Alternative technologies of manufacture and decoration of wood balusters

D Krauinsh¹, N Zhukova¹, M Volkova¹, A Kukhta²
1 Tomsk Polytechnic University, Tomsk, Russia
2 Tomsk State University, Tomsk, Russia

E-mail: dima_krauinsh@tpu.ru

Abstract. Despite the fact that balusters made of stone, metal, gypsum can be found in modern interior, wood is the most popular material for balusters still. The aim of research is to research new forms of designer balusters and technologies of their production. Segmentation allows plane and curved surfaces to be produced independent from each other, and increases the artistic (aesthetic) expressiveness of products.

1. Introduction
Woodworking - most important sphere of modern business in Russia. With the process of development of low-rise building (houses, townhouses) there is a constant demand production of wooden stairs, columns, balusters, etc. And, as a consequence, the search of new technologies for manufacture don’t lose its relevance. Alternative technology and the decoration of wood balusters, considered in this article, may be useful in the manufacture of products (stairs, pillars, balusters) for low-rise building (houses, townhouses), as well as in the manufacture of wooden furniture (wardrobes, chairs, tables). These same technologies are applicable for the production of souvenir products (boxes, vases, etc.) for design of ornithological art objects, etc. The authors of this article, having sufficient experience in various areas of woodworking, offering an alternative method of making and decorating products, obtained by transforming the bodies of revolution in the segment structure.

Baluster is support column of railing, made in the form of a pillar shape. Wooden baluster is made by turning traditionally. The basic function of balusters is security, second function is decorative of stairs. During the manufacturing process balusters given a variety of forms that provide visual harmonization of interior space. Note that a typical baluster manufactured from the block, a cut of square from 40x40 mm to 80x80 mm, with a total length of 900 mm, and processed profile (graceful form) about 600 mm (Figure 1).

2. Technology
Consider some possible unifying factors manufacturing of balusters as revolution bodies. The main factor is manufacturing of balusters on turning lathes. It can be as Universal Turning Machine (UTM) for wood and copying turning lathe for wood [1].

Turning on the lathe faster than milling. Skilled turner manufacture a typical turned baluster (Figure 1) for 15-25 minutes (including grinding). Total cost typical turned balusters for consumer is small.
Milling let you transform traditional turned forms in segment structure in various profile, as well as create additional independent of each other surfaces which constructor - designer can use to create an artistic shape of the product (balusters) [2, 3].

During milling on a single lathe milling machine with CNC processing time balusters be about 8:00, and its total cost to the consumer will increase significantly compared to the cost of a typical turning balusters. Processing surround woodwork largely determined by the finishing tool is weakly dependent on the depth of treatment, but depends on the total area of cultivated layer material. For “conditional” reduce processing time is used multi-place processing. But for such equipment will require additional space in the workplace.

![Diagram of balusters](image)

**Figure 2. Workpiece of balusters**

Authors of the article offered an alternative method of processing of balusters that significantly transforms the form standard balusters, giving it a form of milling and turning products. This method is based on the introduction of mass production techniques in processing that reduces the final cost of the treated this way balusters.

The production of balusters must have room, a set the necessary equipment and experienced designer.

Skilled constructor - designer must develop a design carved balusters so that the workpiece can be included laths - segments that can be obtained in different ways.

In the proposed method, instead of bulky specialized equipment is used as the main universal milling machine gantry type. Processing zone machine is 150 to 150mm, or 400 to 600mm, or 600 to 900mm. On this machine can be refined individual segments or made various multiplace matrix from gypsum for the mass production of various decorative elements.
Work piece of balusters (eg, Figure 2a) possible paste over a different segments (Figure 3) or other variant - to make the segment insertion (Figure 4), and then connect them with the rest of the balusters by the central rods (Figure 2b).

What is the insert, and how production it?

For organize a competitive of technological process should seek to mass-produced segments of inserts, received by the productive equipment. For example, machines for quadripartite processing of balusters are used for making standard linear products including the desired tilting angles. Typical options linear profiles (Batten, block house, siding, door lining) are shown in Figure 3. For further processing of products and to obtain the desired segments a workpiece is divided on elements.
measured length or angular shaped segments. It should be noted that the top row of segments in Figure 3 can be obtained directly at the quadripartite machine processing. This simplifies the manufacturing process. Figure 4a shows the options segment inserts from the floorboard. Figure 4b shows the options segment of the finished panel inserts. Figure 4c shows the options segment inserts a block house. Figure 4d shows the options segment inserts of wood siding.

Note also that the flat linear products can be obtained on the machines for rolling pattern embossed roller hot way, for example: «BORGORE 800 / I» Italian producer Renzo Borgonovo, or «DM-45” or «PC-TR1D». Typical maximum depth of relief on such machines is 3mm. This avoids time-consuming (time machine) milling process for segments.

If the segment insertion modify simple technological operations such as drilling, gluing some ornament or a decorative element of polyacrylic type sealant «Parkett-202” [4, 5], we obtain the result shown in Figure 5.

3. Conclusion
As seen from the results, segmentation has allowed do more independent from each other plane and curved surfaces. Combining this surfaces in different combinations, or adding on segment surface other decorative elements can get the products presented in Figure 5. Described technology can increase the diversity of the range of products and their artistic (aesthetic) expressiveness and minimizing manufacturing costs. Equipment features allow you to post manufacture on smaller areas, what reduces costs [6]. Technology that described in this article allows the use of standard blanks (elements) and their subsequent decoration. This increases the variation forms and reducing it cost.
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