声　明

中等专业学校教材

轻机装备专业英语

郭晓洁　主编

中国轻工业出版社

图书在版编目（CIP）数据

轻机装备专业英语/郭晓洁编．－北京：中国轻工业出版社，1999.3
中等专业学校教材
ISBN 7-5019-2311-6

Ⅰ.轻… Ⅱ.郭… Ⅲ.轻工业：机械工业-设备-英语 Ⅳ.H31

中国版本图书馆 CIP 数据核字（1999）第 01219 号

责任编辑：龙志丹
策划编辑：龙志丹　**责任终审**：滕炎福　**封面设计**：赵小云
版式设计：丁　夕　**责任校对**：郎静瀛　**责任监印**：崔　科

*

出版发行：中国轻工业出版社（北京东长安街 6 号，邮编：100740）
印　　刷：北京交通印务实业公司
经　　销：各地新华书店
版　　次：1999 年 3 月第 1 版　　1999 年 3 月第 1 次印刷
开　　本：787×1092 毫米　1/16　印张：8
字　　数：179 千字　　印数：1—3 000
书　　号：ISBN 7-5019-2311-6/TS·1422　　定价：15.00 元

·如发现图书残缺请直接与我社发行部联系调换·

前　言

本书是根据全国轻工中专轻机装备专业教材建设与指导委员会1997年会议通过的《轻机装备专业英语》编写计划和大纲编写的，计划教学时数50学时。它用于中专学校轻机装备专业的专业英语课程，也可供其他相近专业及有关工程技术人员选用。

本书的目的旨在培养中专学生在学完基础英语之后初步阅读专业英文资料的能力。本书共由20课组成，每课有一篇课文，两篇阅读材料。根据轻机装备专业的课程特点以及本着由浅入深的原则，全书内容由材料力学、机械零件、金属加工、化工原理、轻机制造工艺、包装机械、轻机装备等英文资料组成。为了提高初学者的专业阅读速度，每课课文给出了必要的生词表和难句注释。考虑到学时的限制以及本书的特点，书中没有罗列有关科技英语的语法现象及翻译特点，其目的在于使学生尽可能快地增加专业词汇量，以提高阅读英文资料的速度，而不要拘泥于繁杂的语法现象，所以本书只能作为一本英文泛读教材供读者选用。教师可针对专业特点及学生英语水平程度有选择地安排教学。

本书由内蒙古轻工业学校郭晓洁主编，河北轻工业学校张广文、曾庆良参加编写。在编写过程中还得到了不少其他同志的帮助，在此表示真诚的感谢。本书由原轻工部广州轻校陈士范老师主审，对于他的支持和提出的宝贵意见我们表示衷心的谢意。另外，在本书的成稿过程中，我们参考并采用了大量的文献及著作，在此也对这些著、作者们一并表示谢意。

由于我们学识水平有限、经验不足，书中难免会存在错误和不足，诚恳地欢迎各位教师同行以及读者批评指正。

郭晓洁

1998年3月

Contents

LESSON ONE

Text

Engine Lathe

The lathe is a machine that removes material by rotating the work against a cutter. Parts to be machined can be held between centers, attached to a face plate, supported in a jaw chuck, or held in a draw-in chuck or collet. Though this machine is particularly adapted to cylindrical work, it may also be used for many other purposes. Plain surfaces can be obtained by supporting the work on a face plate or in a chunk. Work held in this manner can likewise be centered, drilled, bored or reamed. In addition, the lathe can be used for cutting threads and turning tapers; with the proper attachment, it can be adapted to simple milling or grinding operations. It is probably the oldest of all the machine tools as well as the most important machine in modern production.

Principal parts of an Engine Lathe

Bed. The main casting of an engine lathe is a horizontal member called a "bed". Planed surfaces on top of the bed, called "ways" or "vees", align the headstock and tailstock and guide the carriage so that it moves longitudinally parallel to the axis of the machine. Legs under the bed raise it so that the top is at a convenient working height above the floor. A chip pan under the bed collects chips and cutting fluid when one is used. [1)]

Headstock. The headstock of a lathe is a subassembly that is mounted on the inner ways at the left end of the bed. On a geared-head lathe, the headstock casting supports shafts and encloses a train of gears that rotate the headstock spindle at rpm[2)] which are suited to the operating conditions of the different jobs routed to the machine. Levers in the front of the headstock casting are employed to shift the gears into trains that will give the cutting speeds required.

