOTOR VEHICLES

Filed March 18, 1941

Serial No.
384,016

3 Sheets-Sheet 1

Fig. 1

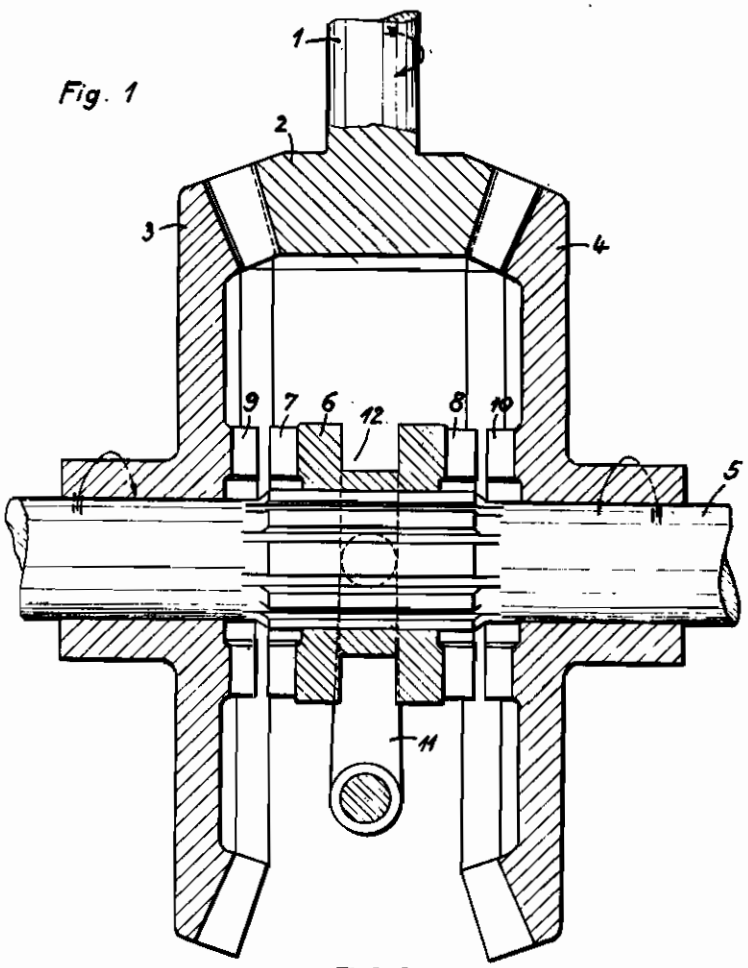

Fig. 2

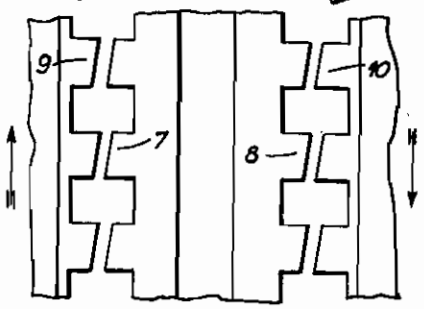

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Fig. 3

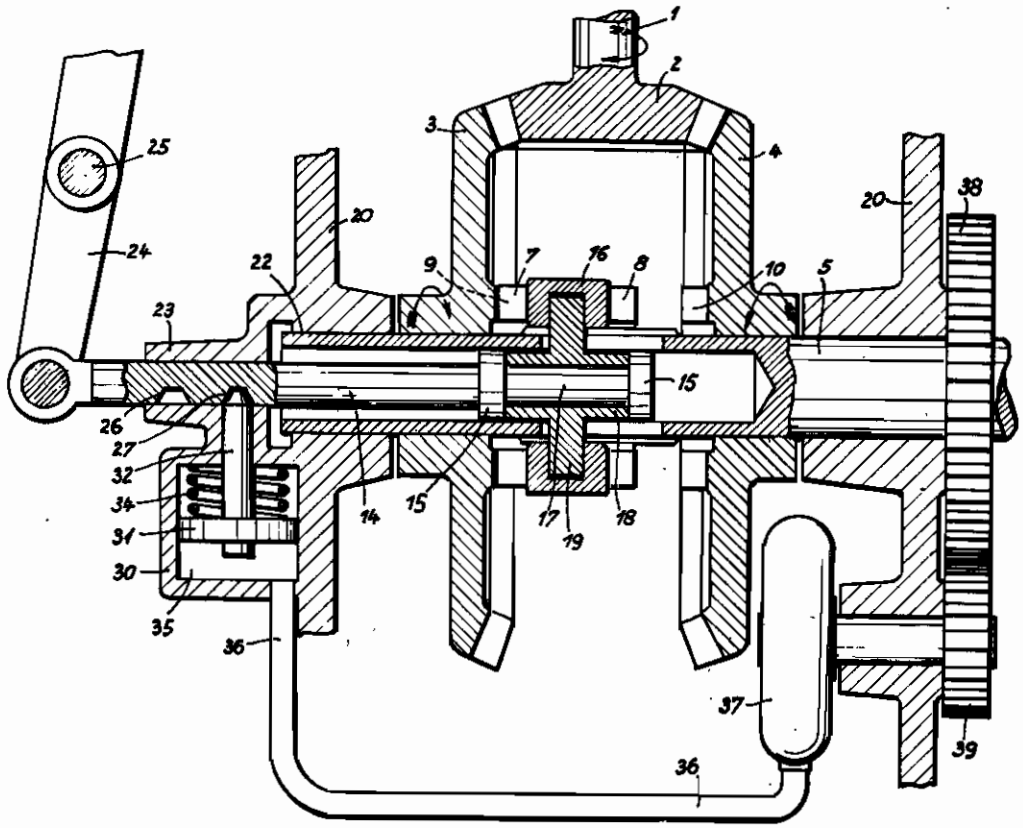

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Fig. 4

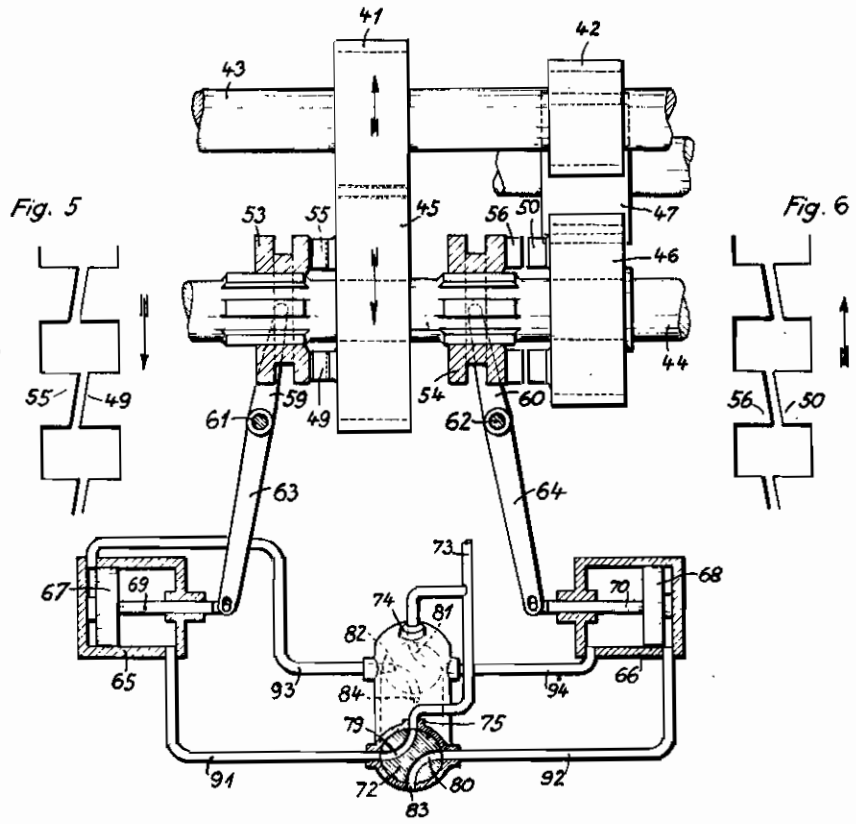

Fig. 5

Fig. 6

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ALIEN PROPERTY CUSTODIAN

REVERSING GEARS FOR MOTOR VEHICLES

Richard Lang, Ravensburg, Hermann Gros and Franz Hehle, Friedrichshafen, Bodensee, Germany; vested in the Alien Property Custodian

Application filed March 18, 1941

Our invention relates to reversing gears in motor vehicles and has special reference to gears of this kind mounted in heavy rail cars driven by internal combustion engines.

