现代工程专业英语系列

机电工程专业英语

Fundamental and New Concepts for Mechanical and Electrical Engineering

主编◎李庆芬 副主编◎朱世范 陈其廉

哈尔滨工程大学出版社
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内容简介

本书较全面地介绍了“机械设计、制造及自动化”专业的有关知识。选材基本上涵盖了机电工程专业的学科领域，包括机械设计与制造的基本知识，机械加工及成型技术，自动化技术及现代设计制造等内容，还包括了绿色设计等新的技术理念。所有文章均选自英美原版书籍和期刊，部分选自英美大学机械系教材——Machine Design Theory and Practice。本书可作为高等院校机械工程，机电工程，机械设计、制造及自动化等领域的本科生和研究生的专业英语教材，也可供有关专业的工程技术人员使用。

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前言

PREFACE

机电工程专业英语是机电工程专业的一门重要的基础课。对于机电工程专业的本、专科学生和研究生，以及从事相关专业工作的工程技术人员来说，熟练掌握专业英语对于促进国际交流，了解国外机电工程专业的最新发展动态，是十分必要的，并且有着越来越重要的意义。随着计算机辅助设计的兴起和国际互联网的发展，专业英语的学习更为迫切，为了满足机电工程专业英语的教学需求，我们编写了《机电工程专业英语》一书。

机电工程是一门交叉学科，内涵丰富，涉及面广。本书的选材是在有限的篇幅内尽可能地涵盖机电工程专业的学科领域。全书共分五个单元，第一单元介绍了机械加工与制造的基本知识，如机床与加工、初加工工艺、精加工工艺、铸造、锻造、焊接、塑料成型等；第二单元介绍了机械设计的基本知识；第三单元介绍了自动化技术的相关知识，如数控技术及软件、自动化系统、机器视觉等；第四单元介绍了现代设计与制造技术，包括微机电系统、柔性制造系统、CAD/CAM/CIMS 及绿色设计等新的设计制造技术和理念；第五单元介绍了其他一些相关知识，如工程图、纳米技术、断裂机理及市场调研等。

本书由哈尔滨工程大学机电工程学院的李庆芬、朱世范和陈其廉共同编写。其中李庆芬负责全书的结构及第一单元，陈其廉负责第二、三单元的编写，朱世范负责第四、五单元的编写，李赫担任本书主审。

由于时间仓促，水平有限，书中难免有错误和不当之处，敬请读者批评指正。

编者

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Unit One Fundamentals of Manufacturing Techniques

机械制造基本知识

Lesson 1 Machine tools

机　床

1.1 The Engine Lathe 普通车床

Lathe size is determined by the swing and the length of the bed (Fig. 1 – 1 – 1). The swing is twice the distance from the live center point of the spindle to the top of the bed, or the largest diameter that can be turned over the ways of a lathe. For example, a 10-in. lathe will turn a 10-in. diameter workpiece over the ways, but not over the carriage cross-feed slide. Sometimes two numbers are used to indicate swing, such as 17 – 12. The 17-in. swing would be over the bed and the 12-in. swing over the cross slide.

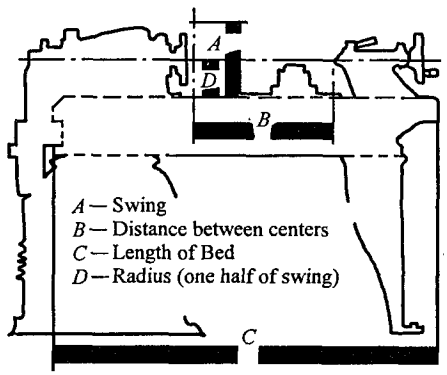

Fig. 1 – 1 – 1 Size is indicated by swing and the length of the bed

The length of the bed includes the part the headstock rests on. It determines also the distance between centers. A typical size might be a 3-foot bed with a distance of 23 in. between centers. Lathe beds are offered in many different lengths for each available swing size.

