June 5, 1928. 1,672,232

L. SAIVES

VARIABLE SPEED TRANSMISSION DEVICE

Filed Aug. 28, 1924

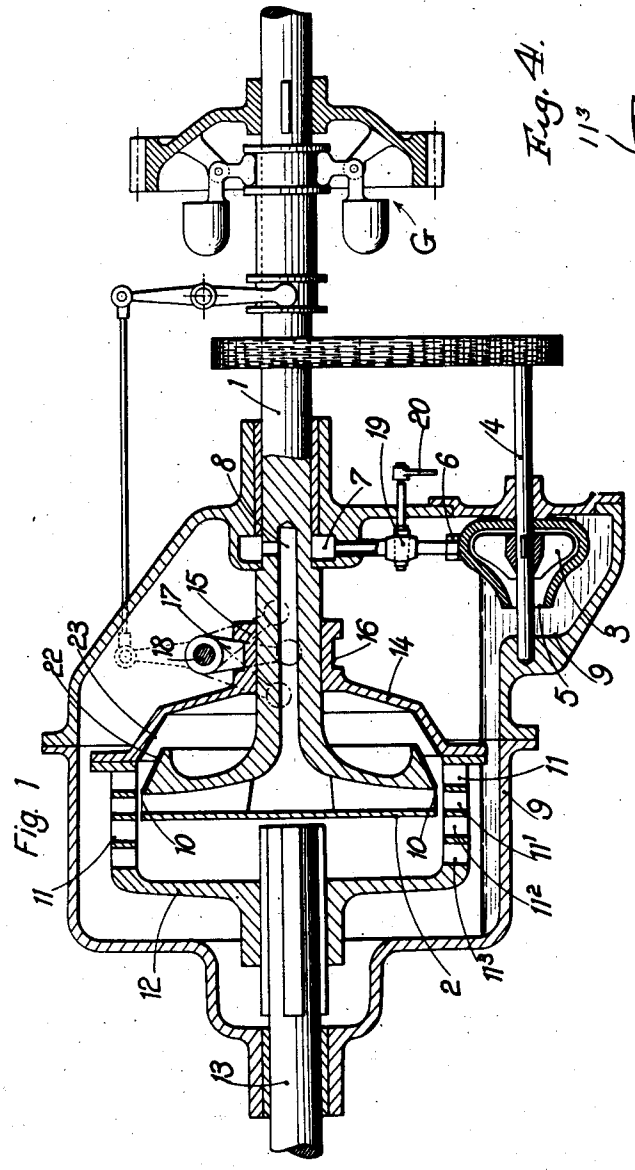


Fig. 1

Fig. 4.

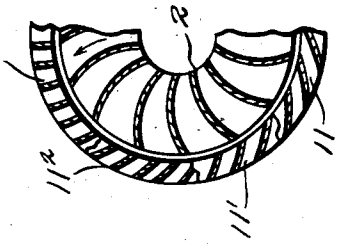


Fig. 3

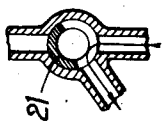
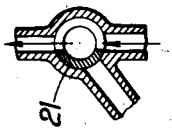


Fig. 2



INVENTOR

Leon Saives

by Miller Bunn

ATTORNEYS

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UNITED STATES PATENT OFFICE.

LÉON SAIVES, OF BILLANCOURT, FRANCE, ASSIGNOR TO LOUIS RENAULT, OF BILLANCOURT, FRANCE.

VARIABLE-SPEED-TRANSMISSION DEVICE.

Application filed August 28, 1924, Serial No. 734,802, and in France November 21, 1923.

The invention relates to a device for transmitting motion from one shaft to another, the respective speeds of the two shafts being variable and a function of the resistant torque of the driven shaft; the transmission of motion from one shaft to the other being effected through the medium of a liquid.

In the accompanying drawing Figure 1 is a diagram showing the way, in which the invention is carried out, and Figures 2, 3 are details, and Fig. 4 is a fragmentary vertical section showing the different blade inclinations.

1 is the driving shaft integral with a bucket-wheel 2; a pump 3, which may be centrifugal or of any other type, receives motion through its shaft 4 from the driving shaft 1 by any suitable means, gearing, chain or the like.

The pump at 5 draws the liquid contained in the lower part of the casing 9, which encloses the whole mechanism, and discharges this liquid at 6, which then reaches the chamber 7, and passes therefrom through ports into a channel 8 provided in the shaft 1, finally reaching the bucket-wheel 2, which throws off the liquid at its periphery.

