POWER TRANSMISSION WITH CONTINUOUSLY VARIABLE CONTROL OF THE KINEMATIC CHAIN

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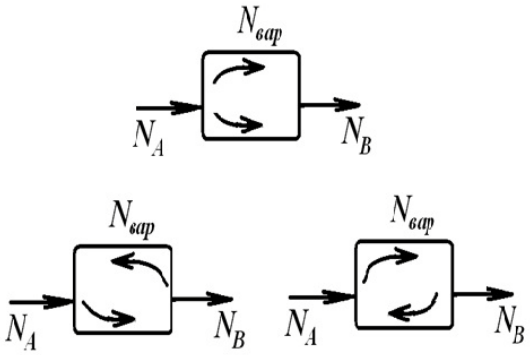
***Abstract**: In the well-known power stepless gear mechanisms with planetary gear ratio control is carried out by varying the power flow of power which is going through variator control circuit.*
Differentiation of the proposed method of stepless control of the known methods is that instead of using the power kinematic chain management is not involved in the transfer of power, giving the opportunity significantly to reduce the size and weight, improve the reliability of structures. It is achieved by using a self-braking mechanism in the control circuit, eliminating the circulation of power flow along the contour. The circulating power of self-locking mechanism is not passed to the side of the variator control circuit. This device works without a power transmission and has a relatively small size and weight, has a high reliability, etc.
Keywords. Power, stepless, transmission, chain, management, power, a way of regulation, variator.

At present, millions of units of gear mechanisms are used in transportation and many other machines. They are designed to transfer energy from the engine (electric, diesel, gasoline, wind, etc.) to the actuating mechanisms (wheels, tracks, the working bodies of technological equipment and so on.). These programs have an impact on the quality, timeliness and efficiency of technological processes, machines and units. The transfer step, which found wide application, does not provide a qualitative change in gear ratios, and have large dimensions and weight. Haven't found wide application known continuously variable transmission because of the high cost, limited regulatory limits, and low reliability etc.

Power transmission with stepless power control circuit – N *variant*

Regulation of gear ratios is carried by varying the power flux N *variant* passing through the variator control circuit (CVT) or by a power control circuit.

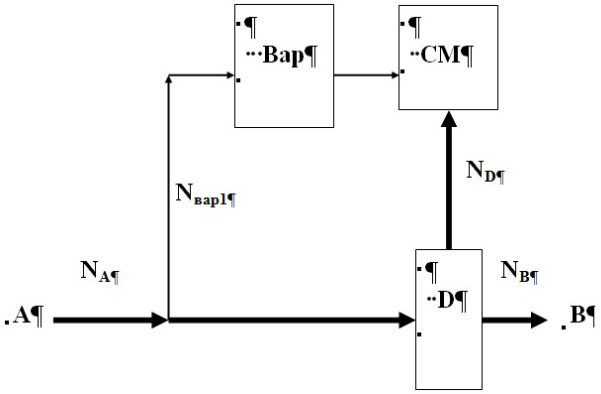


***Picture 1**. Schemes of power flux of continuously variable transmission with a power control circuit, where NA and NB - input and output power, N variant - the power passing through the variator.*

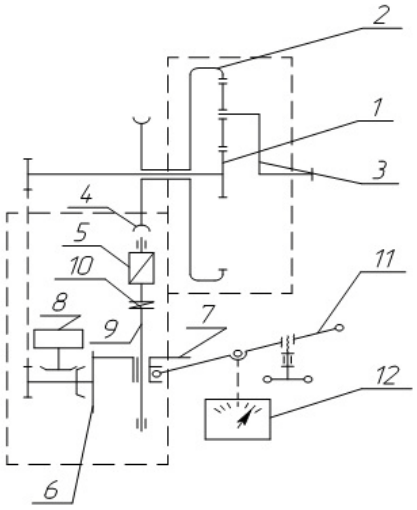
In the control circuit variable-speed drives (torus, belt, hydraulic, electrical, etc) are installed. For example, the dimensions and weight of V-belt variator control circuit in a multiplicity exceed size and weight of the planetary gear of power continuously variable transmission. Therefore, they are due to the large size and high prices are not widely used in engineering.

A new type of power continuously variable transmission with a kinematic chain management is designed on the basis of inventions of "Adjustable transmission by Zhunisbekov P." USSR N 1788365, "Adjustable transmission by Zhunisbekov P." patent RK N 647, "Mechanism for turning of tracked vehicles by Zhunisbekov P." decision to grant a provisional patent of Republic of Kazakhstan on the application # 990881.1-1210 and etc.(1,2,3,4,5,6,7).

The use of continuously variable transmission in the kinematic chain management in a short reduces the weight and dimensions of the variator. Reliability and durability of continuously variable transmission is increased because variable speed control circuit is not involved in the transfer of power. This ensures high quality control over a wider range of gear ratio mechanism.



