

HYDROELECTRIC POWER AUTO WITH PERIPHERAL TORQUE TO THE WHEELS.

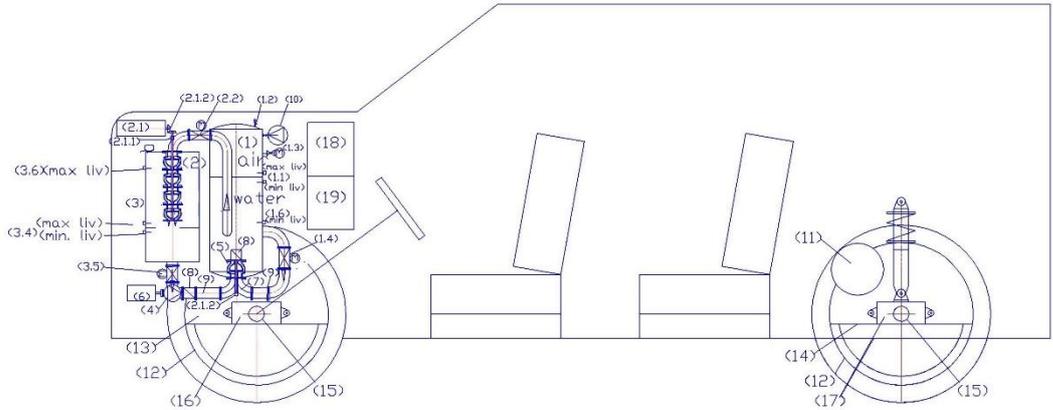
Author: Luigi Antonio Pezone Via Caserta, 33- 81055 Santa Maria Capua Vetere, Italy

ABSTRACT

The current state of the art of means of transport was affected by heat engines, which predominated, for the absence of viable renewable energy with small dimensions. But the invention of the pump with double separate supply until the impeller has allowed the pressurized hydropower invention, with recycling water, which can replace thermal engines. Certainly it is more cumbersome, but immensely cheaper and nonpolluting. From the point of view of the electro-mechanical means of transport that will use the pressurized hydropower, are simplified, eliminating in addition to heat engines the fuel tank, the mufflers and exhaust pipes, the engine cooling system, the transmission shafts, the exchange gears, clutch, differential. The hydroelectric-electronic system, which will be used, does not need of fuels and even of heavy and expensive batteries lithium accumulators with little shipping autonomy, which involve considerable disposal costs and the use of materials in the process of exhaustion. The hydroelectric means of transport will cost less of the existing means of transport for the absence of many of the components mentioned above but also because the motion transmission by electric-electronic means is much more economical than the mechanical, without sacrificing the safety on the road. In fact, the four-wheel drive of the wheels may be of series and all the wheels powered and controlled individually. Also the control of the differential speed in the curves and the braking system (ABS) may be incorporated in the motors that turn the wheels by transmitting the driving torque to the periphery and not in the center of the wheels as in the existing vehicles. This allows to reduce the power required according to the transmission ratio between the ring gear mounted to the periphery of the wheel rim and the pinion keyed to the shaft of the electric motor that turns the wheel, but also according to the force-transmitting arm, which coincides with the radius of the rim on which the tire wheel is mounted. In the hydroelectric vehicle the reduction in power is not imported for the purpose of energy consumption, since the energy is produced without the outlay of money for the fuels, but to reduce the size of the electro-mechanical equipment, and especially to reduce the volume of the tanks which will be incorporated in the means of transport. By the pumps with the dual separate supply up to the impeller, we can work around the autoclave pressure, without having to restore, by inserting in the 'water recycling circuit water which has produced the energy, consuming a small part of the energy produced by the group turbine - alternator. The drive control of the pump motors and the drive wheels allows managing instant by instant the energy that must be produced based on consumption required by the vehicle.

