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THE CONSTRUCTIVE DESIGN OF A GRABBING DEVICE FOR A ROBOTISED HANDLING OF A CAR BODY PART
Part I

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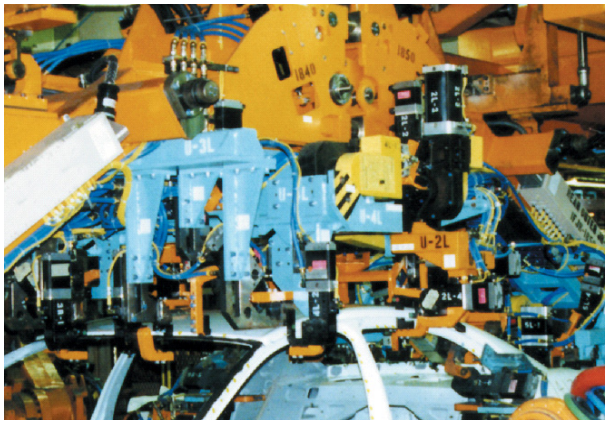
Key words. Vacuum grabbing device, car body elements handling, typical modulated elements.
Abstract This paper is based on a scientific research, made by the authors, with the aim to reduce the designing and execution time of a grabbing device, intended for the handling and transferring operation of a car body part. The grabbing device is designed and 3D shaped, presented in the paper, is realized by assembling typical elements of constructive types, the alignment and fixation of the handled object in the grabbing device being realised vacuum, pneumatically and mechanically.

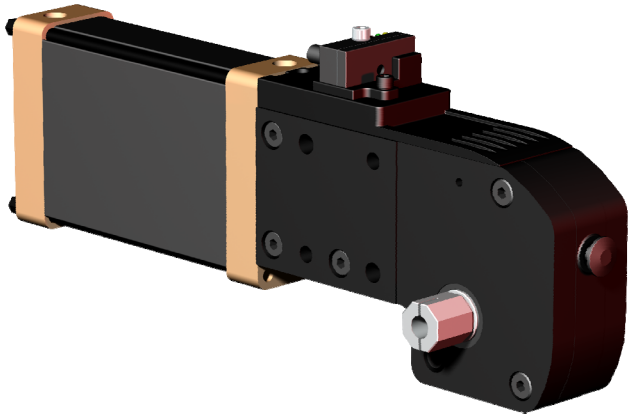
1. Introduction
The continuous development in the automobile industries, and the gain of new markets, which to satisfy a huge number of buyers of the products, brought a continuous diversification of the components of a certain new type of card body. Robotisation of the assembly lines allowed the complete automation of the assembly process for the vehicle body, determining a continuous growth of the obtained product quality, because the robots used in the mounting operations bring the productivity growth and lowers the cost price of the final product.
This paper authors aimed to present a quicker method of projecting a constructive type of the prehensile device used in operations of fixing and handling of metallic structure objects used in the auto industry. To reduce the execution time of a grabbing device, and it's costs, we proposed, that starting from the initial phase to use in it's construction various types of typical elements, quickly assembled by removable fixing elements. The operation on the grabbing systems with the aim of fixing the object in the grabbing device will be realized by a mixed system made of pneumatic, vacuum, mechanical and electronically auctioning of the Norgen Automotive Company.



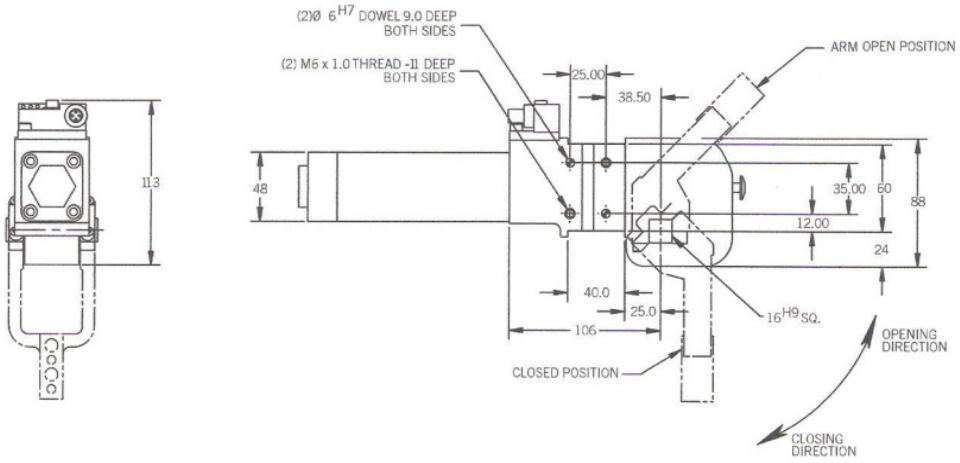
Picture.1. Robotized assembly line of a car body

In picture 1 is presented a, it's fixing system being made of several modular components for grabbing and rotation, frequently used in the construction of the prehensile device destined for these operations. The grabbing and rotating devices are used in the positioning and quick grabbing operations, realizing a fixation of an element at a high precision.

