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Innovative Constructive Technology in the Tractors and Vehicles Technical Service

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Abstract – The tractors and cars (energy resources) maintenance (M) growing importance is indicated by statistical data not only in our country, but also data from other countries. At machine-building plants, 8 ... 12% workers are engaged in maintenance and repair. Their number is growing day by day as a high labor intensity result of machines maintenance. For example, in the last ten years, the industrial workers number has increased by 50%, and the employed people number in maintenance and repairs has increased by 70%.
Therefore, the reduction in the maintenance labor intensity or its elimination by developing the optimal technical design solution, given by us below, becomes relevant.

Keywords – Tractors Maintenance (Service), Cars (Energy Facilities). Improving The Energy Facilities Design Adaptability For Technical (Service) Maintenance.

I. INTRODUCTION

In the last decade, there has been a maintenance rapid development and machines repair around the world, and in the future this industry development will accelerate. In Hungary, the maintenance and repairs cost - at the national economy level - amount to several tens billions of forints per year, and the annual maintenance costs and agricultural tractors repairs amount to 4 ... 5 billion forints.

Therefore, the reduction in the maintenance (service) labor intensity or its elimination by developing optimal technical solutions, given by us below, becomes relevant [2].

II. CONDUCTED RESEARCH

It is difficult to name the national economy branch in which the mechanization complex problems solution and agricultural production automation processes would not be associated with the chain use, belt (flexible) transmissions and devices.

The machines creation number and tractors and automobiles mechanisms became possible thanks to the chain and belt drives use in them, which have the necessary flexibility, noiselessness, work without vibration and slippage, and absorb light shocks and shocks. They can operate reliably in a transmitted powers wide range from 0.1 kW to 5000 kW, up to 35 m/s speeds.

The chain and belt drives only drawback is that during their operation, it lengthens and, as a result, decreases its performance.

Therefore, it is necessary to carry out diagnostic work to check the flexible connection tension, and in the standard tension parameters violation case, perform maintenance to eliminate it.

The research carried out in the operational adaptability field shows that systems with flexible communication in most cases are installed in those places of the machine structure, where it is not technologically advanced and laborious to

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carry out operations for their diagnostics and maintenance. And maintaining the standard tension parameters is the basis for ensuring the machines reliable operation [3].

Our researches have established that the belt tension relaxation by 20% leads to the latter slipping along the pulleys working surface. At the same time, the cooling system temperature of an internal combustion engine (ICE) rises from 85°C to 110°C, the DC voltage generated by the ICE generator decreases to 27%, and the compressor capacity by 30%. And, with increased tension, the belt and chain resource drives decreases to 40% [4].

Therefore, during the ICE operation, it is necessary to maintain the nominal values of the fan flexible connections parameters, compressor and generator by technical control means at certain operation intervals.

According to 20793-86 State standard, the maintenance operations frequency for "Checking and, if necessary, adjusting the drive belts tension " is 125 motor hours, and its implementation labor intensity average according to the data determined by us is 0.062 man-hours. From this it can be seen that during the maintenance cycle, this operation labor intensity alone is 12.85 man-hours.

The maintenance operation exclusion for "Checking and, if necessary, adjusting the drive belts tension " from the tractors and cars maintenance structure leads to a decrease in their downtime, and thus increases the machine-tractor unit and the vehicle productivity.

III. Research Results

Taking into account the foregoing, we have developed an automatic device for tensioning belt and chain drives, used both on tractors and cars and on stationary power plants, which provides the ability to automate their systems work processes with flexible elements (figure) [5].

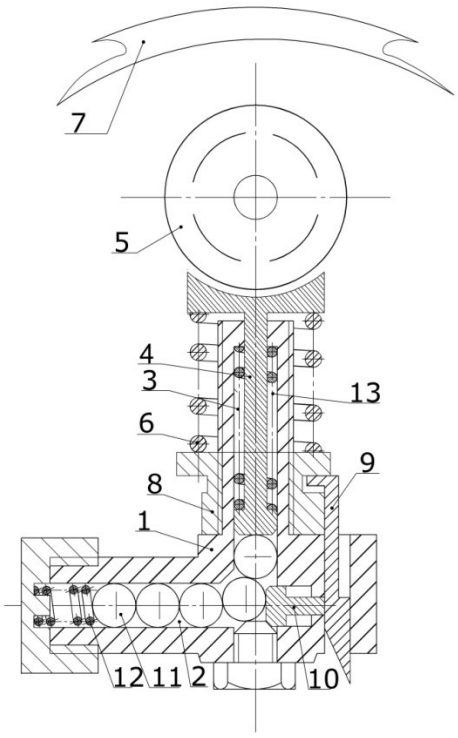


Fig-1. Developed automatic tensioning device for flexible machine elements.

