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ASSEMBLY AND ATC TOOL CHANGE FUNCTION WITHIN THE NEW HORIZONTAL MACHINING CENTER CPH 800

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ABSTRACT

Keywords: *High speed ATC*

The present paper introduces the ATC assembly and function, i.e. the tool automatic change function within the new CPH 800 horizontal machining center, of 22Kw power, with a 8000 rpm maximum speed of the main spindle, APC 2x800, ATC 40.

INTRODUCTION

Given the evolution of the machine tools and the sudden increase of the cutting rate, the necessity imposed itself that the tool be changed in the shortest time possible. Yet, such thing proved itself difficult to accomplish, if certain hydraulically- driven tool changers are used.

CONTENT

As a definition, the tool transfer refers to all operations that auxiliary mechanisms execute in order to extract a certain tool from the store, transport it from the store to the main spindle and put it inside the main spindle bore or the other way around, from the main spindle to the tool store. In order to reduce the tool changing time, the distance between the main spindle and the tool store be as small as possible, for the tool changer to execute a minimum number of movements in the shortest period of time, at the highest speed possible.

The tool changer provides tool catching and extraction from the store or the main spindle, as well as tool transportation through the entire distance between the store and the main spindle. In order to duly execute its functions, besides the tool hold-down, the toll changer executes rotation and translation movements, being thus driven by mechanical linkages.

Most of the tool changers used within the machining centers are of the hydraulically - driven type, which cannot ensure a sufficiently increased speed for the tool change; yet by using an electric motor, the movements' speed increases also because the braking-speeding curves of the servo-motors allow for modifications, and the change process can be thus controlled and adjusted to a high- performance level.

In what position is concerned, the main spindle is placed vertically on the store tool shaft, which explains the fact that the tool changer is double and L-shaped, having two movable crushing jaws on both sides, and thus it can simultaneously grasp the tool already used for the main spindle processing and the next tool to be used from the store.

The tool changer is provided with a Fanuc motor that executes all movements except for the clipper closing, and which is located on the machine's longitudinal column.

The movements executed by the tool changer are as follows:

- clipper closing

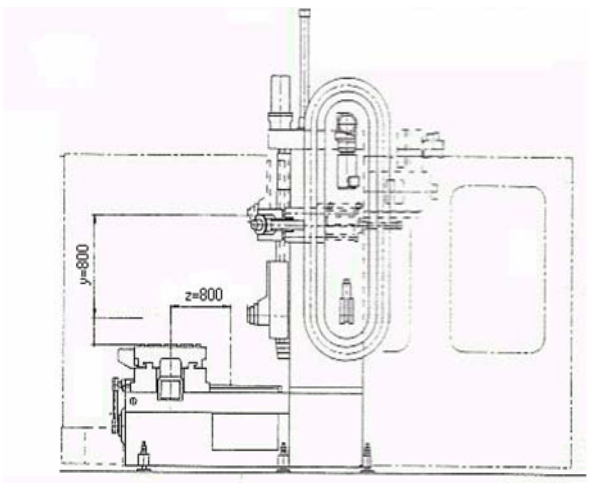
- translation for the simultaneous extracting of the tool from the main spindle and of the tool in the store
- 180- degree rotation for the tool reversion
- translation for the introduction of tools in the main spindle and the tool store respectively
- clipper opening

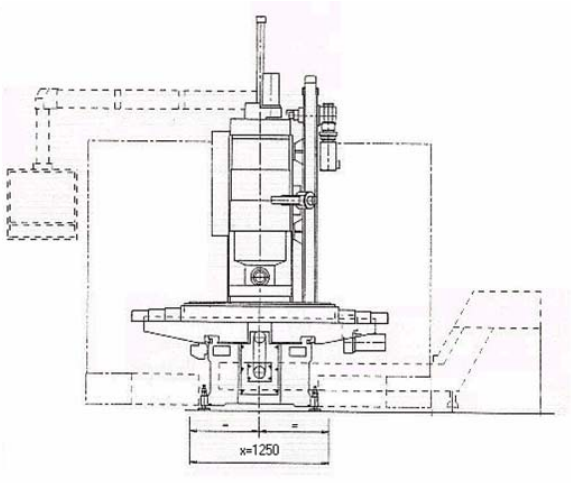
The tool change starts by a hydraulic closing of the grippers, simultaneously with the tool release from the main spindle. Once the grippers are closed, the motor that drives the cam is then started. Given the cam profile, the toll changer executes translation movements in order to extract tools. The cam keeps rotating and drives the rods, which, in their turn, rotate the actual tool changer by 180 degrees, thus accomplishing the tool reversion. Because of the cam, the tool change continues its rotation movements and performs a translation movement for the tool introduction in the main spindle and in the tool store, respectively. Grippers are opened simultaneously with the main spindle tool catching.

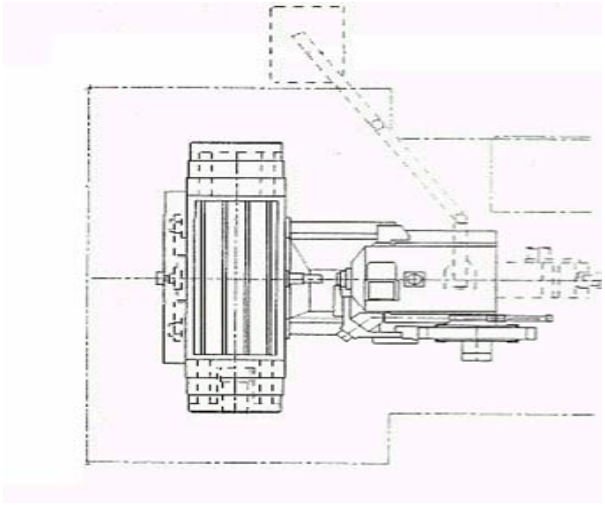
The tool store used is of the chain-type, the tool compartments are placed on each chain elements and tied to the transporting chain, a store capacity for 40 variable management tools. The tool store moves isochronously with the longitudinal column on the Y axis, and time is, thus, saved.

The main spindle tools and cone correspond to the HSK system, which is one of the most modern tool fixing systems.

CONCLUSIONS: The elimination of hydraulics in the most part of the tool changer drive, leads to a highly increased performance and to an improved parts' reliability. Consequently, the tool change time was reduced to 5 seconds (chip to chip).







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