The grabbing devices intended for handling operations of the metallic structures like vehicle body part have in their composition several Power Pivots typical constructive types, one typical model of a constructive type being presented in picture 2a, and in picture 2b it can be observed too the positions of the grabbing arm, before and after rotation.



a)

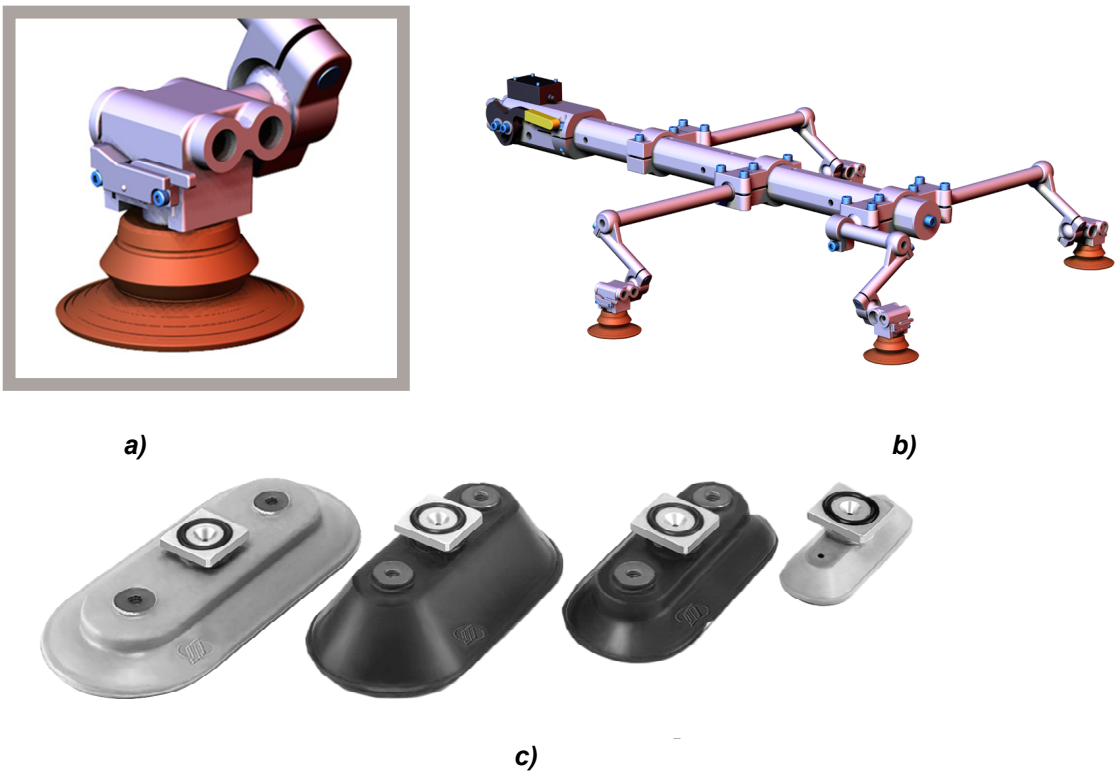


b)

Picture .2 a,b. The Power Pivots model type, external pre-stop system.

The usage of typical fixing elements assures a higher flexibility of the fixing system, realizing till 8 rotating positions, at several angular sizes between 15^0 and 120^0. Also they are fitted with shock absorbers at both ends of stroke, realizing a precise and silent running at the installation operations. These fixing systems can be mounted on the structure of the grabber in various positions such as, on top, below and laterally, in the specialty literature being met under the name of external pre-stop system.
The grabbers used in handling operations of the metallic structure and more precisely car body parts, apart of having the modular system like mechanical-pneumatically claws, with role of effective grabbing the metallically structure of the car body, has in composition a supplementary system of grabbing and more precisely a vacuum one. From construction