The main object of our invention is to improve the two claw couplings used in such gears for alternately coupling one or the other of the two gears provided on the shaft common to both of them. These couplings in reversing gears are brought into or out of engagement while the car stops. Generally, the two coupling halves intended for engagement cannot engage immediately as the claw teeth of one half are not situated exactly opposite to the gaps of the other half. It then happens when the car is started that instead of getting into engagement they glide or rattle past each other as the speed of rotation of the driving half increases rapidly so that mutual engagement of the claws becomes impossible. The undesirable and bad consequences are: start by jerks, inadmissible high speed of rotation of the driving engine and damage on the claws or of other vital parts of the transmission. It does not help to provide rounded edges on the claw teeth for facilitating their engagement because then the touching surfaces when the coupling halves meet are very disadvantageous and the angle under which they touch each other is extremely unfavourable. Triangular teeth would give an immediate engagement, but their rigidity is low and their front faces because of their steepness would cause high repulsing forces when rattling past each other in case of the transmission being driven by the wheels of the vehicle on reduction of the motor speed, so that this would lead to destruction within shortest time.

We avoid all these disadvantages by providing double-acting claws (with two substantially parallel flanks) having front faces so inclined that engagement of the coupling halves is facilitated or even caused when the driving coupling half connected to the motor surpasses in speed of rotation the driven half connected to the wheels of the vehicle. Thus, the claw coupling for driving the car in the new direction will engage immediately and guarantee an immediate and safe start. On the other hand, if it should happen that the shiftable claw coupling half out of some reason or other should come out of engagement with its co-operating half, the inclined front faces would repulse each other in case the coupling half connected to the car wheels would overrun the driving coupling half.

Furthermore, the coupling according to our invention because of the claw teeth having substantially parallel flanks is adapted to transmit driving force in either direction of rotation without disengagement. And even if by way of exception when passing a switch or the like the driving force being interrupted the shocks and jerks should happen to cause disengagement then the claw teeth rattle past each other without doing any harm—as explained above—and as soon as the relative direction of rotation of the two coupling halves is reversed again they automatically come to re-engagement, which may be caused by increasing the motor speed or by the car speed being reduced by any reason whatever.

It is advisable according to our invention, to provide elastic or resilient means, such as springs, pressure oil, compressed gases or the like, for pressing the two coupling halves against each other. In case the coupling should come to disengage such means would tend towards re-engagement and cause such, as described above. Thus, while the car is running wrong connections and their disagreeable consequences are avoided.

We prefer to provide locking means with the operating device for changing the direction of movement of the car, so that either one or the other of the two couplings may be shifted into engagement. Besides, an additional locking device may serve for preventing disengagement of the coupling engaged while the car moves. A third locking device may prevent engagement of the coupling not corresponding to the direction of movement of the car.

Having given a general description of our invention we now want to point it out more in detail having reference to the drawings which represent three examples embodying our invention.

All the Figures are mere diagrams.

Figs. 1 and 3 are sections through reversing gears. Fig. 2 represents a portion of the circumference of the two claw couplings, developed in one plane.

Fig. 4, giving a third example, is a view of the main gear parts, the two couplings being shown in section, and its lower middle portion representing a perspective view of the control cock for the pressure cylinders shown in section to the right and left thereof. Fig. 5 is a portion of the circumference of the left hand claw coupling and Fig. 6 is a portion of the circumference of the right hand claw coupling, both developed in the drawing plane.

In Fig. 1 the driving shaft 1 at its end is shaped into bevel wheel 2 meshing with bevel wheels 3 and 4 journaled loosely on driven shaft

5. Splined to shaft 5 is sleeve 6 having claw coupling half 7 at its left hand end and claw coupling half 8 at its right hand end. The co-operating coupling halves are 9 on bevel wheel 3 and 10 on bevel wheel 4, respectively. Sleeve 6 is represented in its middle or idling position in which shaft 5 is at rest. By means of fork 11 fitting into the circular groove 12 it may be shifted to the left causing engagement between coupling halves 7 and 9 or to the right thereby bringing coupling halves 8 and 10 to engagement. In the first case driven shaft 5 will rotate in the direction indicated by the arrow at the left and in the other case in the direction reverse thereto, as indicated by the arrow at the right.

The position of the claw teeth in relation to each other is shown in Fig. 2 which may be taken as a kind of plan view of the sleeve 6 and the couplings 7/9 and 8/10. In this figure also the directions of rotation of claws 9 and 10, respectively, are indicated by arrows.

Assuming, the car on which the reversing gear is mounted be at rest and it be intended to start in forward direction which would for example mean connection between wheel 3 and shaft 5. Then sleeve 6 has to be shifted to the left so that the claw teeth of coupling half 8 immediately and without any delay after the motor being started come into engagement with the claw teeth of the co-operating coupling half 7 on sleeve 6 thus causing rotating connection between wheel 9 and driven shaft 5. The coupling is engaged without occurrence of shocks and the vehicle starts immediately without any teeth rattling past each other and being destroyed as with the usual gears of this kind, and at the same time from the start the entire height of the flanks of the claw teeth is bearing in the transmission.