DESCRIPTION

FIG. 1 shows the arrangement of maximum of the hydroelectric plant in the car engine hood, where they are visible in particular the technical devices which have allowed to reduce to a minimum the overall dimensions. In particular way is important for the use of a well pump used as a turbine, feeding it to the opposite direction with respect to the way in which it is used the pump (All pumps powered the contrary can be used as turbines), but, in this case, a submersible pump saves much space being inserted directly into the tank where it must discharge the water to be recycled. Another precaution is the arrangement angle of the alternating current generator, arranged above, after the pump shaft having prolonged until coming out through the supply curve by means of a bushing containing a ring of mechanical seal or stuffing box. Even for the entry of water into the pressurized tank is used a pump with a double separate supply obtained from a single-stage pump for the well, which allows it to be installed in the water, coupled at an angle, by means of a diverter conical gears 90 degrees, to an alternating current motor, inferiorly placed, prior extension shaft that runs through the supply double curve by means of a bushing with a mechanical seal or stuffing box.



ITALIAN DEMAND PATENT 10201600087373 DATED 25 / 08 / 2016

FIG. 1

FIG. 2 shows a section of the pump with double separate supply until the impeller which allows energy miracle connecting two different hydraulic systems: One is generous in energy production that uses the energy of the compressed air on water and one thrifty in the phase of recovery of the same water (lp = low pressure), which is inserted directly into the impeller in rotation, of the

pressurized water recycling circuit (hp = high pressure) without the opposition affected by the hydrostatic pressure.

