

DEVICE BY HYDROFORMING CORRUGATED DIAPHRAGMS

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Abstract: In this paper the authors present a device of manufacture the corrugated diaphragms by hydroforming. The technological process of obtain the diaphragms is complex, difficult and presupposes a big degree of process material. Exist a big diversity of proceed manufacturer the elastic corrugated diaphragms, only that abaft comparison of the advantages and the specific disadvantages their, the hydraulics method is prescript for used.

1. INTRODUCTION

The elastic diaphragms are pieces of circular form on a planed or profiled surface, integrated in a contour, which, under the pressure applied on one face, gives visible and easily measurable distortions. The function of the appliances has as sensitive element metallicly diaphragms it's based on elastically deformation of those under the action of a pressure or external forces.

In as part as the technological process of obtain the diaphragms, operation for form's sake corrugated he is one of the most importance operations, considering the hold over the feature on which has it form corrugated and her geometry. The paper are propose to establish which among the methods of obtain the corrugations is optimum using technical the decision enforced from the engineering value.

The advantage of those diaphragms, are (Negoescu et al., 2002):

- characteristics closer to linear, sow a shorter variation for effective surface;
- give possibilities for designer to adopt relatively easy the characteristics of some given dates;
- bigger sensitivity
- give possibilities to keep constant effective surface of the diaphragm when centre of the diaphragm are moving along to plan in which are the diaphragm situated;
- biggest arrows without appearance of permanent deformations, sow gives the possibilities to measure superior pressure;
- easy to modelate the characteristic by simply modifying the height H of the undulations, witch is allowed to counterbalance the unlinears of the parameter to measure, which mean straighten the scale of the appliance.

Applicable areas for that type of **diaphragm are** sow large, so that the modest enumeration for contrivances in which construction are used, may contain some tenthly appliances and are include example part of the most variety technical fields, beginning with the regulators of temperature used at hatcheries and end with measure indicators of high and speed of aeroplanes.

2. THE PRESENTATION OF THE DEVICE

For the realization of metallic corrugated diaphragms he conceived, projected and executed, as part as laboratory by cold forming from Faculty of Machine Manufacturing, Iași a device by hydroforming with rigid die, carry permits formation the corrugated pursuant to action the pressure of a liquid about the semiproduct, carry maybe carry out the role his punch or the die of drawing.

This the method characterize through the fact as, the degree of deformation of material is major against usually drawing and the hydrostatics pressure of the liquid press evenly perform on die, oppose as much the formation of the folds, quotients and stretch and attenuation of the material processed. Deforming the material is in progress due to the of a pressure of the liquid, carry action indirectly about material, by dint of a elastic membranes, carry has the role assured the seal-off space in which create the hydrostatics pressure.

In the figures 2 and 3 he is presented the device for formation the corrugated, with help whom the perform the plan (18) he is transformed in a corrugated diaphragm by reason of the pressure entered in the room (2) of a pump with piston (4), which compel material his the form die (16). The oppress force is achieve with help ensemble format from the screw (13), the disk (14), the cylinder (15) and the ring of pressure (19). The position's die is assured by the screw with square thread (12), what he can be out of place manually. Of the base plates (3) are fixed two couples of necklaces (6) what support the superior part of the beams (7) and (8), onto which are mounted the bolt nuts (11), what assure the screw movement (12) and (13). Fabrication the diaphragms with different sizes are possible through the change die (16) and the ring of pressure (19).



