MANUFACTURING OF THREADED PRODUCTS FROM ALUMINUM ALLOY BY THE METHOD OF COLD PRESSING

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The process of cold direct pressing is a forming process carried out using a deformation tool such as a die or mold. The die or mold consists of two main parts — a punch and a matrix. The punch is attached to the ram of a hydraulic press, and due to its pressure the configuration of the product changes through deformation. The matrix serves as the stationary part of the mold, acting as the base for the deformation process of the product. The required pressure is created by the hydraulic press through its hydraulic system.

The purpose of this work is to demonstrate an alternative method for manufacturing threaded products. The advantages of this method compared to conventional methods are high productivity, quality, and improved strength characteristics. The main objective of the work is to demonstrate the possibility of obtaining threaded products with increased strength. As the final product, an M4 threaded stud shown in Figure 1 was selected.

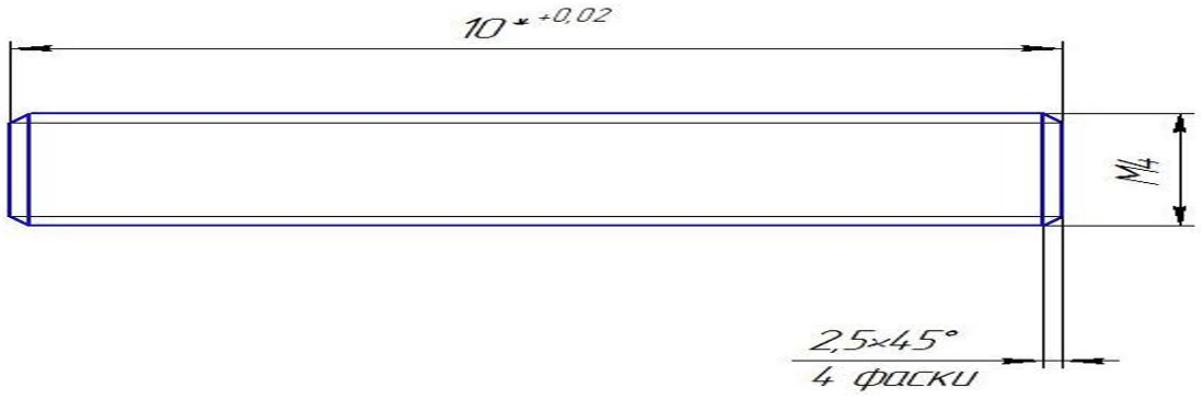
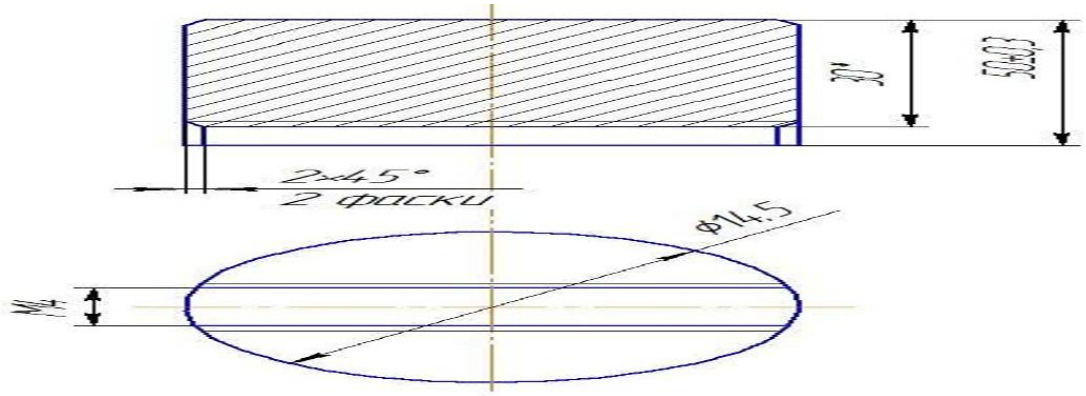


Figure 1 — M4 Threaded Stud

In industry, such studs are manufactured on screw-cutting lathes or heading machines. When producing a stud on a heading machine, the workpiece is heated to the deformation temperature before thread cutting in order to simplify the process and increase machine productivity. During heating, the structure of the workpiece becomes softer and coarse-grained. After cooling, the surface of steel products becomes covered with iron oxide scale, which significantly increases metal loss.

Manufacturing studs on a screw-cutting lathe is a low-productivity process. In addition, the surface of the finished product requires annealing to relieve stresses in the work-hardened layer, followed by strengthening heat treatment to improve such properties as hardness and wear resistance.

The alternative method of manufacturing threaded products is aimed at obtaining parts with high productivity and improved strength characteristics. For the production of the studs shown in Figure 1, two halves of a press mold shown in Figures 2 and 3 were designed and manufactured.



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Figure 2 – Designed press mold for manufacturing M4 studs

After the design stage, two steel halves of the press mold were manufactured. The production of the mold halves included several operations: turning, drilling, and thread cutting. First, two cylinders were manufactured on a lathe. Then both cylinders were clamped coaxially in a vise, after which a hole for an M4 thread was drilled. The thread was cut in the hole using a tap. Both halves of the mold are identical. One of the halves is shown in Figure 3.