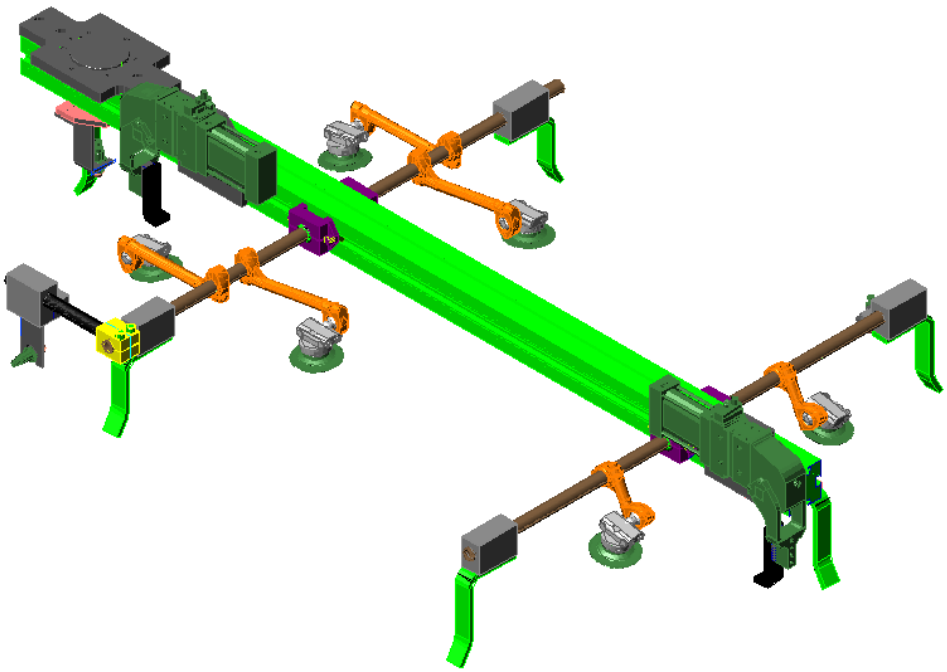
they have vacuum circuits in composition, various types of suckers and accessories for complete systems of vacuuming. In picture 3 a,b,c are presented several types of these categories of equipments.



Picture 3. a,b,c. Intelligent systems for vacuum, Suckers, Vac-Lok Suckers mounted on a modular structure, Venturi Suckers

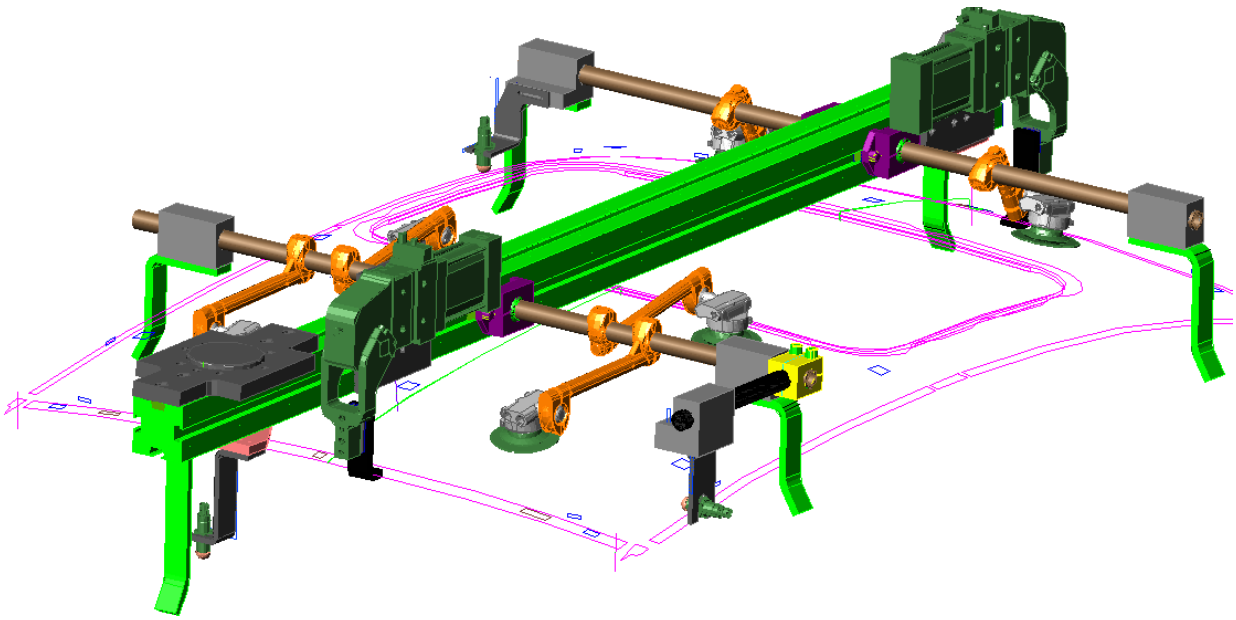
2. Designing and 3D molding of a vacuum prehensile device with pneumatic auctioning used for handling of metallic structures type auto body roof