Figure 1. Corrugated diaphragm

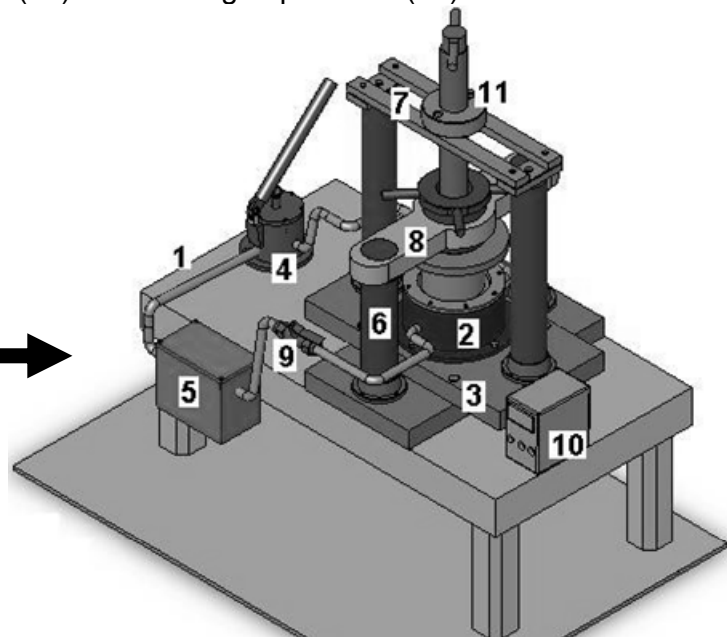


Figure 2. Device by hydroforming corrugated

The module of function is presented as: the semiproduct the plan (18), is put on the elastical membrane from rubber (20), clamped on the pressure cylinder (15), with a shackle (17) grasped with the screws, obtained and a seal-off between average hydraulic and the semiproduct. Force of pressure fulfil ones through the manually displacement by the screw (13), and this value is measured with help 4 resistive tensometer transducers of type WG (21), and (22) (figure 4), mounted in the semi bridge on the cylinder (15), connected at an electronic tensometer N2301 (10). Thereto is come down the die (16) through the screw actuation (12), till this he gets in touch with the semiproduct. With help of the pump with piston (4), creating in installation the necessary pressure for deformation measured with a manometer, carry is maintained for c.c.a 20 seconds. The hydraulic circuit compound from the reservoir of oil (5), the handy-billy with piston (4), the cylinder of pressure (2) and the mesh by pape line (1) which ensure the circulation of the fluid

between these elements is closed his open with help of the faucet (9). The positions of the nut bolt mechanisms used at realization of the pressure forces, as well as to the movement die, is obtained by the ensemble format from the beams (7) and (8), supported of the columns (6). Fitting in the semi bridge of the tensometer transducers, permits the compensation of the temperature effect. Preparation the surfaces in the fated zones adhibition brands, as well as the procedure of apply these, pursuanting nearly the recommendations of the produced firm.

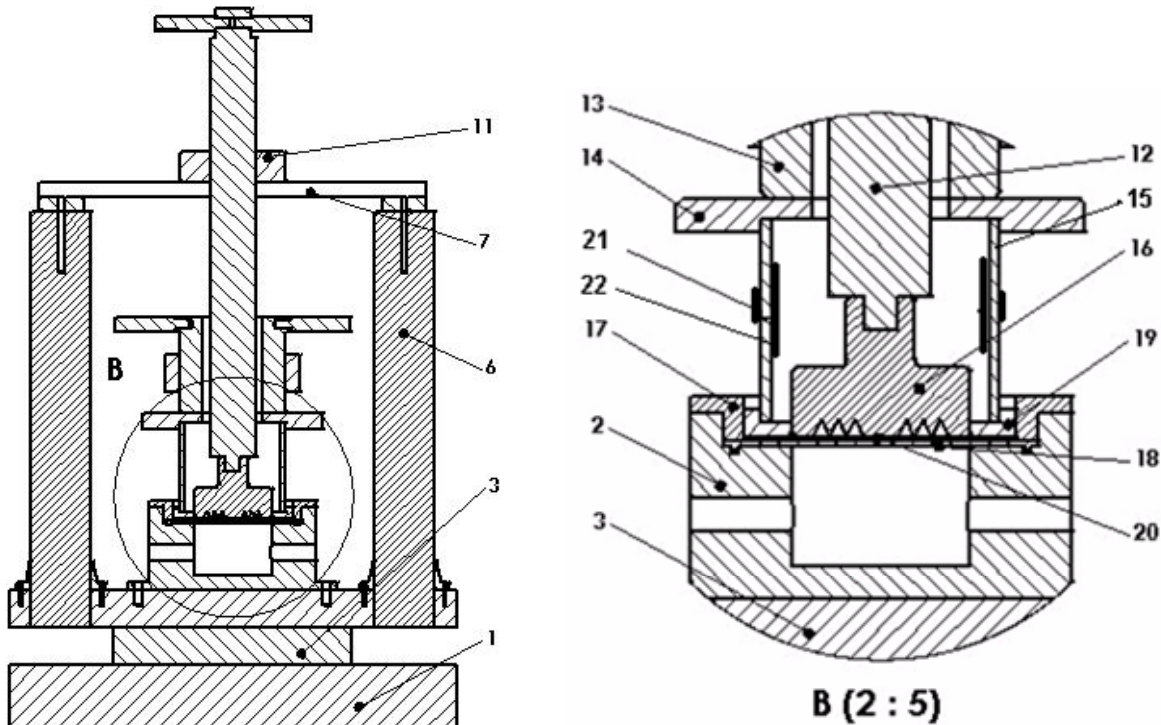
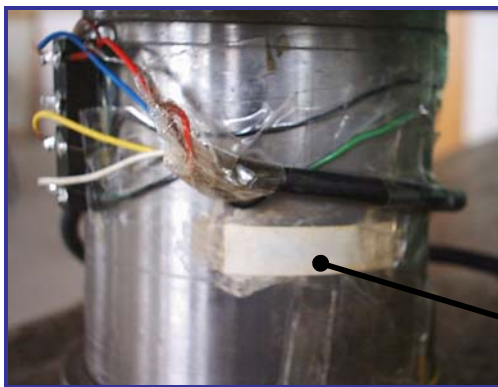


