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MILKING MACHINES AUTOMATED WITH ADAPTIVE QUAD MILKING PROCESS CONTROL

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The fundamental scientific problem (target) machine milking cows is to study morphological and laktogeneticheskih signs of biological objects, including accurate physiologically adequate interaction actuators (vacuum milking machines) to the udder of animals in order to better reach their full genetic potential on the basis of the study and optimization of the electrical stimulation methods reflex of milk, processes lactation to create adaptive mechatronic systems milking machine with separate milking the individual quarters of the udder, the use of working bodies (liner) with antimicrobial nanoagentom protecting nipples animals from bacterial infections and biosensor devices for monitoring and control the milking process that enhance the completeness of milking, preservation productive longevity of animals and production of high quality milk.

To solve this problem, we propose the following tasks:

- Explore and define the basic laws of the adaptive process of lactation of the individual quarters of udder changing pulsating vacuum (level, frequency fluctuations, the ratio of cycles, etc..) In a high variability of parameters of biological objects (shape and size of the udder of cows) and the instability of the persistence of stereotypes milking in the presence of stress in animals;

- Investigate the mechanism of milk ejection reflex to tactile stimulation and explore responses to different stimuli applied to animals biosensor devices and electrical methods;

- To study the dynamics of transients control pulsating vacuum to drive the actuators (teat cup) with optimal sparing effect on the mammary gland of an animal;

- To develop a control algorithm milking process with changing the present values for individual milk flow from the udder quarters and mechatronic design al-

gorithm for its implementation on the basis of sync physiologically safe milking vacuum on and off the individual shares of the udder;

- To develop a model sample of adaptive system of machine milking cows, comprising the best ratio of the amount of control the pulsating vacuum between the front and the rear quarter of the udder, physiologically appropriate modes of stimulation and milking methods for measuring milk flow, providing full simultaneous and safe removal of milk from individual quarters of the udder of an effective period of validity (5 ... 7 min) of milk hormone oxytocin.

The purpose of research - development of automated milking machine with a milking control.

Materials and methods of research. For a more accurate determination of the basic parameters of the system developed by biotechnology is necessary to study domestic and international experience in this field of research. It should be noted that the most complete implementation of this concept can be achieved in robotic milking systems.

One of the main problems in the process of creating an adaptive mil-term is to synchronize the speed of the machine and the speed of milk lactation by individual quarters of the udder with subsequent trip milked shares, which would exclude them "dry" milking, and, as a consequence, reduce the disease cows mastitis.

This is important to consider a sign for the continued reduction in the idletive preservation of milking and udder health is the ratio or proportion of milk production in the quarters of the total productivity of the udder and its index - an objective measure of functional status and share of the udder.

By studying these and other symptoms, the researchers noted the uneven share of individual milking udders and milking duration of the idle first emptied share, concluding that prolonged exposure (more than 1.5-2 minutes), milking machine milked at stake can contribute to the cows mastitis. At the same time, a significant proportion of non-uniformity of the productivity often appears after mastitis due to the destruction of the glandular tissue and the excretory ducts. In other

words, the uneven milking or milking idle individual shares and mastitis are interconnected, speaking alternately as cause and effect.

To solve this seemingly simple problem is not really that simple. One of the first tried to solve this problem the American company "Perfection" manufactured disconnectors with milking machines to milk the nipples located on the milking bucket is suspended under the belly of the cow. In this case the teat cup, fallen from the nipple does not fall into the mud. During milking, this task is complicated because the individual off of the vacuum cup without further support them will lead to their inevitable drop with udders and milking complicate other shares (most rear).

It is therefore proposed a compromise: disable individual pulsation milked teats (Firm "Milklayn", Italy) in the compression stroke while maintaining the nominal vacuum or reducing the latter to physiologically safe limit (33 kPa - known brand "Duovak-300" of the company De Laval) without removal apparatus to the udder, with the danger idle milking, particularly in the latter embodiment. A more radical solution - is an individual removing the teat cups from the udder, implemented in the design of the milking machine company IMPULSA AG Elsterwerda (Germany) under the name "Multilaktor", which has a collector that allows to connect and disconnect the teat cups independently. However, brushless version suspended the milking machine is difficult to implement without special mechanical support line milking plants, which are in Russia widespread. For these purposes, an academician LP Kormanovsky suggests using a special arc, hang a cow teat cups and supportive when they put on and turned off.