The headstock or live spindle is the final shaft in the power transmission system. It supports and rotates workpieces about the axis of the lathe, that is, about the horizontal line which is fixed by the center line of the headstock spindle. [3)]

Tailstock. The tailstock is a subassembly that is mounted on the inner ways, at the right end of the bed, to align it with the headstock. It is adjustable on the bed longitudinally so that it may be positioned wherever needed to support workpieces that are held on centers and to hold twist drills, reamers, and other tools that may be used to perform operations on jobs that are held with a chuck or on the large faceplate.

The tailstock spindle is a hollow shaft that is mounted in the tailstock body. The left end of the hole is tapered to hold dead center on the tailstock to hold twist drills, etc., for doing work as mentioned above

Carriage. The lathe's carriage is a subassembly that is mounted on the outer ways of the machine between the headstock and tailstock. Its function is to hold and move the turning and boring tools that are used on the machine. The principal parts of the carriage are a saddle, cross slide, compound rest, tools post and apron.

Lead Screw. The lead screw is a precision-threaded shaft that extends from the gearbox across and in front of the bed and through the apron also. When threads are cut, the half-nut in the apron is closed over the lead screw to give a positive and uniform motion to the carriage, which is parallel to the axis of the lathe.

Sometimes the feed rod and lead screw are combined in one shaft that is both splined and threaded.

New Words and Expressions

1. lathe	n.	车床
engine lathe		卧式车床
2. rotate	v.	转动，旋转
3. likewise	adv.	也，同样
	conj.	也，而且
4. center	n.	中心，顶尖
	v.	钻中心孔，定心
5. face plate		花盘
6. chuck	n.	卡盘，夹盘；
	v.	卡紧
7. collet	n.	套筒
8. cylindrical	adj.	圆柱体的，圆筒形的
9. drill	v.	钻孔，穿孔
	n.	钻床，钻头
10. bore	v.	镗孔
11. ream	v.	铰孔
reamer	n.	铰刀
12. thread	n.	螺纹，螺旋线
	v.	车螺纹
13. taper	n.	圆锥，锥形
	adj.	锥形的
	v.	加工锥形
14. attachment	n.	附件，连接
15. grinding	n.	磨削

16.	headstock	n.	主轴箱，床头箱
17.	tailstock	n.	尾座，尾架
18.	carriage	n.	拖板，滑板
19.	longitudinal	adj.	纵向的
	~ly	adv.	
20.	parallel	adj.	平行的
21.	axis	n.	轴线，轴心
22.	convenient	adj.	方便的，合适的
23.	chip pan		盛屑盘
24.	subassembly	n.	部件，组件
25.	inner	adj.	内部的，内侧的
26.	shaft	n.	轴
27.	spindle	n.	主轴
28.	lever	n.	控制杆，杠杆
29.	workpiece	n.	工件
30.	horizontal	adj.	水平的
		n.	水平线，水平面
31.	hollow	adj.	空心的
32.	saddle	n.	床鞍，鞍座
33.	cross slide		横拖板
34.	compound rest		小刀架，复式刀架
35.	lead screw		丝杠
36.	gearbox	n.	齿轮箱
37.	apron	n.	溜板箱
38.	tool post		刀座，刀架
39.	half-nut		开合螺母
40.	positive	adj.	确定的，肯定的
41.	feed rod		光杠
42.	uniform	adj.	相同的，不变的

Notes

1) A chip pan under the bed collects chips and cutting fluid when one is used. 其中 one 指的是 A chip pan。

2) rpm: revolutions per minute 每分钟转数。

3) It supports and rotates workpieces about the axis of the lathe, that is, about the horizontal line wich is fixed by the center line of the headstock spindle. 主轴用来安装工件，并使工件绕车床轴线旋转，即绕由床头箱主轴中心线所确定的水平线旋转。It 指上句中的 headstock or live spindle。

Reading Materials

(A) Lathe Cutting Tools

The shape and geometry of the lathe tools depend upon the purpose for which they are employed. Turning tools can be classified into two main groups, namely, external cutting tools and internal cutting tools. Each of these two groups include the following types of tools:

Turning tools. Turning tools can be either finishing or rough tools. Rough turning tools have small nose radii and are employed when deep cuts are made. On the other hand, finishing tools have larger nose radii and are used for obtaining the final required dimensions with good surface finish by making slight depths of cut. Rough turning tools can be right-hand or left-hand types, depending upon the direction of feed. They can have straight, bent, or offset shanks.