The liquid issuing at the periphery 10 from the bucket-wheel 2 is thrown into a wheel 11 provided with suitably inclined vanes; this wheel or turbine is driven by the liquid passing through its blades and as it is integral with the member 12, which can slide on the driven shaft 13, but is attached thereto with respect to rotation, the shaft 13 is driven by the member 12.

It is to be noted that the member 12 comprises at its periphery several wheels 11, 11^1, 11^2, 11^3, the vanes of which have different inclinations whereby it is possible for the driven shaft 13 to be driven at different speeds.

For this purpose, the member 12 is attached to another member 14 carried loose on the shaft 1, on which it is centered at 15; the boss 15 is provided with a circular groove 16, in which engage the pivots on a fork 17, the axle 18 of which is integral with a lever controlled, for example, by a centrifugal governor G as a function of the speed of the engine.

Suppose that the opposing torque exerted on the driven shaft 13 increases and becomes preponderant over the torque of the driving shaft 1, the driving shaft slows down and under the action of the governor in connection with this latter shaft, the aggregate 12—14, carrying the wheels 11, 11^1, 11^2, 11^3, is displaced until that one of the wheels 11, 11^1, 11^2, 11^3, the vanes of which impart to this latter a speed proportional to the resisting torque required, comes in front of the outlet 10 of the liquid from the bucket-wheel 2.

It is evident that under the action of the governor, the proper wheel 11 will automatically come into position in front of the issuing liquid, accordingly as the driving shaft 1 increases or decreases in speed, under the action of the resisting torque.

Figures 2 and 3 show in section the cock 19 inserted in the delivery pipe 6 of the pump 3 and operated by a lever 20.

When the plug 21 is in the position shown in Figure 2, the liquid delivered by the pump can come into 7 and passes on to the bucket-wheel 2, everything then taking place as described above, and the clutching of the two shafts 1 and 13 is effected by the operation of the cock 19.

When the plug 21 is in the position shown in Figure 3, the liquid can not reach the chamber 7 and is emptied into the casing 9 of the mechanism, whence it is drawn up again by the pump. This latter is therefore short-circuited and as the liquid no longer reaches 10, the wheels 11 and consequently the shaft 13 are no longer driven.

The clutching of the two shafts 1 and 13 is thus effected by the operation of the cock 19.

If, when the right-hand wheel 11 has come into position in front of the orifices 10, a position which corresponds with the highest speed of the liquid transmission, the resisting torque still decreases, the speed of the engine will increase and under the action of the governor the aggregate 12—14 will be shifted towards the left.

At this moment the conical part 22 of the shaft 1 will come into contact with a conical clutch member 23 integral with the member 14. These members 22 and 23 constituting a friction clutch will connect up the shafts 1 and 13. This last combination will then give a direct drive.

It is to be noted that the cone-clutch shown by way of example may be replaced by any other known type of clutch.

In the case in which this transmission is

applied to a self-propelled vehicle, a geared reverser would be provided connected with the shaft 13 for operation when running backwards.

It is to be understood that the liquid used may be of any kind, the above description in no way limiting the invention to the use of a specified liquid. In some cases a liquid of high density might be used, for example mercury.

I claim:

1. In a variable speed hydraulic transmission, a drive shaft, a driven shaft, a pump actuated by the drive shaft, means for delivering fluid to the pump, an outlet for pressure fluid from said pump, a turbine operatively connected to the driven shaft and shiftable with respect to said pressure fluid outlet, said turbine having sets of differently inclined blades, and means dependent on the torque of the driven shaft for bringing different sets of blades in register with the pressure fluid outlet.

2. In the structure defined in claim 1, the means dependent on the torque of the driven shaft comprising a speed controlled device operated by the driving shaft.

3. In the structure defined by claim 1, the pump operated by the drive shaft being of the centrifugal type.

4. In the structure as defined in claim 1, the means for delivering fluid to the pump comprising an auxiliary pump for returning the exhaust fluid from the turbine to the drive shaft pump.

5. In the structure as defined in claim 1, the means for delivering fluid to the pump comprising an auxiliary pump for returning the exhaust fluid from the turbine to the drive shaft pump, and a by-pass valve in the return line for by-passing the fluid whenever desired.

6. In the structure defined by claim 1, the means dependent on the torque of the driven shaft also including mechanism for connecting the drive and driven shaft for direct drive.

In testimony whereof I have signed my name to this specification.

LÉON SAIVES.