

9.5 Gear mill

Spiral bevel gear generator

Spiral bevel gear generator is a kind of processing machine to process spiral bevel gear and hypoid generator in a precise or rough way with spiral bevel gear milling cutter based on generating method. The structure and motion characters are: there are two types of principal axis of tool, the one that can be fixed horizontally and the other that can be adjusted aslant. When the height of workpiece principal axis and the center of cradle is equal, it can cut spiral bevel gear; it can also cut hyperboloid gear when skewing. The principle axis of milling disc is installed on the eccentric drum wheel so as to adjust the position of mill center. The eccentric drum wheel is installed inside of the cradle and swing along it, returning in a certain angle in an opposite way from workpiece. That forms generating motion. The processing range of the machine is relative large with the processing diameter being 10~2500mm and its processing accuracy can reach Class 7~6. The surface roughness is $R_a 0.63\sim 0.32\mu\text{m}$. There are many kinds of spiral bevel gear generator. Some are rough cutting machine with simple structure and without generating motion while some others make generating motion; some are gear-broach machine that performs well in cutting bull gear while some are good at cutting both large and small gears. The outline drawing of spiral bevel gear milling machine can be seen from Figure 9-9.

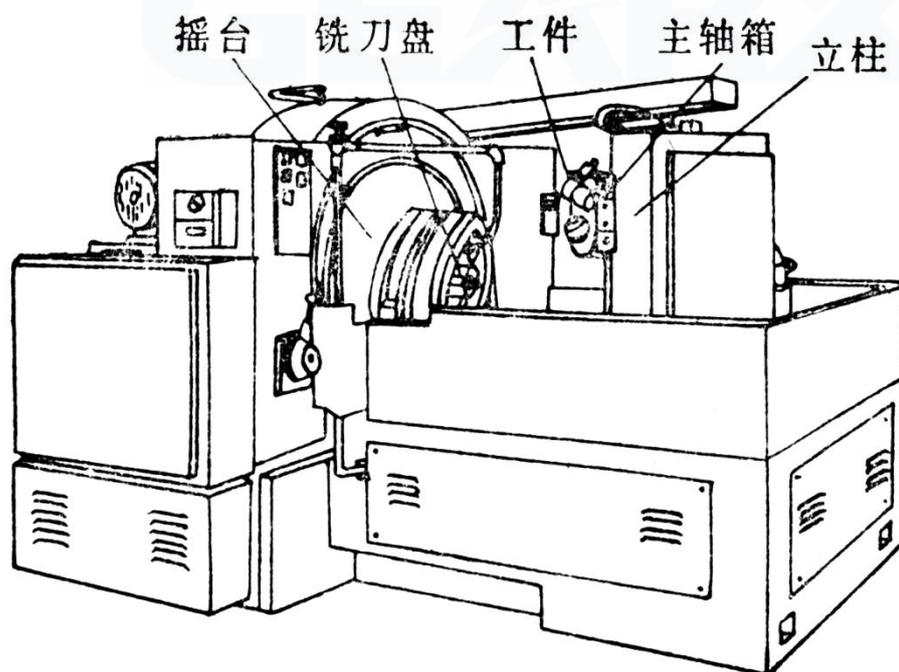


图 9-9

Gear generator of indexing

It is a kind of machine that cuts gear tooth under the guidance of duplicating method. The machine has automatic stop mechanism. It can process various involute, cycloid gear and lots types of groove shape workpiece. Gear generator of indexing is mainly used in gauge industry. The machining accuracy can reach over Class 7 and the surface roughness is $R_a 0.63 \sim 0.32 \mu\text{m}$. The module of domestically processed Y0312 gear generator of indexing processed is $m=0.08 \sim 0.5\text{mm}$, the diameter is $d_a=0.5 \sim 12\text{mm}$ and the tooth number is $z=6 \sim 60$.

End face gear generator

End face gear generator is a kind of machine that cut the tooth surface of transverse gear under generating method. This kind of machine has automatic feeder which makes the whole processing method automatically processed. It is mainly used in gauge and watch industry.

For domestically processed Y0801 end face gear generator, its maximum processing module is 0.5mm and the maximum processing diameter is 6mm.

NC (numerical program control) non-circular gear milling machine

It uses NC (numerical program control) system to cut the tooth surface of non-circular gear. In short, NC non-circular gear milling machine. When using the machine, one need to deduce the pitch line equation based on the pitch line equation of workpiece first, then calculates and programmes and records the quotation on piercing belt to transmit it to computer. Finally, the computer will turn it into pulse signal to control the operation of machine. NC system of machine sets four modes, they are “debugging”, “manual operation”, “marking out” and “processing” working mode. Except load and unload workpieces, every part can be operate automatically.

Prolate epicycloid bevel gear generator

It cuts tooth with prolate epicycloid bevel gear milling disc or end face milling disc with double blade based on generating method. When cutting tooth, the cradle, cutter disc and workpiece all rotates constantly and the cradle makes feeding motion at the same time. The rotation of facing cutter and workpiece make the latter get certain tooth number's continuous indexing and form tooth length curve. The rotation of cradle and the added motion of workpiece form generating motion and help the workpiece getting tooth profile curve.

Double cutter head straight bevel gear generator

It is a machine that is used to cut the two tooth surfaces of the same tooth space of straight bevel gear with double cutters. This kind of machine has high productivity and it is suitable for batch production. As there is no relative tooth-length-direction movement between facing cutter and workpiece, however, the bottom of the milled gullet presents circular arc shape. So the module and tooth width of the processed gear is limited.

Palloid gear generator

Palloid gear generator refers to machine that uses bevel shaped hobbing to cut palloid gear based on generating method. It is always called Germany KLINGELNBERG machine tool. The machine tool is equipped with stepless speed changes devices so as to secure the same speed cutting when it is working. When cutting the gear tooth, cradle, hobbing cutter and workpiece are all rotates constantly, and the rotation of cradle and workpiece create generating motion through the differential mechanism and it helps the workpiece get tooth profile curve that has equal height along tooth length.

Automatic indexing gear generator

It is a kind of machine that is used to process gear with small module, shaft gear, the tooth surface of sector gear and some other specific groove shape components based on duplicating method. Automatic indexing gear generator can use rough and precise tooth cutting technology to get smooth tooth profile surface. Except for indexing gear generator, the machine is also equipped with automatic stock feed devices, which could automate all the working process. It is mainly used in gauge instrument industry.

Universal spiral bevel gear finishing machine

Universal spiral bevel gear finishing machine can be precisely cut as well as roughly shaved.

GEARX