Facing tools. Facing tools are employed in facing operations for machining plane side or end surfaces. There are tools for machining left-hand-side surfaces and tools for right-hand-side surfaces. Those side surfaces are generated through the use of the cross feed, contrary to turning operations, where the usual longitudinal feed is used.

Cutoff tools. Cutoff tools, which are sometimes called parting tools, serve to separate the workpiece into parts and/or machine external annual grooves.

Thread-cutting tools. Thread-cutting tools have either triangular, square, or trapezoidal cutting edges, depending upon the cross section of the desired thread. Also, the plane angles of these tools must always be identical to those of the thread forms. Thread-cutting tools have straight shanks for external thread cutting and are of the bent-shank type when cutting internal threads.

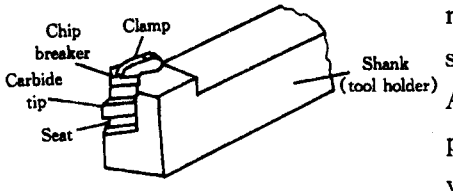

Fig. 1-1 A carbide tip fastened to a tool holder

Form tools. Form tools have edges especially manufactured to take a certain form, which is opposite to the desired shape of the machined workpiece. An HSS tool is usually made in the form of a single piece, contrary to cemented carbides or ceramice, which are made in the form of tips. The latter are brazed or mechanically fastened to steel shanks. Fig. 1-1 indicates an arrangement of this late type. Which includes the carbide tip, the chip breaker, the pad, the clamping screw (with a washer and a nut), and the shank. As the name suggests, the function of the chip breaker is to break long chips every now and then, thus preventing the formation of very long twisted ribbons that may cause problems during the machining operation. The carbide tips (or ceramic tips) can have different shapes, depending upon the machining operations for which they are to be employed. The tips can either be solid or with a central through hole, depending whether brazing or mechanical clamping is employed

for mounting the tip on the shank.

(B) Primary Motion and Feed Motion

A machine tool provides relation movement between the cutting tool and the workpiece. Material is removed in this process to produce a part of the desired shape.

Broadly speaking, two kinds of relative motion must be provided by a machine tool to produce various desired shapes - the primary motion and feed motion. Combination of these two motions will lead to a chip removal and the creation of a machined surface with desired geometry. As a rule, the primary motion absorbs most of the total power which is required to perform a machining operation. The feed motion may proceed by steps or continuously and absorbs a small proportion of the total power.

In turning a workpiece, primary motion, the rotation of the workpiece, is provided by the movement of a series of gears driving the main spindle, the tool feeds and traverse along the axis of the rotation of the part. By using various types of tools and feeding them along the axis of the spindle, boring and drilling may be performed on a lathe. The process of planing and shaping is removing metal in a series of straight cuts. The main motion is reciprocating and the feed is normal (perpendicular) to the direction of the main motion. Both shapers and planers employ a reciprocating cutting action to produce flat or contoured surfaces. In planing, the work is given a linear motion while the tool remains motionless during the cutting stroke and is provided with a lateral feeding movement during the return stroke. In the case of the shaper, the kinematical relationship between work and tool is reversed; however, the cutting action principle is the same. Drilling consists of rotating a cutting tool and advancing the tool along its own axis into a stationary workpiece to produce a round hole. Of the two function, advancing the tool along its axis is the major consideration in the design of drilling machines. Rotating the drill is, by comparison, a simple matter.

LESSON TWO

Text

Milling

Milling is a machining process that is carried out by means of a multiedge rotating tool known as a milling cutter. In this process, metal removal is achieved through combining the rotary motion of the milling cutter and linear motions of the workpiece simultaneously.[1] Milling operations are employed in producing flat, contoured and helical surfaces as well as for thread-and gear-cutting operations.

Each of the cutting edges of a milling cutter acts as an individual single-point cutter when it engages with the workpiece metal. Therefore, each of those cutting edges has appropriate rake and relief angles. Since only a few of the cutting edges are engaged with the workpiece at a time, heavy cuts can be taken without adversely affecting the tool life. In fact, the permissible cutting speeds and feeds for milling are three to four times higher than those for turning or drilling. Moreover, the quality of the surfaces machined by milling is generally superior to the quality of surfaces machined by turning, shaping, or drilling.

A wide variedly of milling cutters is available in industry. This, together with the fact than a milling machine is a very versatile machine tool, makes the milling machine the backbone of a machining workshop.

As far as the direction of cutter rotation and workpiece feed are concerned, milling is performed by either of the following two methods.