Picture 2. The scheme of continuously variable transmission with kinematic chain management, where D - a differential, CVT - variator, SLM - self-lock mechanism, N variant 1 - power supplied to the variator, ND – power, which is locked by self-locking mechanism



Picture 3. kinematical scheme of continuously variable transmission with kinematical circuit control by one differential D

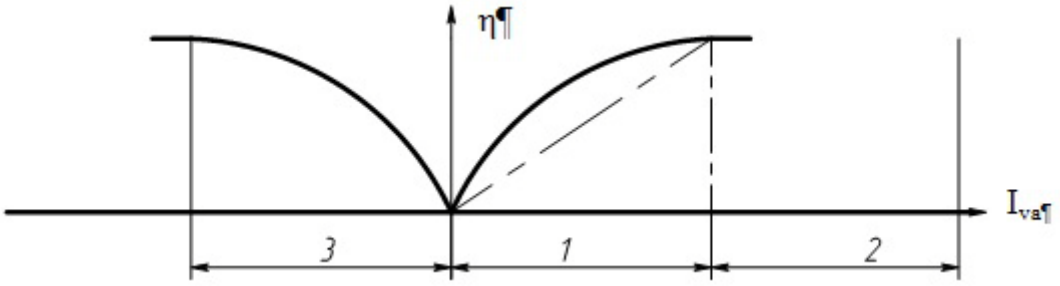
The national economy will use this transmission in machine tools, drawing mills, petroleum, mining machines and units, tractors, combines, cars, machines of water and air transport, road construction machines, agricultural machines and many other machines and units to ensure their competitiveness in domestic and international markets. Invented by the transfer of power is different from the stepless transmission power control circuit that controls the transmission ratio of the kinematic chain is not involved in the transfer of power.

In this transmission CVT or variator in (picture 2)is supplied by power N variant 1 15-20 times less than the power of N variant (picture 1). The power ND isn't let to pass by the self-locking mechanism (SLM). The value of power N variant 1 determined by the force of friction in a self-locking mechanism and frequency of rotation of the controlled self-locking element.

The transfer includes (picture 3) a differential having a connection to the engine via a drive shaft - (1), and controlled link –(2), and the third link (3), connected to the driven shaft. Transmission also has a self-locking, such as worm gear mechanism (4-5), by which the controlled link (2) is connected with the means of speed control (6-7) of the link (2).

Self-locking mechanism consists of a wheel (4) and the self-locking element (5), which are tightly connected with the link (2). Management tool is designed as a variable-speed drive with a disk (6), the roller (7) which is kinematically linked with a link (1) and the drive shaft.

CVT also includes a roller drum (7) and (8), connected with the disk (6) by a tooth element (gear train). Roller (7) is installed on the output shaft 9 of management tools (MT) with the possibility of axial displacement and alternate interaction with the end face of the disc (6) and the lateral surface of the drum (8). The shaft (9) via the coupling 10 is connected to a self-locking mechanism (5).



Picture 4. the zones of existence of continuously variable transmission, 1 – the removal of the power in the chain.

The drum (8) can be made with a conical lateral surface. Roller (7)is connected to the lever (11) to move, which has a means of indexing (12) of its position and adjustable stop (13). Picture 4 shows the region of existence of variable speed gear. The first zone corresponds to the scheme when the control circuit (P) is given the power by the variator from the controlled link (2), the second zone (2) on both circuits the power flows from the drive shaft(A) to a driven shaft (B). In the third zone (3) power is supplied to the control circuit and the chain of differential the removal is implemented. During the work of continuously variable transmissions in zones (1) and (3) circulating power arises in the circuit.

The proposed method of stepless control with the kinematic chain can function only in the first zone or only in operation with the power to the challenge from the controlled link, its inhibition. If the known structures used for braking CVT, the proposed method is achieved by inhibition of self-locking mechanism (4 and 5). Use of self-locking mechanism(4,5) eliminates the flow of power diverted from the controlled link Np to the variator (P) or its rink (6) and (7) disk.

A t the same time, very little power compared with Na is supplied to the self-lock mechanism by variator. This power is sufficient only to overcome self-lock mechanism (5) and a wheel (4). Improvement of the properties of continuously variable transmission, in this method of regulation, is achieved with the help of reduction of power passing through the variator (P). Reduction of the mass dimension, improving reliability and quality control.

Recommended continuously variable transmission will be used in machine tools, drawing mills, petroleum, mining machines and units, tractors, combines, cars, water and air transport, road construction machines, agricultural machines, and many other machines and aggregates.

Summary

A new type of continuously variable transmission with a kinematic chain management is developed on the base of

inventions “Adjustable transmission by Zhunisbekov P.”. The use of continuously variable transmission in the kinematic chain management in a short reduces the weight and dimensions of the variator.

The invented transmission differs from the well- known continuously variable transmissions because it controls the transmission ratio of the kinematic chain which is not involved in the transfer of power.

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