In the next phase the paper authors have conceived and designed a constructive grabbing device with a vacuum and mechanic grabbing system with pneumatic auctioning, destined for handling operations of metallic structures type auto body roofs. For the grabbing device designing we used computer assisted designing software. The 3D designing of the grabbing device was realized in the designing software SolidWorks. We chose this program because it enhances and accelerates the examining process of the assembly process and for the component parts, of the manufacturing for an eventually launch in production. The constructive type of the designed grabbing device is realized, from a constructive point of view, from different constructive types of typical elements, destined and used for construction of such types of final grabbers. In picture 4 is presented a 3 D isometric view of the designed vacuum grabbing device assembly.



Picture 4. 3 D Design of the grabbing device assembly

In the followings in pictures 5 and 6 are presented two isometric views of the 3 D model of the grabbing device assembly, and from these isometric views it can be observed both the position of the realized grabbing device from typical elements and the metallic structure of the handled object, in this case a car body rooftop.



Picture 5. 3 D Design of the grabbing device assembly while handling the metallic structure isometric view 1

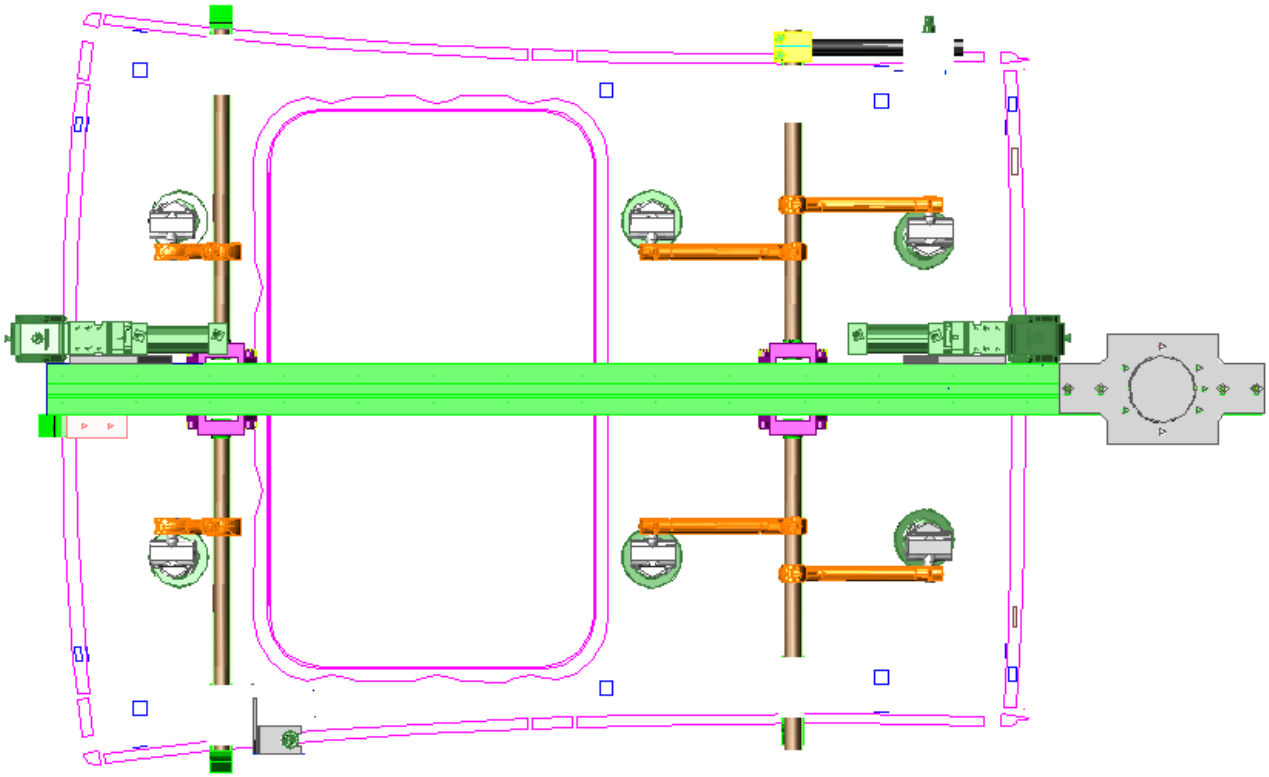
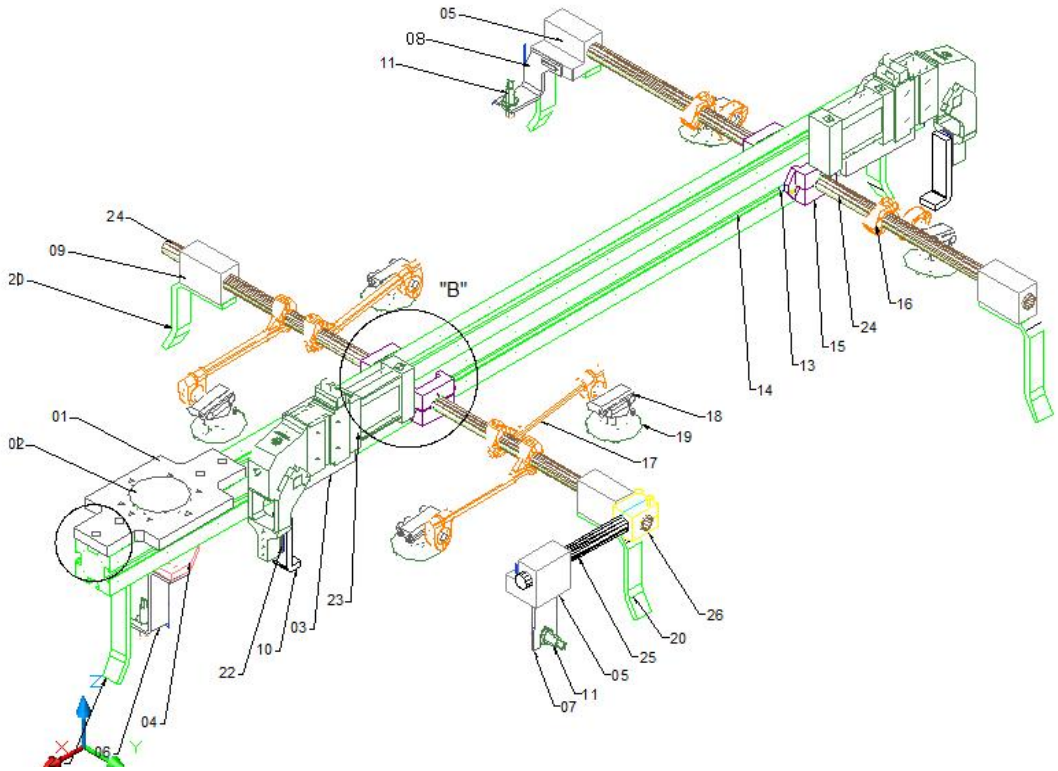