Up milling (conventional milling). In up milling the workpiece is fed against the direction of cutter rotation, as shown in Fig. 2-1 (a). As we can see in that figure, the depth of cut (and consequently the load) gradually increase on the successively engaged cutting edges. Therefore, the machining process involves no impact loading, thus ensuring smoother operation of the machine tool and longer tool life. The quality of the machined surface obtained by up milling is not very high. Nevertheless, up milling is commonly used in industry, especially for rough cuts.

Down milling (climb milling). As can be seen in Fig. 2-1 (b), in down milling the cutter rotation coincides with the direction of feed at the contact point between the tool and the workpiece.[2] It can also be seen that the maximum depth of cut is achieved directly as the cutter engages with the workpiece. This results in a kind of impact, or sudden loading. Therefore, this method cannot be used unless the milling machine is equipped with a backlash eliminator on

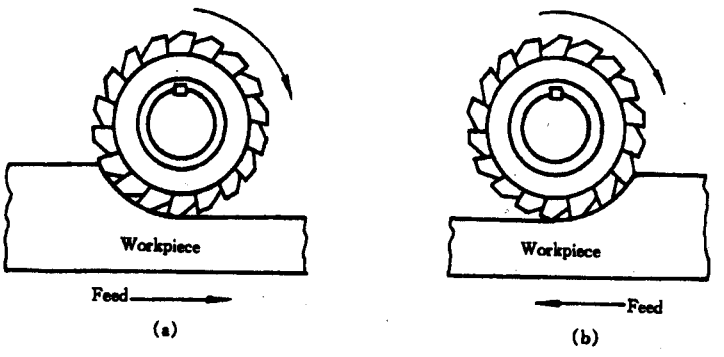

Fig. 2-1 Milling methods
(a) Up milling (b) Down milling

the feed screw.[3] The advantages of this method include higher quality of the machined surface and easier clamping of workpieces, since the cutter forces act downward.

New Words and Expressions

1. multiedge	n.	多刃
2. removal	n.	移动，切削，切除
3. combine	v.	联合，结合
4. simultaneous	adj.	同时的，同步的
5. flat	n.	平面
6. contour	adj.	仿形的，靠模的
7. helical	n.	螺旋面
	adj.	螺旋的
8. individual	adj.	个别的，单一的
9. appropriate	adj.	适当的，合适的
10. rake angle		前角
11. relief angle		后角
12. adverse	adj.	有害的，相反的
13. permissible	adj.	容许的，许可的
14. moreover	adv.	况且，并且，此外
15. superior	adj.	高级的，优秀的
be～to		胜过，优于
16. shaping	n.	刨削
17. versatile	adj.	通用的，万能的，多用途的
18. backbone	n.	骨干，主要成分
19. concern	v.	影响
	n.	关系

20.	conventional	adj.	惯用的，平常的
	~milling		逆铣
21.	successive	adj.	连续的，顺序的
	~ly	adv.	
22.	impact	n.; v.	碰撞，冲击
	~loading		冲击载荷
23.	nevertheless	adv.; conj.	尽管如此，不过
24.	climb	v.; n.	攀登，爬
	~milling		顺铣
25.	coincide	vi.	与…一致（相同）
26.	contact	n.	接触，连接
27.	equip	vt.	装备
	be equipped with		装备有…，安装着…
28.	backlash	n.	间隙
29.	eliminator	n.	消除器
	backlash~		螺纹间隙消除装置
30.	recommend	v.	推荐，介绍
31.	cast	n.	铸件
32.	forging	n.	锻件，锻造

Notes

1) In this process, metal removal is achieved through combining the rotary motion of the milling cutter and linear motions of the workpiece simultaneously.

在这种工艺中，金属的切除是通过铣刀的旋转运动和与此同时进行的工件的直线运动的组合来实现的。

2) in down milling the cutter rotation coincides with the direction of feed at the contact point between the tool and the workpiece.

顺铣时，在刀具和工件接触点上的旋转方向与进给方向一致。

3) Therefore, this method cannot be used unless the milling machine is equipped with a backlash eliminator on the feed screw.

因此，这种方法只能用在在进给丝杠上安装了螺纹间隙消除装置的铣床上。

Reading Materials

(A) Milling Machine

The milling machine is a machine that removes metal from the work with a revolving milling cutter as the work is fed against it.

The milling cutter is mounted on an arbor where it is held in place by spacers or bushings. The arbor is fixed in the spindle with one end, while the other end of the arbor rotates in the

bearing mounted on the arbor yoke.