The developed automatic device indicated in the figure contains 1 housing with G-shaped channel 2, in the working arm 3 which a rod 4 with a tensioning element 5 is placed, providing tension with a flexible connection 7 with 6 spring help. The 6 spring of the rod 4 abuts against the adjusting nut 8, with which the pusher 10 is connected by plunger 9 means.

The automatic device also contains a mechanism for fixing the rod 4, made in the rolling form elements 11, located in the G-shaped channel 2 of the housing 1 and pressed against the rod 4 by the spring 12 and a return spring 13 located in the working arm 3 of the channel coaxially with the rod 4.

The spring 13 elastic force is less than the rod 6 spring elastic force, but more than the spring 12 elastic force of the rod locking mechanism. The rolling body 11 axis, located at inflection point of the body 2G-shaped channel, is located not above the working arm axis of the body 2G-shaped channel when the pusher 10 is removed from the body channel, and above the working arm axis of this channel with the pusher 10 introduced into the channel.

An automatic device for tensioning flexible elements (belt and chain drives) operates as follows. With the adjusting nut 8 and the spring 6 help by the tensioning element 5 connected to the rod 4, the device stretches the flexible connection 7 to the desired deflection boom value. During operation, the flexible connection 7 branches are pulled out, while the rod 4 with the tensioning element 5 under the spring 6 action moves and remove the slack. As the rod 4 moves, the rolling elements 11 under the spring 12 action move in the G-shaped channel 2. In this case, the rolling body 11, located at the G-shaped channel 2 inflection point of the housing 1, is located with its axis not above (on or below) the rolling bodies 11 axis lying in the G-shaped channel working arm 3, thereby ensuring the rod 4 fixation.

To change the flexible connection or carry out repair work and maintenance, the adjusting nut 8 is shifted back, releasing the spring 6. In the extreme position of the nut 8, the pusher 10 under the action of the plunger 9 is displaced upward, raising the axis of the rolling body 11 located at the inflection point of the G-shaped channel 2, higher than the axis of the rolling bodies 11 located in the working arm 3 of the channel, and, which is the same, above the stem axis 4. This ensures the reverse movement possibility of the rolling elements 11 and, together with them, the rod 4 along the G-shaped channel 2 and 3 under the action of the return spring 13. Flexible connection 7 is released from the influence of the tensioning element 5.

After the work end, the device returns to the operating position by moving the adjusting nut 8 until the required deflection of the flexible connection 7 is provided.

The developed automatic device makes it possible to ensure the easily removable belt and chain transmissions, to increase the flexible elements reliability, as well as to reduce the labor intensity of maintenance and repairs, to improve the operational adaptability of the design of tractors and cars, while reducing the unproductive downtime of these energy resources.

And, also, the long-term research carried out by us shows that the operational labor intensity of one technical (service) service (M) of the coarse fuel filter of diesel engines of cars is on average 462 s, and the coefficient of operational manufacturability of the structure (OMS) is 0.17. In this case, an average of 1.5 liters of fuel is consumed as a deterrent to remove dirt and sludge.

If there are 30 tractors in the machine and tractor fleet, their unproductive downtime only for maintenance of these coarse filters is about four hours, and the consumption of diesel fuel for washing is 45 liters.

Therefore, in order to exclude an increase in the labor intensity of the technical service of machines, we have developed a new design of a coarse filter for diesel engine fuel (see Fig. 2) [6].

