

9. Toothed wheel cutting machine

9.1 Gear-hobbing machine

Gear-hobbing machine

Gear hobbing machine is a special machine tool used to process gear with various tooth shape and tooth surface of worm wheel under the guidance of generating principle. If special tool is used, spline and chain wheel can also be produced.

The engagement of tool and workpiece is equal to that of rack and pinion. Besides, tool and workpiece also make cutting and feed movement. The common processing precision of gear hobbing machine is class 7~6, and the gear hobbing machine with high precision can reach class 4~3. It can be used to process gear with maximum diameter of 15m.

Gear hobbing machine can be classified into common gear hobbing machine (see “high efficiency gear hobbing machine”), high precision gear hobbing machine (see “high precision gear hobbing machine”). Based on the different layout, it can also be classified into vertical gear hobbing machine (see “vertical gear hobbing machine”) and horizontal gear hobbing machine (see “horizontal gear hobbing machine”). Based on the size of the processed workpiece, it has small, medium and large types. Figure 9-1 is the outline drawing of Y38 gear-hobbing machine.

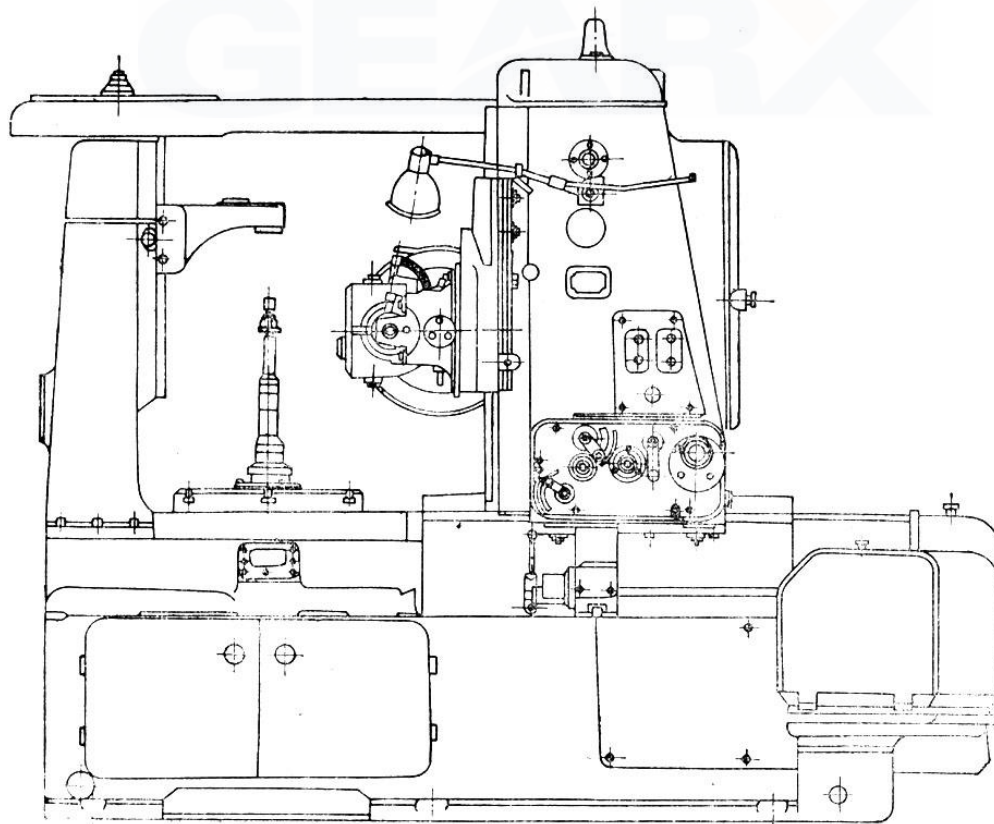


图 9-1

Horizontal gear-hobbing machine

It is one of the machines processing tooth surface with hobbing cutter based on generating method. The layout character of this machine is: the axis of rotation of workpiece is horizontal. Gear hobbing machine with this layout is generally small type gear hobbing machine. It can be applied in processing long shaft gear and spline shaft, etc.

Vertical gear-hobbing machine

The axis of rotation of workpiece center shaft is vertical to the horizontal plane. At the moment, most of the large and medium size gear hobbing gear machine is vertical type. Vertical gear-hobbing machine can be classified into working table migration and upright movement. When it is working, the hob spindle rotates driven by the main motor and the carriage can make vertical movement along the upright rail and adjust angle around the horizontal axis. The workpiece is installed on the working table and it is rotating by the force of index worm wheel. If the tool rotates a round, the workpiece rotates z^0/z . When it is working on helical gear, the differential mechanism makes the workpiece moves correspondingly. The outline drawing of vertical gear-hobbing machine can be seen from Figure 9-2a, b.