The principal parts of various types of machines will vary. Those described here are for column-and-knee-type machines (Fig. 2-2).

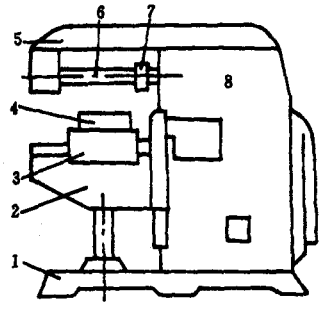

Fig. 2-2 A sketch of a plain horizontal knee-type machine
1—base 2—Knee 3—Saddle 4—Table 5—Overarm 6—Arbor 7—Spindle 8—Column

The base is the foundation of all machines and is the part upon which all other parts are mounted. It gives the machine rigidity and strength. It may also serve as a reservoir for cutting fluid.

The column is the main supporting frame. The motor and much of the driving mechanism are contained with the column. The front is a machined surface called the column face. It supports and guides the knee in its vertical travel.

The spindle of the milling machine is driven by an electric motor through a train of gears mounted in the column. The spindle nose has a tapered hole and two driving keys which locate and drive the arbor. Cutters of the end -mill type may be mounted directly in the spindle nose.

The knee projects from the column and slides up and down on its face. It supports the saddle and table and is partially supported by the elevating screw which adjusts its height. It also contains some of the mechanism for moving and controlling the saddle and table. Clamps on the face keep the knee from shifting under the load after the screw is adjusted.

The table rests on ways on the saddle and travels longitudinally in a horizontal plane. It supports the workpiece, fixtures, and all other equipment. The working surface is provided with longitudinal T slots for clamping work or fixtures.

The arbor is an accurately machined shaft for holding and driving the arbor-type cutter. It is tapered at one end to fit the spindle nose and has two slots to fit the nose keys for locating and driving it. When it is in place, a draw-in bolt is threaded into the tapered end from the rear of the machine, holding the arbor tightly in place. The outer end is supported by an overarm support in a proper bearing. It has a keyway running its length and is supplied with a variety of collars or spacers which enable exact location of cutters. Very thin shims may be used to position the cutters to the last thousandths.

The overarm is mounted on and guided by the top of the column. It is adjusted in and out by hand to the position of maximum support for the arbor and then clamped. Braces from the saddle or knee may be used to give added rigidity to the overarm and thus contribute to the accuracy of the work. This is particularly desirable when taking heavy cuts or when mounting several cutting at the same time.

(B) Types of Milling Machines

There are several types of milling machines employed in industry. They are generally classified based on their construction and design features. They vary from the common general-

purpose types to duplicators and machining centers that involve a tool magazine and are capable of carrying out many machining operations with a single workpiece setup. Following is a survey of the milling machine types commonly used in industry.

Plain horizontal milling machine The construction of the plain horizontal milling machine is very similar to that of the universal milling machine except that the machine table cannot be swiveled. Plain milling machines usually have column and knee-type construction and also have three table motions, i. e., longitudinal, transverse, and vertical. The milling cutter is mounted on a short arbor, which is, in turn, rigidly supported by the overram of the milling machine.

Universal milling machine The construction of a universal milling machine is similar to that of the plain milling machine, except that it is more accurate and has sturdier frame, and its table can be swiveled with an angle up to 50. Universal milling machines are usually equipped with an index or dividing head, which allows cutting of gears and cams.

Vertical milling machine As the name vertical milling machine suggests, the axis of the spindle that holds the milling cutter is vertical. Table movements are generally similar to those of plain horizontal milling machines; however, an additional rotary motion is sometimes provided for the table to enable machining helical and circular grooves. The cutters used with vertical milling machines are almost always of the end mill type.

Duplicators A duplicator is sometimes referred to as copy milling machine because it is capable of reproducing an exact replica of a model. The machine has a stylus that scans the mode, at which time counterpoints on the part are successively machined. Duplicators were used for the production of large forming dies for the automotive industry, where models made of wood, plaster of Paris, or wax were employed. Duplicators are not commonly used in industry nowadays because they have been superseded by the CAD/CAM systems.

Machining centers Machining centers are multipurpose NC machines that are capable of performing a number of different machining processes at a time. A machining center has a tool magazine in which many tools are held. Tool changes are automatically carried out, and so are functions such as coolant on or off. Machining centers are, therefore, highly versatile and are employed to perform a number of machining operations on a workpiece with a single setup. Parts having intricate shapes can easily be produced with high accuracy and excellent repeatability.