INVESTIGATION OF A UNIVERSAL PULLER OF BEARINGS WITH SOLIDWORKS

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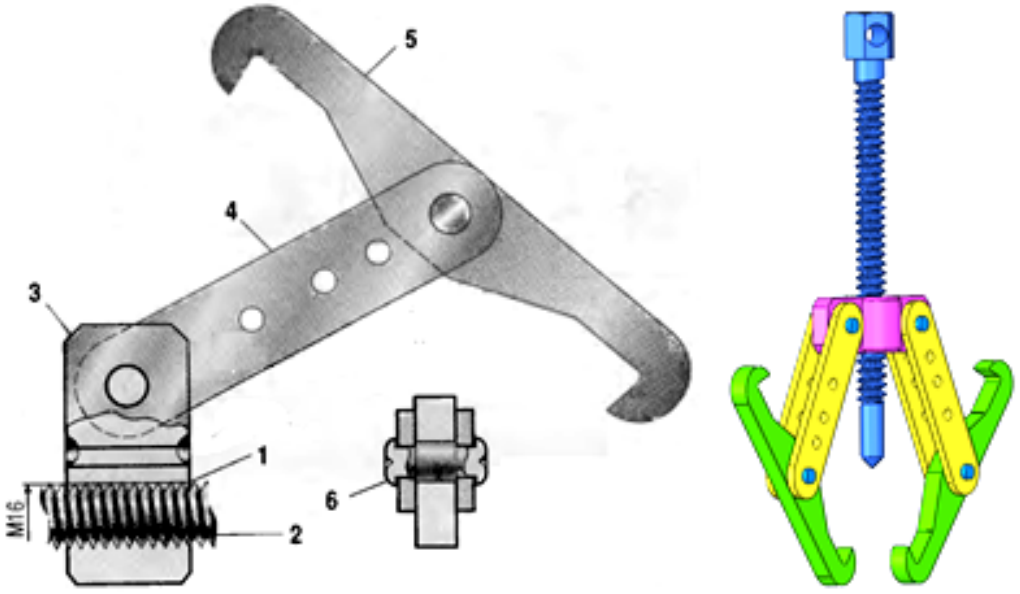
There are many machines and mechanisms whose work is based on the movement of parts. Basically, moving parts and units are mounted on bearings, which require maintenance as they work. The assemblies can be twisted with minimal effort, but there are situations where the bearing has not been removed for a long time or it has oxidized. A hammer and a chisel can be used to dismantle it, but there is a possibility of damage to bearing parts, as well as injuries to the mechanic [1].

The bearing is a rather complicated and expensive part, so it is better to use a special stripper to avoid damage, chips and nicks. Although it is possible to remove the bearing by knocking out the inner holder, but this requires a sleeve clearly the size of the inner part of the bearing. And if the bearing is stuck, it is practically impossible and technically incorrect to remove it in this way. Thus, in any car service that deals with the chassis of the car, there must be a set of bearing removers [1].

Consider the universal puller, shown in fig. 1 [2]. Gripper 5 is made with two legs: since the ends of the gripper are the same, the second acts as a spare (just screw the screw into the nut 1 on the other side).



a b

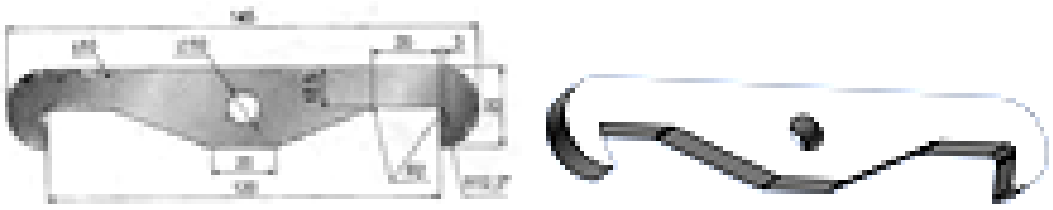
1 – nut; 2 – screw; 3 – plate; 4 – serga; 5 – delight; 6 – axis

Figure 1 – Assembly drawing of the universal puller with delight (a) and its 3D model (b)

The aim of the study was to determine the maximum force that can be applied to the grip 5 (fig. 1) with the allowable margin of safety [n] = 3. To do this, we used SolidWorks, which is a system of hybrid (solid and surface) parametric modelling. It is designed for the design of parts and assemblies in three-dimensional space (3D-design), as well as for the design documentation [3].

SolidWorks Simulation was used for engineering calculations – it is a software solution that is fully integrated into the SolidWorks 3D working environment [4].

Thus, in SolidWorks created a 3D-model of the delight (fig. 2, b), and in SolidWorks Simulation assigned its material (steel 45 GOST 535-88), fixed and set the area of its load. Next steps [5] – the system identified contact interactions and created a finite element model of delight (fig. 3).



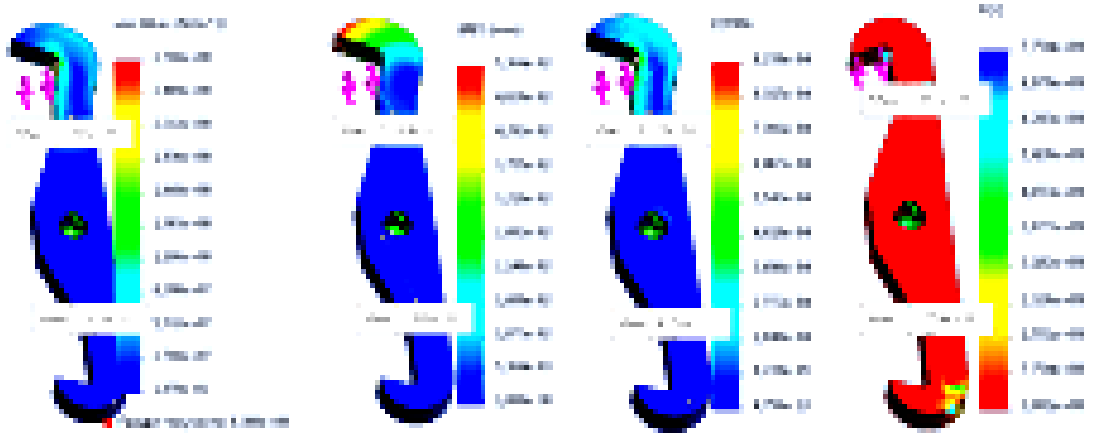
а б

Figure 3 – Drawing (a) and 3D-model of delight (b)

а б

Figure 3 – Parameters of the grid (a) and its display on the delight (b)

Given the connections between the elements, SolidWorks Simulation software created algebraic equations. They associate the reaction with the materials properties, limitations, and loads. After arranging the equations into the general system were unknown (fig. 4).



а b c d

Figure 4 – Plot of total von Mises stresses (a), URES displacements (b), equivalent ESTRN strains (c), FOS delight strength margin (d)

Therefore, for the considered delight of the universal bearing stripper, the maximum force that will not lead to safety violations (with the minimum allowable margin of safety [s] = 2) will be 1978 N (for one delight).

The obtained results confirm the relevance of the study in determining the maximum

force that can withstand the delight at [n] = 3. But, first, it is necessary to establish which bearings (according to the assembly drawing of the universal puller) can be dismantled without damaging their parts. Secondly, to determine the performance of the puller in question, it is necessary to examine its other components.

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