Figura 6. 3 D Design of the grabbing device assembly while handling the metallic structure isometric view 2

In picture 7 is presented the 3D Design of the designed vacuum prehensile device assembly, containing the assembly component elements, these being positioned and numbered.
Each element from the assembly composition is identified, numbered and wrote in a component table.
The component elements of the vacuum grabbing deice assembly are presented in picture 7 and are the following: 1) robot panel; 2) centering bolt; 3),4),5) – mounting plates; 6),7),8) - sensors support; 9) – adapter; 10) – compression holder; 11) – inductive sensor; 12),13) – mounting nuts; 14) – extruded profile; 15) – installing support; 16), 17) – arms; 18) – Cup holder; 19) – vacuum cup; 20), 21) – locators; 22) – spacers; 23) clamping device; 24), 25) – tubular arms; 26) – compression holder.



Picture 7. 3 D Design of the assembly containing the numbering of the component elements

3. Conclusions

This paper brings an improvement to the concept of modulated vacuum grabbing device designing, by effectively applying the “Computer Assisted Programming”, “Computer Aided Design”, CAD”.

Conceived on a very simple and viable architecture of the designing software SolidWorks, which has been used for designing the vacuum grabbing device designing, it contains all the major facilities of a software package for computer assisted designing.

The designing strategy has as starting point the designing based on the constructive-technological characteristics of the elements, continuing with the assembly development, the functionality quotation and semi-automatic generation of the execution drawings, quick generation, directly from the 3D design, of the 2D documentation composed from views, sections, details, elevation, tolerances, text elements, components table, and material list. The documentation is in a permanent correlation with the geometric design, so every modification made to the model is automatically seen in the 2D documentation.

The constructive optimization of a vacuum grabbing device was realized both by the designing concept and by the possibility of effective construction of the device, by assembling all the modular components.

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