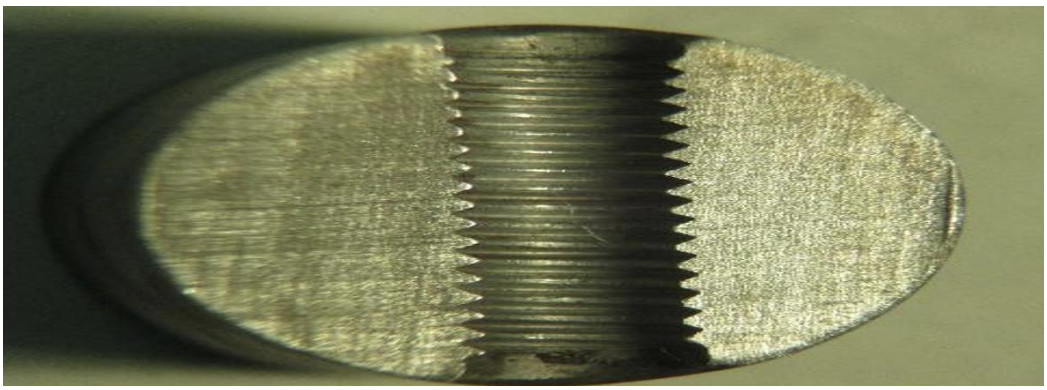


Figure 3 – Half of a press mold for making an M4 stud

After manufacturing the deformation tool, the process of producing the stud itself began. Preparation for pressing is shown in Figure 4.

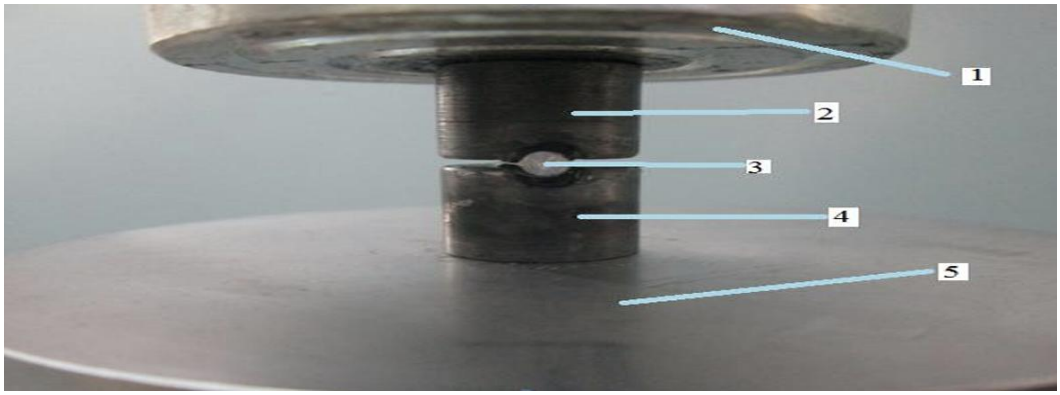


Figure 4 – The workpiece deformation process: 1 – Press plunger; 2 – Upper half of the mold; 3 – Aluminum workpiece; 4 – Lower half of the mold; 5 – Press table

The first half of the press mold was installed on the table of the hydraulic press. An aluminum workpiece was placed onto it, after which the upper half of the mold was installed. Then the pressing process was carried out with a force of 4.1 tf. The finished products are shown in Figure 5.

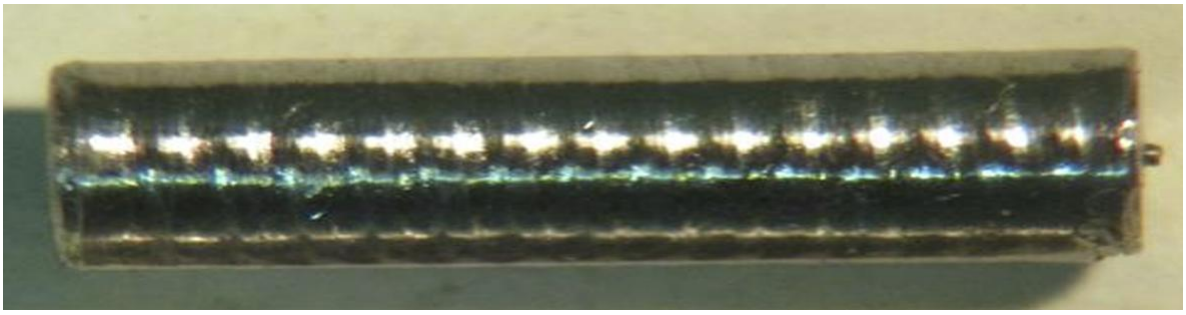


Figure 5 – Hairpin

This figure shows a product resembling a stud with thread contours.

Conclusion

It can be concluded that threaded products can be manufactured by the method of

cold pressing. To improve the quality of the resulting products, it is necessary to select equipment with greater pressing force.

References

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