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R. LANG ET AL
OPERATING MECHANISM FOR CLUTCHES
Filed July 2, 1941

Serial No.
400,816
4 Sheets-Sheet 1

Fig. 1

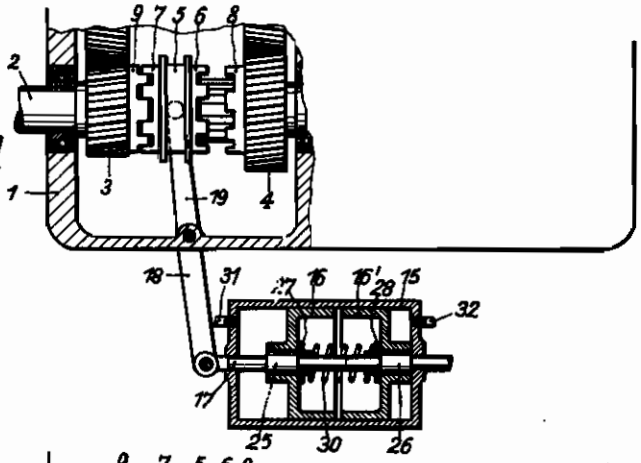

Fig. 2

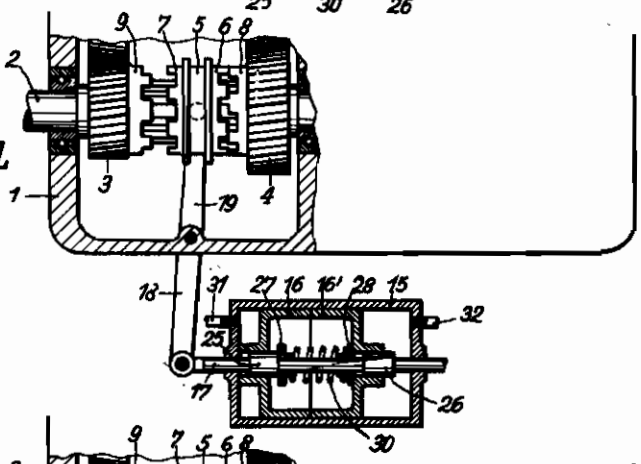

Fig. 3

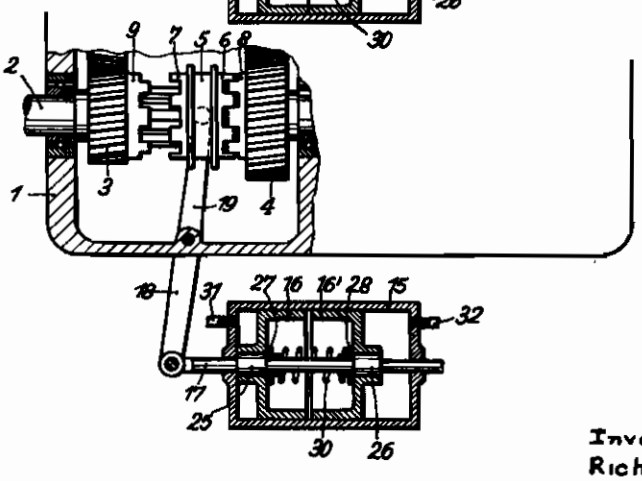

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Fig. 4

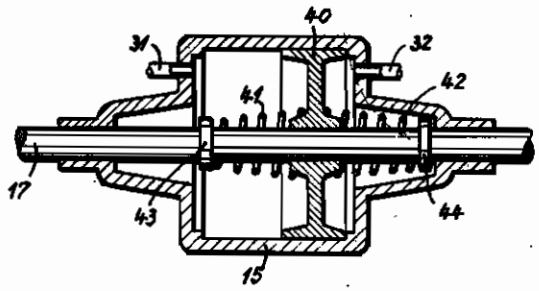

Fig. 5

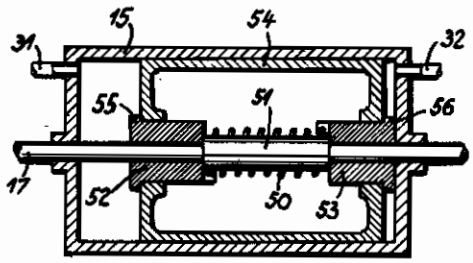

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Fig. 6

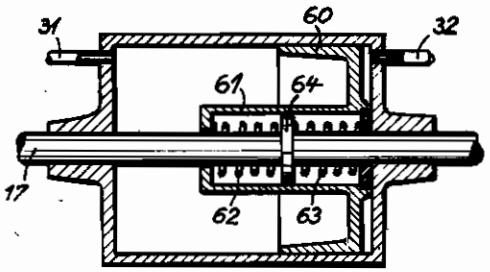

Fig. 7

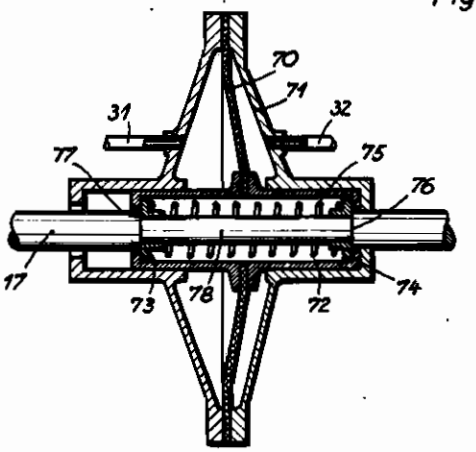

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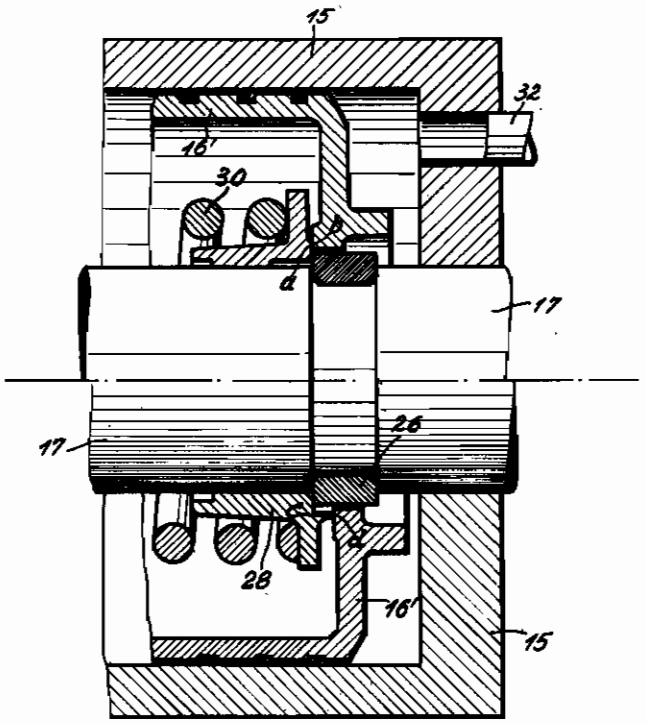
Fig. 8



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ALIEN PROPERTY CUSTODIAN

OPERATING MECHANISM FOR CLUTCHES

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Application filed July 2, 1941

Our invention relates to operating mechanisms for clutches and has special reference to double-acting clutches as they are often used in change speed gears of motor vehicles. In many cases such clutches are operated by means of fluid pressure and springs are provided which are set under tension, such tension vanishing only after the shifting of the respective clutch member was performed.

Generally such operating mechanisms are used in change speed gears of big motor cars having many different speeds and because of the large dimensions of such mechanisms it is difficult to have sufficient space for them as they make the entire transmission bulky and complicated.

Our invention simplifies these conditions as it makes possible to provide the springs to be tensioned without affording additional space, so that even greater spring forces are allowable, if desired, than usual.

According to our invention, the spring or springs are placed inside of the fluid pressure cylinder and are situated between the member (piston) on which the pressure fluid presses and the member which acts on the shiftable clutch element. The arrangement is so that on the first member being moved by fluid pressure the second member remains at rest—the spring being further compressed—until special circumstances allow for the second member to move also, whereby the tension of the spring is reduced again.

It is advisable, according to our invention, to provide a rod connected with the shiftable clutch member and to have two piston halves inside of the fluid pressure cylinder, said piston halves being slidably mounted on said rod. The rod has two fixed stops against which the spring or springs bears or bear, preferably by means of rings.

Our invention is applicable to simple or to double acting claw clutches as well as to shiftable gears. It is also of advantage with claw couplings having synchronising devices.

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 several examples embodying our invention.

Figs. 1, 2 and 3 relate to one example, showing different positions of the members and elements. Fig. 4, Fig. 5, Fig. 6 and Fig. 7 show four other examples. Fig. 8 represents a preferred construction of the tightening surfaces between the spaces separated by the piston, on enlarged scale.

In all of the Figs. the operating mechanism is shown in longitudinal section.