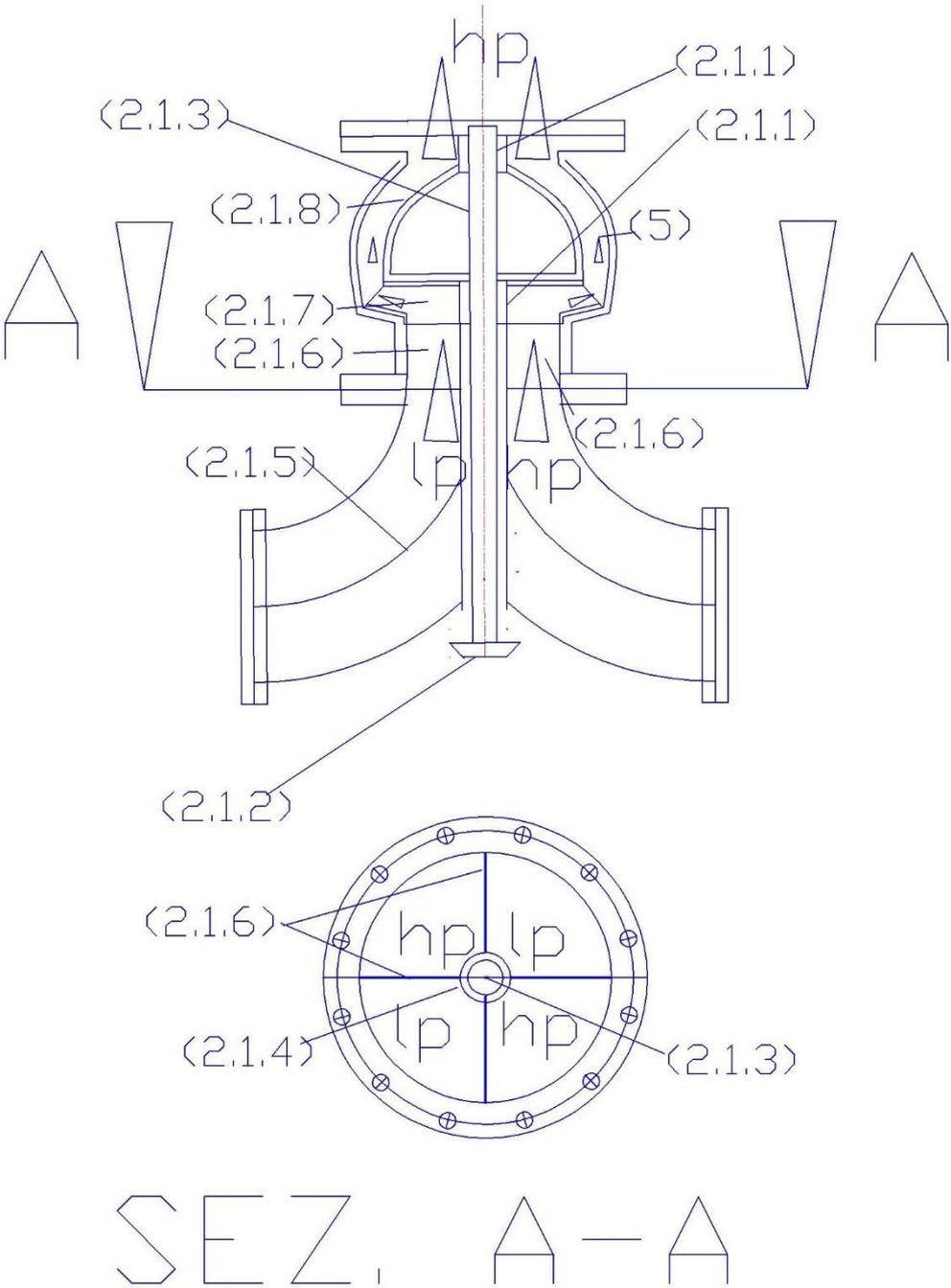


FIG. 2

FIG. 3 schematically shows the mounting section of the shaft (15) which no longer receive motion from the heat engine through the gearbox and differential, but it will be a simple fixed shaft, as the drive takes place through the modified rim, the motor 11, supported by the supports (13 - 14), connected to the axles (16 - 17). It is not necessary to get into other details in which the automakers have very advanced experiences to find the right solutions.