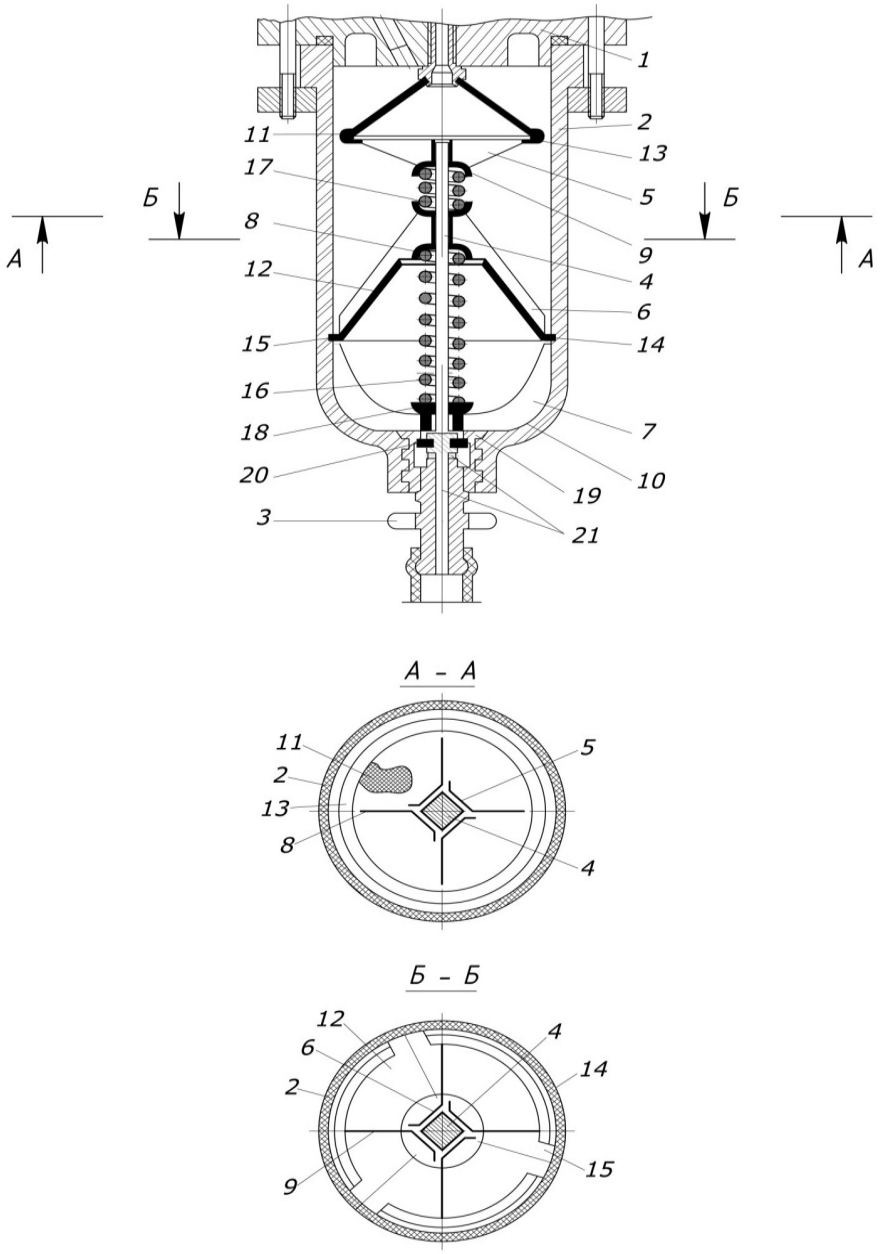
The operational labor intensity of the proposed developed filter for coarse cleaning of fuel of one maintenance is 59 s, the operational maintainability factor of the structure is 0.95, and the consumption of diesel fuel for maintenance is 0.5 liters.

The proposed device has a housing 1 and a glass 2. The device for cleaning the filter is made in the form of a scraper mechanism, which contains a valve 3 with a square shaft 4, impellers 5, 6 and 7 arranged in tiers.Their edges 8, 9 and 10 are made congruent to the generatrix of the cleaned surfaces of the mesh filter element 11, the damper 12 and the bottom of the glass 2. The element 11 is located in the mandrel 13. The position of the damper 12 in the insert 2 is fixed in the annular groove 14 by means of the petals 15. The impellers 5, 6 and 7 are formed as petals with a square hole in the center. Their edges are pressed against the mesh filter element 11, against the conical surface of the damper 12 and the bottom of the glass 2 by springs 16 and 17. The stiffness of the first spring 16 is twice that of the second spring 17. The end surfaces of the springs rest on the impellers through the shaped washers 18.

In the lower part of the glass 2 there is a threaded plug 19, into which the valve 3 is screwed. The square shaft 4 ends with a groove on which the collar 20 is located. The threadless cavity of the plug 19 is connected to the atmosphere through the holes 21.

While draining the fuel sediment, removing sludge and contamination with a handwheel 3, unscrew the valve from the screw plug 19. The impellers 5, 6 and 7 installed on the shaft 4 clean the surfaces of the mesh 11, the damper 12 and the bottom of the glass with their edges. Pollution and sludge are suspended. With further rotation of the valve, the collar 20, together with the groove of the drive shaft 4, is lowered down into the threadless fuel space. Together with the latter, impurities are discharged through holes 21 into a container

for collecting spent fuel. The amount of discharge is equal to the volume of glass 2 [7].



Picture. The proposed device for cleaning filters diesel engine machines.

Thus, the proposed constructive technical solutions make it possible to increase the operational and repair manufacturability of the machine design, and also sharply reduce the labor intensity of the service, respectively, reducing material and financial resources [8].

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