A lathe should have a swing capacity and distance between centers that is at least 10 percent greater than needed to do any job that may be required. Standard lathes come in a variety of designs and styles and may have a swing changing from about 9 to 53 in. They are generally classified as small, medium swing, and heavy duty.

The bed is the base or foundation of the lathe. It is a heavy, rigid casting made in one piece. It is the "backbone" of the lathe and holds or supports all the other parts. Located on the top of

the bed are ways. More expensive lathes have a combination of V ways and flat ways. Less expensive lathes have flat ways only. Construction of ways varies according to the make. Some builders use ways made of hardened steel that can be replaced if necessary. Others use flame-hardened ways that are an integral part of the bed section.

The headstock assembly is permanently fastened to the left end of the lathe. It contains the headstock spindle, which is rotated by gears or by a combination of gears and pulleys. The spindle holds the attachments which, in turn, hold and turn the workpiece. Spindles come in several quality ratings and are supported in headstocks by three to five bearings. Since the accuracy of the work done on a lathe depends on the axis of rotation of the spindle holding the workpiece, the spindle and all its accessories must be built and assembled with the greatest possible care.

The tailstock can be moved along the bed ways and clamped in position. It consists of two castings or main parts. The lower part rests directly on the ways, and the upper part rests on the lower part. Adjusting screws hold the parts together. The upper casting can be moved toward or away from the operator to offset the tailstock for taper turning and to realign the tailstock center for straight turning. The tailstock spindle moves in and out of the upper casting when the tailstock handwheel is turned. This spindle has a taper hole into which the dead center or other tools such as drills and reamers fit. Only tools having the same taper as the tailstock spindle should be placed in the spindle hole. To remove tools from the spindle, it is only necessary to back up on the handwheel until the spindle end is nearly inside the casting. The end of the screw that moves the spindle loosens the taper shank so it can be removed.

The carriage consisting of the saddle and apron is the movable part which slides between the headstock and tailstock. It controls and supports the cutting tool.

1.2 Drilling Machines 钻床

Cutting round holes in metal stock is one of the most common operations performed in the machine shop. Very few metal pieces go through a factory without having holes drilled in them. Later operations are often located by referring to these holes. Drilling machines are used to produce most of these holes. They are also used in operations such as reaming, boring, countersinking, counterboring, and tapping (Fig. 1 - 1 - 2).

The size of a drilling machine is expressed in one or more of the following four ways:

1. By the diameter of the largest disk that can be center drilled. An 18-in. drill press, for example, can drill a hole through the center of an 18-in. diameter disk.

2. By the distance the spindle moves up and down.

3. By the maximum distance between the spindle and table.

4. By the distance from the column to the center of the spindle.

The principal parts of the drill press are the base (or lower table), column, table, and head. The heavy metal base and upright column have the table and drill head attached. The drill head consists of the main operating parts, including the speed and feed mechanisms, the motor, the

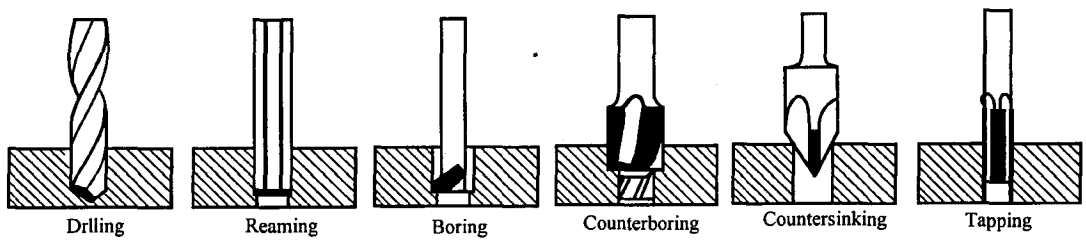

Fig. 1 – 1 – 2 The six common operation that can be done on drilling machine

spindle, and the quill.