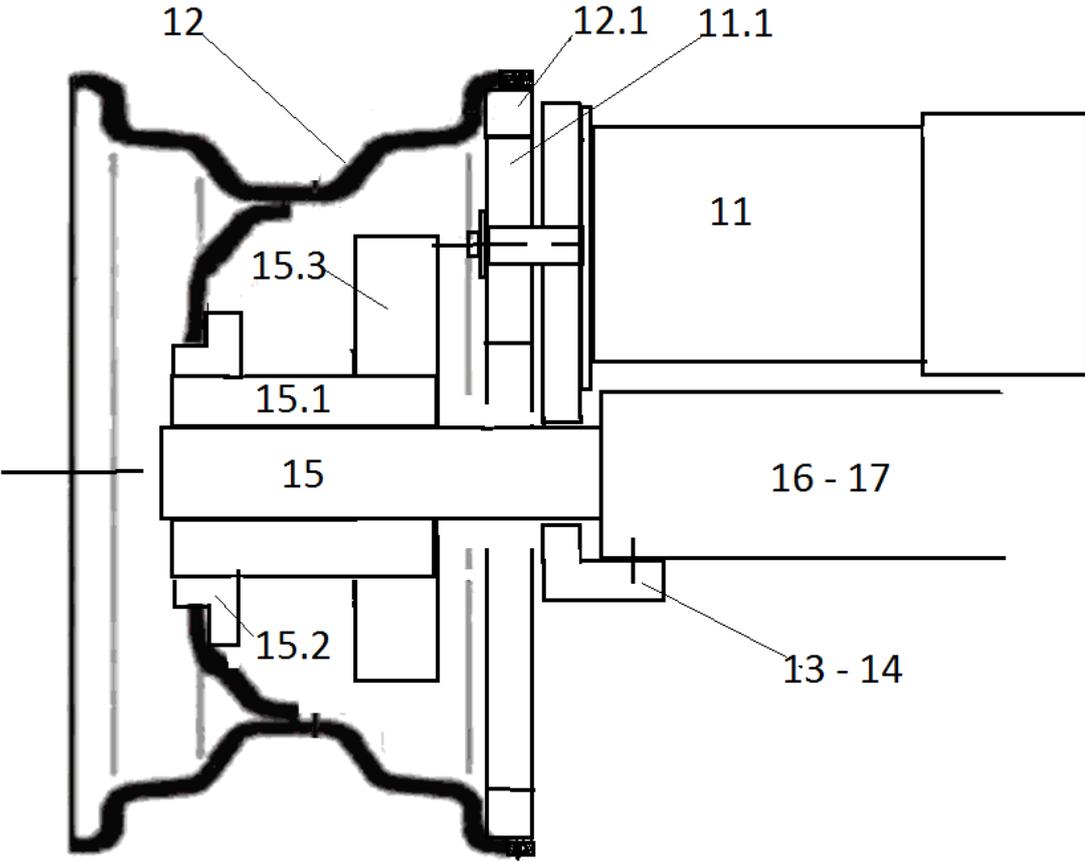


Fig. 3

3 / 3

In the world of environment and energy it is also needed strategic inventions that cut across all sectors as the recent invention of the pumps with double separate supply until the impeller. To understand the functioning of how this type of pump, it can be observed FIG. 2, and imagine the center of the impeller supplied by four sectors separated by 90 degrees cruise. Two are supplied

in low pressure and two high pressure, possibly arranged diagonally to balance the hydraulic thrust on the bearings. Furthermore, observing the FIG.1, it is necessary to make a distinction between the static and dynamic pressure of system. The static pressure is the pressure supplied by the compressed air cushion and with the valve (1.4) open, spreads on the right side of the pump with double separate supply also entering into the impeller. The dynamic pressure, or kinetic energy, is that which circulates the water inside the tubes and autoclave. In open circuit on the left side of the autoclave. To circulate the water is sufficient to open the valve (2.2) and the air pressure circulates the water in the turbine, but the air pressure decreases as it expands the volume of air and the water comes out from the circuit. While to circulate the water on the right side of the pump with the double separate supply up to the impeller, it is necessary to open the valve (1.4) and to move the pump since the static pressure already fills the entire circuit, also coming into the impeller, but without the movement of the pump the water is not circulating for obvious reasons. However, it is sufficient to provide the pump the prevalence of a few cm of water column to overcome the pressure loss of the check valve, since the static pressure does not oppose the kinetic energy developed internally to the stored volume of water. So, we can have a static pressure of 12 bar and a dynamic pressure of 0.25 bar. But the movement on the right side (looking at FIG. 1) does not produce energy, being only an internal recycling in the stored water volume. To produce energy we must use the circuit on the left side of the autoclave passing through the pump used as a turbine (2) and insert with a low energy cost the water free of static pressure in the autoclave tank, that the current state of the art requires a pump with a prevalence that wins the static pressure and the pressure drop, then a higher prevalence to 12.5 bar. This is the reason why hydropower with water recycling has never been produced. With the pump with double separate supply until to the impeller we can achieve this application with a very low energy cost that seems impossible, because coming from the suction side of the pump that is already full of water statically pressurized from the autoclave, we get around the opposition of pressure hydrostatic, as if it were an internal circulation to the pressurized volume of water. In fact, the suction pipe of the pump, which comes from the left side (open) and from the right side (closed) is divided into four fixed and separate sectors (as seen from FIG.2), therefore, when the impeller rotates, advances towards the autoclave the water present in the impeller and produces in each quarter of the sector of the supply pipe a depression which favors the entry of water into the impeller both from right side, both from the left side. As soon as the inlet water is involved by centrifugal acceleration towards the periphery, produced by the fins of the impeller which is proportional to the square of the angular velocity, and in the radius of rotation, according to coefficients that depend on the type of impeller. But the important characteristic of the pump with the dual separate power supply is one that the rotation forces the impeller to receive in succession in the same quarter of the impeller, the water sucked