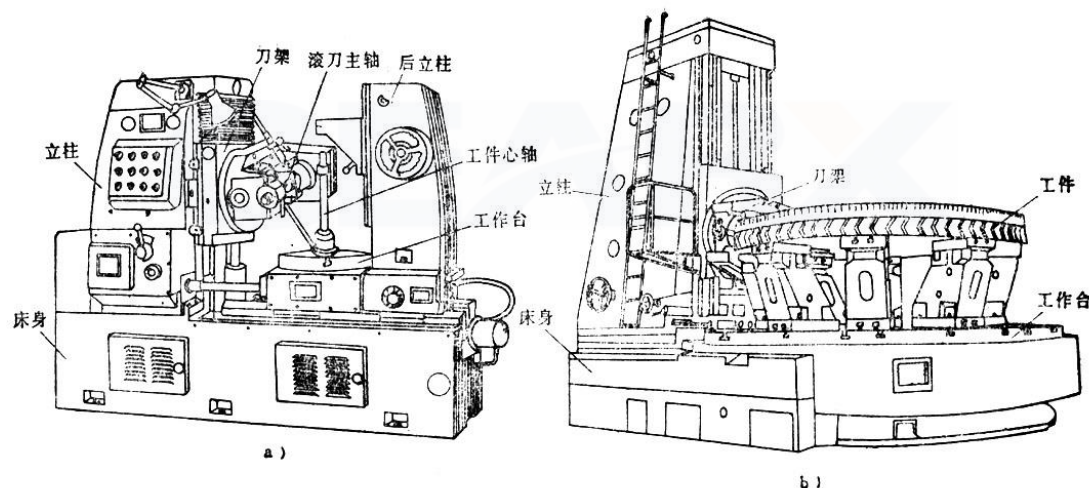


图 9-2

Universal gear-hobbing machine

It is one of the machines processing tooth surface with hobbing cutter based on generating method. This kind of machine has lots of specifications, such as SU5342, SU 5310, CY320, W¹Y³J, Y31125, Y38 and Y3213. It has large processing range and they are usually universal. It can be used in processing cylindrical straight gear, helical gear and herringbone gear with tool withdrawal groove. It can also process worm wheel with radial tangent method. When the accessories are used, it can also process herringbone gear without tool withdrawal groove, internal gear, bevel gear and shaft gear. When special hob is used, workpiece with special tooth profile like spline and chain wheel can also be processed. The process precision can reach to class

7~3. Currently, the maximum processing diameter can reach 15m.

Automatic gear hobbing machine

It refers to gear hobbing machine that has half automatic and automatic cycle working type. It sets hobbing automatic drafting mechanism. The main driving medium and bearing adopt automatic cycle lubrication. It also has up-down material and workpiece clamping device installed. What's more, the machine can also remove chip automatically and can be included into the automatic line of gear production. If mechanical hand and stocker are added, the machine can work itself. It is suitable for quantity production.

Large-scale high precision hobbing machine

It is one of the machines processing tooth surface of large scale high precision gear with hobbing cutter based on generating method. This kind of machine has high level of automatic production. It has automatic stopping mechanism, quick motion mechanism for tool rest and upright sliding plate adjustment. The processing precision can reach over class 4 and the maximum processing diameter can reach 15m. It is developed based on CY38A, SU5Д32 type and gear hobbing machine with high precision. This kind of machine is mainly used to process large scale gear which has strict requirement on the stability and service life.

High precision hobbing machine

It refers to hobbing machine used in processing gear with class 4-3 precision. The structure and working principle is the same with common hobbing machine. But the processing precision of components is relatively high or it has mechanism that can eradicate transmission error installed. Generally speaking, this kind of machine has automatic stop mechanism. It is quite easy to operate and adjust.

Gear hobbing machine of indexing worm wheel

It is used to process the tooth surface of worm wheel with high precision. In order to avoid vibration and heat deformation, the main motor and gearbox is always put outside of the tool and each part takes pressure oil to realize circulating lubrication. The transmission chain is short, movement precision is high, and there is no tangential and axial feeding transmission chain. It uses high precision tool to work and the maximum processing precision can reach class 4 (JB179-83). It refers to indexing worm wheel that mainly used in processing indexing mechanism, precise tool, high precision instrument and tools.

Camshaft special gear hobbing machine

It is a special gear hobbing machine that is used in processing the tooth surface of helical gear on camshaft. The production efficiency is high and it is easy to operate. The machine is mostly used in mass production.

Microcomputer numerical control gear hobbing machine

On the basis of common gear hobbing machine, it adds board computer, stepper motor, driving electric source and impulse generator. Except for the functions of common gear hobbing machine, it also has the function to process variable tooth thickness gear. It has many merits: high level of automation, easy operation and high production efficiency etc.

Watch gear hobbing machine

It is a kind of small scale machine processing tooth surface of watch gear with hobbing cutter based on generating method. This kind of machine has high reliability. It is equipped with automatic up-down material device and can process automatically by itself. It is adaptable in processing watch cycloid gear.

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