Also known milking machine milking to change the intensity of the front and rear udder shares created in the Latvian MR in the department of animal husbandry mechanization II Grinevich and GG Palkin.

The principal difference between the milking machine - reducing the stroke of sucking the teat cups in the front compared to the rear of its duration. This allows to bring closer the end of the removal of milk from the front and rear quarters. In addition, the unit provides both an asynchronous mode. This mode of action on

both sides of the udder, according to the authors, has several advantages over the traditional way of milking.

More complicated is the problem of synchronization speeds of milk and lactation, the solution of which the most expedient by means of special sensors that determine the degree of filling of the tank breast milk and the corresponding adaptive control the formation of a pulsating vacuum for individual quarters of the udder of animals.

Thus, the main task of research is reduced to synchronize processes of milk animals and lactation (suction capacity of the milking machine) for the udder quarters with the Office of milk ejection reflex.

The results of research. The block diagram of the milking machine can be as follows (Fig. 1).

On the basis of initial claims was developed an experimental model of an automated portable milking machine to the milk line installations.

Automated milking machine has two versions:

- 01 computer-controlled milking, scientists, and an indication that the individual milk production;

- 02 further includes a number input animal accumulation removal and transfer information to a computer.

The composition of the milking machine (Figure 2) includes: suspension part 1, electron-pairing throne pulsator action in a controlled 2-count sensor measurement of the amount and flow of milk to the shutdown-yl 3 cups, glasses pnemotsilindr udder cow 4 ECU 5 milking process, a set of milk-vacuum hoses and the device connecting to the milk connector for the power supply 24 6. In version 02 include additional input device numbers of the animal, storage, removal and transfer of information in the computer. Counter-discrete sensor provides continuous measurement of the flow of milk, his summation of all milking time on the display with the display rate of milk and milking, the teat cups off of the vacuum at the end of milking.