from the four separate sectors. Not simultaneously, as is the case with pumps that have only one power supply. Therefore, the water of open circuit (no static pressure) and the water of the closed circuit (with the static pressure of the autoclave), alternates in the same location and with the same direction (toward the impeller exit). This functioning implies that the flow rates are added together, while the total pressure (static plus dynamic) spreads in the entire outlet section, according to the principle of Pascal. Obviously, since the static pressure is only transmitted from the right side of the system, for not having drops in pressure in the pump with the dual separate supply, the passage sections must be dimensioned, for the transmission of the entire flow rate and pressure. This simple modification of the pump allows us to retrieve with costs infinitesimal the water that has produced energy in the pump used as a hydraulic turbine which is located on the left side of the system and reinsert it in the pressurized water recycling of the tank circuit, without that occurs the pressure drop due to the expansion of the air cushion, which occurs in normal autoclaves, whose restoring, would require energy both from the pumps that the compressors. In fact, the autoclave system was not born to produce energy, but to limit the number of starts of the pump motors, by providing for a few minutes to the hydraulic system, which consumes water, the volume of water stored by means of the expansion of the cushion of air. It 'obvious, that the same system can be used to produce energy if the water exits the autoclave circuit (to produce energy) and go back simultaneously by another input, without changing the internal volume. Obviously, the return of water i pressurized autoclave must not be with the force of a multistage pump, which consumes more energy than it produced, giving reason to skeptics who ironically call "perpetual motion" hydropower with water recycling. Skeptics have been right only because it lacked the pump invention with double separate supply until to the impeller. In fact, if the separation of the flow does not reach inside the impeller and if this is not rotating, the system does not work, relying on the dynamic pressure to bypass the static pressure. In the hydropower system of the car the valve (2.2), which feeds the pump used as a turbine, must be strictly closed when the car is not in operation, otherwise they are not the conditions for starting the system. In the car hydroelectric plant of FIG.1, we expand the air cushion only in the starting phase of the hydraulic motor, to reduce battery costs for starting and possible three-phase UPS group. During normal operation, the water coming out from the autoclave must be perfectly in a quantity equal to that which enters into the left mouth of the pump with the double feeding, without stopping in the tank (3) and without accelerating the flow, while the mouth the right is used only to pressurized water recycling from the air cushion (the recycling pump works with a very low prevalence merely to recycle the water in the same volume without lift or win the compressed air cushion pressure). Today these adjustments are possible by establishing a priori limit the oscillation of the water level in the two side by side tanks, either by means of adjustments of the valves, both of the speed of the pump

motors, while the decrease of the air pressure is regulated by a pressure switch that drives the compressor at the minimum variation. Thus, at rated operating conditions, not happening the variation of volume of water in the pressurized tank, do not happen the expansion of the air cushion, therefore, no power is consumed to compress the air cushion. However, the water that comes out from the autoclave also receives the pressure required to produce energy in the turbine. Obviously, the energy absorption can not be eliminated completely, but it consumes only a very small percentage of the current energies that absorb the hydraulic systems that need to raise the water or compress the air cushions. Since the drive motors of the variable speed pumps, this system can produce the energy that serves to a means of carrying a full load, no load, in the various phases of operation, simply by pressing the acceleration pedal of the vehicle. In fact, the control unit (18) distributes the flow of energy to the electric circuit of the means of transport, which, in the case of a car, is mainly composed, by two or four AC motors (11) three-phase or single phase, by the heat pump for the summer and winter conditioning and auxiliary circuits in low-voltage direct current, which feeds, in particular the valve that intercepts the turbine (2.2), the starter battery, little larger than the current batteries.

Fig. 3 shows in a very schematic way as is the transmission of motion to the drive wheels in hydroelectric power car, where the torque is applied to the periphery of each rim, by means of a transmission cylindrical teeth between a ring (12.1) and a spool (11.1). The fixed part of the transmission will be the new support of support of the front wheel motor drive (13) and rear (14 in the case of four-wheel drive). This support is in the form of half disk, also acts as a protective casing of the gear transmission and ensures the same oscillation of the current wheels, adjusting the convergence, the connection with the steering system and suspension, the flange on which port is mounted the electric motor (11) which carries the sprocket (11.1), and is crossed from the shaft (15) with the rotation of the bearing which carries the brake disk, the flange on which is mounted the rim (12) which is supported cantilevered from 'front axle (16), equipped with an articulated frame to allow for minimum turning radii, or rigid rear from the axle.