If it is desired to start with the vehicle in the opposite or reverse direction, coupling halves 9 and 10 have to be approached in similar manner as described above with regard to coupling halves 7 and 8. The coupling 9/10 comes to engagement without shock and offering the entire flank of the claw teeth for the power transmission.

It may be advisable to provide elastic or resilient means, such as springs, pressure air or the like between the operating member 11 and the couplings 7/9 and 8/10, respectively, for the purpose of having a kind of constant tension towards engagement in these couplings even before their being engaged. As means of this kind are well known they are not specially represented in Fig. 1.

In the example shown in Fig. 3 the same numerals are applied to like parts as in Fig. 1. The main difference is that in Figure 3 shaft 5 is partly made hollow and that the sleeve 16 is differently shaped so as to be operated by rod 14 by means of lever 24 journaled at 25. Rod 14 has two collars 15 between which sleeve 19 is situated having a projecting portion 19 fitting into a co-operating internal groove of sleeve 19 and penetrating through adequate slits in shaft 5. This shaft 5 is journaled in the casing 20 at 22 and rod 14 at 23. Rod 14 has two notches 26 and 27 which serve to lock it in its left hand or in its right hand position by means of bolt 32. This bolt 32 is fixed to piston 31 on which spring 34 presses from one side whereas on the other side there is oil pressure in space 35 introduced by conduit 38 from oil pump 37. Gears 38 and 39 serve for driving this pump 37. In the situation represented in Fig. 3 the left hand coupling 7/9 is in engagement and it is assumed that the car is moving so that shaft 5 rotates and pump 37 creates oil pressure which locks rod 14 in the position shown so that it is not possible to disengage coupling 7/9 before shaft 5 has come to rest again, so that the oil pressure vanishes. Thereafter displacement of rod 14 is allowed again and it is possible to shift sleeve 16 to its middle position or to its right hand position in which the direction of rotation of shaft 5 is reversed. In this latter position, when coupling 9/10 is engaged rod 14 is again similarly locked by bolt 32 projecting into notch 26 as soon as shaft 5 is rotating and driving pump 37 creating oil pressure again.

In the third example represented in Fig. 4 there are two gears 41 and 42 fixed to driving shaft 43. Gear 41 meshes with gear 45 and gear 42 with intermediate gear 47 and this with gear 46; gears 45 and 46 are loosely journaled on driven shaft 44. Splined to this shaft 44 are two sleeves 53 and 54. Sleeve 53 on one side is provided with coupling half 55 adapted to co-operate with coupling half 48 provided at the side face of gear 45. Similarly sleeve 54 has coupling half 56 co-operating with coupling half 55 on gear 46. Sleeve 53 is adapted to be shifted by means of double-armed lever 59/63 journaled at 61 and sleeve 54 by lever 60/64 journaled at 62. The shape of the teeth of coupling 55/48 is shown in Fig. 5 and that of those of coupling 56/56 in Fig. 6. The directions of rotation of the gears and of the coupling halves are indicated by arrows.

Levers 63 and 64, respectively, are operated by piston rods 69 and 70, respectively. Pistons 67 and 68, respectively, situated inside of cylinders 65 and 66, respectively, are adapted to be moved by oil pressure introduced by conduits 91 and 93 and 92 and 94, respectively. These conduits lead to the common control cock 72, represented diagrammatically in perspective view and partly in section. At 74 and 75 the pressure oil enters the housing of the cock fed thereto by means of conduit 73 from a source not specially represented. There are outlets 83 and 84 from the housing into the open air; and through the body of the cock 72 penetrate channels 78, 80, 81 and 82. In one position of cock 72 pressure oil is fed through channels 78 and 81, respectively, to conduits 91 and 94, respectively, as represented in the drawing, and in the other position of cock 72 pressure oil is fed through channels 88 and 81, respectively, to conduits 92 and 93, respectively. Thus, turning control cock 90 degrees means movement of pistons 67 and 69 to their other end positions, and automatically shifting of sleeve 53 so that coupling 55/48 is disengaged and shifting of sleeve 54 so that coupling 56/50 is engaged. Such turning of cock 72 has to be done only when the car is at rest, as explained above. To prevent the cock from being operated a locking device may be provided, similar to that shown in Fig. 3 or on the lines disclosed therein.

We do not want to be limited to the details described or shown in the drawing as many variations will occur to those skilled in the art without deviating from the scope of our invention.

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