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POWER PLANTS IN MOTOR VEHICLES INCLUDING AN INTERNAL COMBUSTION ENGINE WITH HYDRAULIC GEAR

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My invention relates to power plants in motor vehicles comprising an internal combustion engine provided with a hydraulic gear. It has special reference to heavy vehicles such as railroad motor cars.

In vehicles of this kind it is advantageous to make use of a hydraulic transmission including one or several hydraulic gears such as turbines for converting the turning moment because of their automatic adjustment of the transmission ratio between the primary and secondary turning moments in dependence on the vehicle speed and because of the driving force being not interrupted. But the hydraulic transmission, just as the electric transmission, as compared with the plain mechanical transmission is connected with the disadvantage of considerable loss in performance because the highest attainable hydraulic efficiency amounts to about 85 per cent. Furthermore, the curve of efficiency of a hydraulic transmission used for such purposes from its highest value declines on both sides, more or less.

That is why hydraulic transmissions were used only for starting and over certain spheres of revolutions, whereas in addition a mere mechanical transmission was provided for the highest speed for example and for certain speeds frequently used. Thus it becomes possible to attain a good efficiency on certain spheres of speed by means of the mechanical transmission which has not much loss when the hydraulic device is shut off. But such an arrangement has again several other disadvantages. In some spheres of the vehicle speed the output of the engine is not utilized to its utmost because of the unfavourable hydraulic efficiency, while in others the adaptability of the turning moment is missing owned by the hydraulic transmission.

Object of the present invention is the elimination of these disadvantages and the compensation for the loss in performance because of the low efficiency of the hydraulic transmission, so that a highly increased utilization of the motor output is attained, as compared to the former power plants.

With the engines used so far, especially with carburetor engines, the curve representing the out-going performance is more or less bent in relation to the axis of abscissas on which the number of revolutions is marked and it reaches a vertex at a certain number of revolutions which is close to the maximum number of revolutions. The turning moment reaches its maximum for example at about 60 per cent of the maximum number of revolutions. This has its reason in that the cross section of the fuel admission inside the motor must not exceed a certain area so as to avoid precipitations in the carburetor and in the intake which may occur because of the fuel mixture and the vaporization having low speed at low numbers of revolutions at which a high turning moment is wanted when working with the mechanical transmission, which might lead to disturbances and loss in performance. On the other hand when the carburetor is fully opened at a medium number of revolutions the motor tends to knock. Above the number of revolutions corresponding to the maximum turning moment the performance of the motor is considerably lower than it might be with larger cross sections, but these cross sections had to be chosen smaller with regard to good working at lower numbers of revolution. Furthermore, the compression ratio has to be chosen so low that a good running of the motor at low numbers of revolutions and with full opening of the carburetor is attained. That is why at low numbers of revolutions the full motor performance which might possibly be reached is not attained, so that the motor is reduced in its efficiency.

The invention is based on the following perceptions: The relations between the secondary number of revolutions to the secondary turning moment of the hydraulic transmission (for example turbine converter) is about cubical, therefore it is not necessary to choose dimensions for the motor aiming at a good running at low numbers of revolutions.

According to the invention the engine is provided with a fuel admission or charge of greater volume than usual and furthermore, the compression ratio is also increased. Each of these features causes an increase in performance by which the loss from the hydraulic gear is substantially compensated or even exceeded.

The larger fuel admission may be reached on different known ways, for example by feeding a larger amount of fuel or by increasing the cross sections of the fuel leadings concerned (carburetor, intake and valves). Thus no essential losses will occur up to the highest possible performance, as compared to the theoretically possible best fuel admission, especially throttling losses are avoided. Besides, the admission may still be increased by adequate supercharging at the higher numbers of revolutions.

The compression ratio should be chosen as high as possible with regard to the highest numbers of revolutions without taking into consideration the running at low numbers and high performance.

The invention allows for an increase in highest performance with gasoline motors without supercharging up to 30 per cent as compared to motors having the normal curve. This curve of performance which is normally of hollow shape towards the axis of abscissas is changed approximately to a straight line and when supercharging is applied changes into a curve vaulted in the direction towards the axis of abscissas.

It becomes possible by the invention to make better use of the working features of the hydraulic transmission because of the higher performance and also favourable features of the vehicle equipped with such transmission are gained, as for instance: great acceleration and low fuel consumption.

With motors which are not provided with throttling regulaing means as of gasoline motors but with other regulating means the increase in performance attainable with a power plant according to the invention may be a little lower; but also with such motors performances are reached which make the use of power plants with hydraulic transmission possible and economical. The transmission may include several hydraulic gears or for instance a change speed gear in addition to an hydraulic gear.

I do not want to be limited to the details described as many variations will occur by those skilled in the art.

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