This change of the motion transmission system allows to eliminate the gearbox with relative differential, since the reduction of revolutions of the wheel relative to the engine will take place by means of the transmission ratio between the ring gear, integral with the wheel rim, and the braking three-phase asynchronous motor car that makes the spool. But it is also advisable increase the diameter of the wheels, as it would reduce even further the footprint and cost of the hydroelectric system. By way of example, with the pitch diameter of about 600 mm and that of the crown of 200 mm spool we have a reduction ratio of revolutions of the engine equal to 3. But what's even more important is the fact that by applying the driving force on the pitch diameter of

the wheel rim and not on the axis of the wheel (as is currently), multiply the torque to the transmission arm, therefore, we reduce to 1/3 the force required for the motion transmission, and whereas the rubberized part of full load wheel is 10 cm high where applies the resisting torque, also improve the acceleration of the means of transport with a low number of revolutions and torque.

In the hydroelectric engine start-up will take place by means of the expansion of the air cushion, but if the volume of water that can accumulate is not sufficient to completely overcome the departure to alternator scheme, the system is integrated with a group of three-phase UPS (UPS) with battery, rectifier, alternator, loaded by the energy produced during exercise. In fact, during the starting phase, the system control circuit, is an exception to the rule and allows the expansion of the air cushion, until to a minimum level (1.6) by using the accumulated water between the two levels to start the rotation the turbine gradually, as the valve (2.2) with a DC motor, opens. When the water reaches the minimum level (1.6), calculated so that the water does not completely fill the tank (3), controlled by the maximum level (3.6), also open the valves (1.4 and 3.5) and make low the two pumps (4 and 5). When the plant is operational, gradually, the control system brings the water level in the pressurized tank to the nominal position (1.1), varying the pump speed and the position of the valves, to allow to easily carry out a new restart of vehicle.

In the phase of steady state operation, the air cushion, after recovery at the higher level, controlled by the regulator (1.1), does not expand, thus all the water returns into the autoclave through the two inlets of the pump with double separate supply. In fact, the double separate supply until to the impeller, allows to have very similar flow rates by means of the adjustment of the valves (1.4, 2.2, 3.5) and the revolutions of the pump (4), despite the difference in static pressure existing on supply. Therefore, we can estimate that 50% of the total flow of the pump with the dual separate supply (5) passes from the right side (that is a simple recycling) and 50% from the left side (through the pump used as a turbine), producing power. In fact, the turbine discharge the water in the tank (3), from which, the low-pressure pump (4), the check valve (8), the stub flow diverter (9), the double curve with separator baffles, feeding the left side of the pump with double separate power supply (5). The energy expenditure provided to the pump (4), estimated hereinafter, is not that which would be required if we had used the usual hydraulic and electric circuits and to return the water into the autoclave, but only the one to reach the ' water in the pump impeller with dual supply. Who will bring the water inside the autoclave is the circuit on the right side of the pump, where the static pressures on the suction and delivery, are in balance and thus the direction of the water flow depends only on the rotation of the impeller. Consequently, also the water that comes from the left side fits into this flow, not only because the impeller is common, but also because the

partitions (2.1.6) arriving lap the profile of the impeller, act as anti-return valve Furthermore, the rotation does get into every fourth of the cruise sector shown in FIG. 2 in water succession in high and low pressure ($h_p + l_p$) that having the same direction are added together, they do not contrast, also in accordance with Pascal's law which states that the pressure expands in all directions (when it is static). When there is a unidirectional flow, conditioned by the rotation of a pump, the walls of the pipes and check valves the dynamic pressure is forced to expand in the direction of flow.

Industrial applicability.

Fig. 1 proves that even with the current technology, not specifically designed, hydropower car is not a utopia, but a more concrete, practical and economic, of the current cars on the road and those that the automotive industry is going to market because the main problem of the car and transport in general, was and is the energy source, which must be clean and sustainable economy.

Many other measures that will develop the automakers will allow further reduce the size of the hydroelectric plants that will replace the thermal power, and therefore, make the car hydropower even more acceptable from the point of view of aesthetics.