In the gear casing 1 shaft 2 is situated on which gears 3 and 4 are loosely journaled. Sleeve 5 is splined to shaft 2 and adapted to be shifted longitudinally thereon so that claw teeth 6 and 7, alternately, may get into engagement with claws 8 and 9, respectively, provided on the side faces of gears 4 and 3, respectively. Double-armed lever 19/18 serves for shifting sleeve 5. The lower end of this lever is connected to rod 17 to which the two halves 16 and 16' of a piston belong which is adapted to slide inside of fluid pressure cylinder 15. Piston rod 17 has stops 25 and 26 adapted to slide tightly inside of adequate borings in piston halves 16 and 16', respectively. There are rings 27 and 28 slidable on rod 17 between stops 25 and 26, against which the ends of spring 30 are bearing. Fluid pressure conduits 31 and 32 are adapted to allow pressure fluid to enter cylinder 15 alternately from one or the other side, so as to shift piston halves 16 and 16' to the right or to the left and back again, as circumstances may afford. The eontrol valve for the pressure fluid is not represented.

In the positions represented in Fig. 1 gear 3 by means of claw coupling 7/9 is connected to shaft 2. If it is desired to disengage this connection and to cause gear 4 to be connected to shaft 2 instead of gear 3, sleeve 5 must be shifted to the right so as to cause engagement of claw coupling 6/8. For this purpose it is necessary to cause pressure fluid to enter cylinder 15 through conduit 32 and to allow for the pressure fluid to the left of piston half 16 to escape through conduit 31. Thus, piston half 16' moves to the left, presses on piston half 16, and both halves together move to their left hand end position. As during this time the side faces of the claws of coupling 7/9 are still transmitting a turning moment this coupling will not disengage and sleeve 5 will not move, so that lever 19/18 and rod 17 still rest in the position represented in Fig. 1 while the piston halves 16 and 16' have already reached the position shown in Fig. 2. Consequently, spring 30 is under additional tension, as ring 27 bearing against stop 25 remains at rest whereas ring 28 is shifted to the left by piston half 16'.

As soon as the side faces of the claws of clutch 7/9 are released, for example by taking the gas off the engine to which the change speed gear—part of which is shown—belongs, the enlarged pressure of spring 30 will cause disengagement of clutch 7/9 and move sleeve 5 to the right until the front faces of the claws of clutch 6/8 get into touch. This position is shown in Fig. 2.

When the claw teeth have come to a mutual position in which teeth and gaps allow for engagement of clutch 6/8 spring 30 will cause sleeve 5 to move further to the right and thus cause engagement, after which the position shown in Fig. 3 is reached.

In similar manner the re-engagement of coupling 7/9 is attainable by allowing pressure fluid to escape through conduit 32 while pressure fluid is fed through conduit 31.

In the example represented in Fig. 4 conditions are similar to the first example, only one flat piston 40 is made use of instead of piston halves 16 and 16'. This makes it necessary to provide two springs 41 and 42 which are situated between piston 40 and stops 43 and 44, respectively.

In the examples described above the springs 30, 41 and 42 are assumed to be compression springs, whereas in the example shown in Fig. 5 spring 50 is a tension spring. The middle portion 51 of rod 17 is made with a larger diameter, and the rings on the rod 17 are shaped into sleeves 52 and 53 having collars 55 and 56, respectively, bearing against the front faces of piston 54.

Fig. 6 is still another example in which piston 60 has a cylindrical projection 61 inside of which compression springs 62 and 63 are situated, separated by double-acting stop 64.

In the example represented in Fig. 7 a diaphragm 70 is used on which the fluid pressure is brought to act. The casing 71 is adequately shaped and the diaphragm in its centre portion is connected to a cylindrical member 72 surrounding the spring 75 which bears against rings 73 and 74. The path of these rings sliding on the thinner middle portion 78 of rod 17 is limited by stops 76 and 77 shaped on the rod at the spots where the diameter changes from the thinner middle portion to the thicker main portions.

Fig. 8 represents a detail on an enlarged scale. The upper half of the Fig. gives one example for the shape of the tightning surfaces and the lower half is a different example. Both relate to the construction as represented in Figs. 1, 2 and 3.

It is important that the pressure fluid should not leak through between the rod 17 or the stop 26 and the ring 28, which may happen when the entire device is made small, so as to save in space, and the spring 30 is weak. It then becomes possible that the pressure on the ring 28 causes this ring to move away from the bottom of piston 18' which should be avoided. Therefore, the tightening surfaces a/b and c/d, respectively, are made comparatively narrow so that the specific tightening pressure is very high.

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