Figure 3 The cross section by the hydroforming device

For the absolute calibration the force of pressure he obtained through the movement on vertical direction of a table machines by universal mills, and calibration was realised, through comparison the indications of the dynamometer with the indication of the needle from electronic tensometer N2301, feeded to a circuit voltage by 8V, on the scale of 100 $\mu\text{m/m}$.



The tensometer transducers



Figure 5. Device by hydroforming corrugated

Figure 4. The mode of position the tensometer transducers on the cylinder 15

The calibration graph necessary for effectuation correct mensurations, is presented in the figure 6, and in the figures 5 and 7 are presented some aspects by pending the operation of the calibrate pressure force.

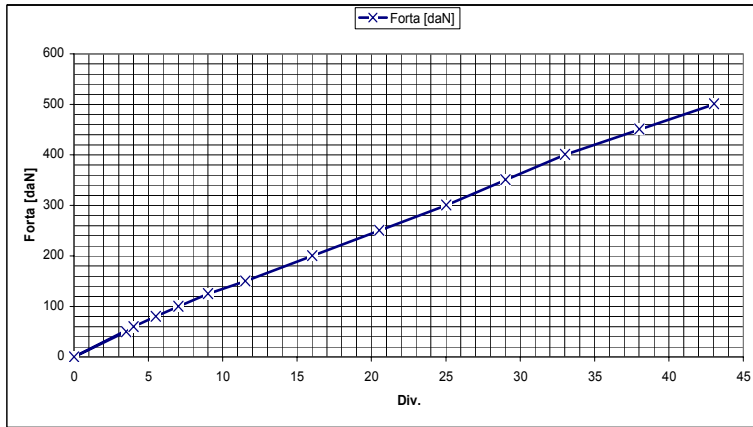


Figure 6. The calibrating plot for the forces



Figure 7. The punch

The absolute calibration he achieved through the cooperation method, consisted in comparison of the signal of go out of the electronic tensometer, abaft shipment with forces by element what realization the pressure on the semiproduct, with a standard dynamometer. In order to is obtained an accuracy high calibration he accomplished in conditions gated closer to one real using same cable of measure and same electronic tensometer commuted on the dial used and in practice. Noticed, dispose linear of the points obtained, what facts confirm the correctness for the calibrate operating.

3. CONCLUSIONS

The technological process of obtain the diaphragms is complex, difficult and presupposes a big degree of process material. Exist a big diversity of proceed manufacturer the elastic corrugated diaphragms, only that abaft comparison of the advantages and the specific disadvantages their, the hydraulics method is prescript for used. For obtain the corrugated diaphragms with different sizes and forms are enforced fabrication for each diaphragm a die and / or punch, what does obtain varied ranges difficult and expensive.

The plant conceived and realisated for the procurance through hydraulic method of the corrugated, permits this utilization for the manufacture of the diaphragms with diameters maxims of 90 mm, thickness ale material semiproduct of maximum 0, 3 mm and an amplitude of the an corrugated of maximum 2 mm;

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