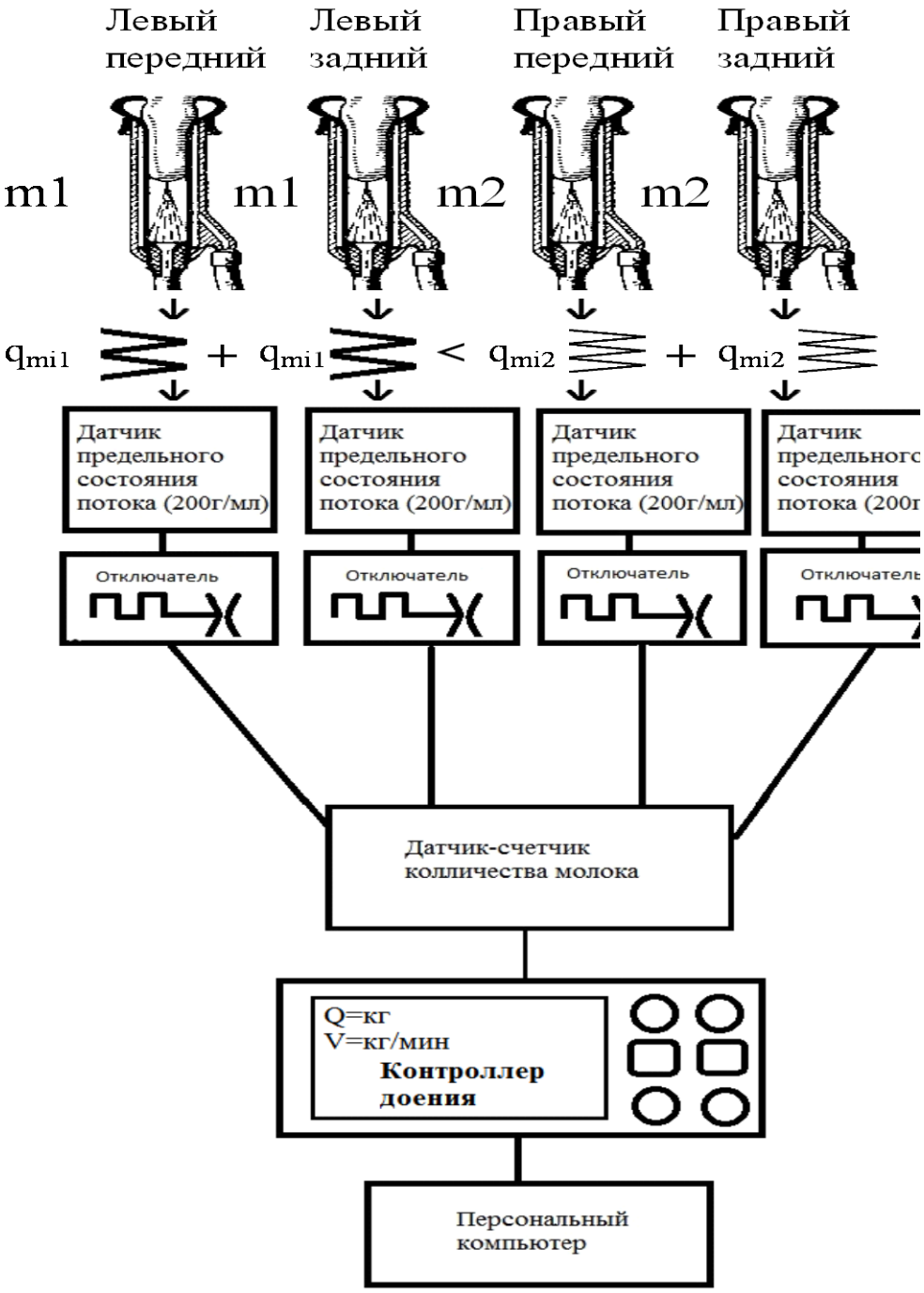

Fig. 1. Scheme of the proposed milking machine

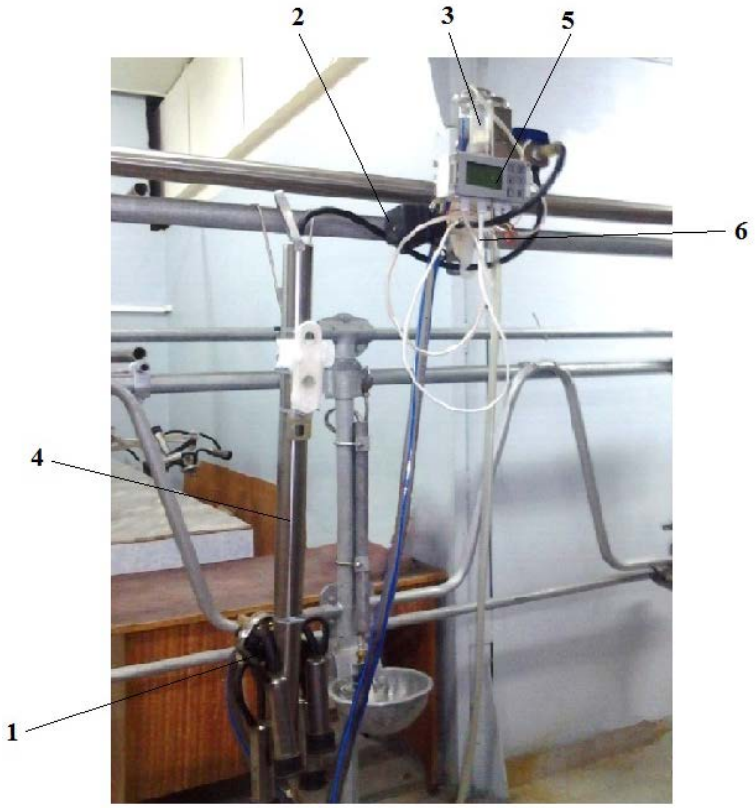

Fig.2. Milking machine

The electronic control unit allows the milking stimulation mode of milk at the beginning and end of milking an increased pulse rate (120 pulses per minute and a ratio of 50:50 cycles), the main mode of milking mode and disconnecting milking with glasses and subsequent auto taking off.

Conclusions

For the first time offered the opportunity to create a unified milking machine with high adaptive properties, compatibility with automation systems for use in the machine, and in line with the milk of milking installations. This circumstance makes it possible to raise the technical level of the latter, as the most common and ensure their competitiveness in comparison with the conventional counterpart firms De Laval (Delpro System), and GEA Farm (Dematron system).