There are several types of mechanisms used to control the speed of a drilling machine. The simplest arrangement utilizes a belt for transferring power from a four-step, five-step, or six-step V pulley located on the motor to a similar pulley attached to the drill press spindle. To increase power on some belt and pulley machines, a countershaft drive is sometimes added. Another mechanism used is the variable-speed pulley, which makes it possible to change the machine's speed without stopping it. In fact, the speed must only be changed while the machine is running. Pulleys of a variable-speed drive are made of two parts having V-shaped sides. By means of an adjusting screw attached to a crank wheel, one side of the driver pulley may be opened or spread apart. As it spreads, the belt moves inward toward the smaller diameter, producing slower speed in the driven pulley that has closed to make a larger pulley. As the sides of driver pulley are brought together, the belt is forced outward toward the larger diameter. This increases the speed of the driven pulley that opens to make the smaller pulley (Fig. 1 – 1 – 3).

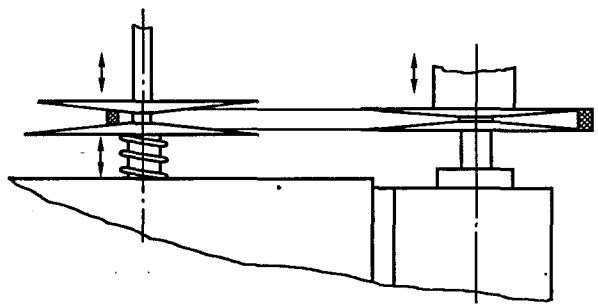

Fig. 1 – 1 – 3 Variable-speed drive

The feed on most drill presses is hand controlled with a hand-feed lever. An automatic power feed attachment is available for some drill presses.

The spindle, which rotates and moves the cutting tool up or down, may have either a taper hole or a threaded end. Small drill presses usually have a threaded or short taper end on the spindle for attaching a drill chuck. Most medium-sized floor-type drill presses have a self-holding (No. 1 or No. 2 Morse taper) hole. Taper-shank cutting tools fit directly into this taper hole. Straight-shank cutting tools must be held in a drill chuck. A depth gage and stop, mounted on the

quill, can be set when drilling holes to a certain depth.

Drill presses are normally equipped with a table that can be tilted to the right and left. Some heavier duty machines, however, have a table with an oil ring around its edge and often a T slot for clamping work. This type of table cannot be tilted.

Self – test

1. Lathe size is determined by _____ and length of the bed.
   A. diameter B. swing C. radius d. height
2. Standard lathes come in a variety of designs and _____ and may have a swing changing from about 9 to 53 in.
   A. makes B. types C. models D. styles
3. The _____ is the base or foundation of the lathe.
   A. bed B. headstock C. spindle D. cutting tool
4. The headstock assembly is permanently fastened to the _____ end of the lathe.
   A. right B. upper C. left D. lower
5. Cutting round holes in metal _____ is one of the most common operations performed in the machine shop.
   A. part B. bar C. workpiece D. stock
6. The _____ on most drill presses is hand controlled with a hand-feed lever.
   A. feed B. depth C. motion D. clamping
7. Pulleys of a variable-speed drive are made of two parts having V-shaped _____.
   A. sides B. edges C. parts D. lines
8. Small drive presses usually have a threaded or short _____ end on the spindle attaching a drill chuck.
   A. square B. taper C. rectangular D. round
9. Drill presses are normally equipped with a table that can be _____ to the right and left.
   A. turned B. rotated C. lifted D. tilted

关键字解释

Engine lathe: the versatile engine lathe ranges in size and design from small bench and speed lathes to large floor types. The workpiece may be held between tapered centers and rotated with the powder spindle by means of a clamping device, or it may be held in a chuck, or even fixed to a rotating plate. When the work is swung between centers, the tailstock is clamped firmly in place.

普通车床:多用途的车床,其大小和设计多种多样,有小的台式车床,高速车床,大的落地式车床,工件支在两个锥形的顶尖之间。通过夹紧装置随主轴一起转动,或者工件装在夹盘上,甚至可固定在一个转盘上。当工件在两个顶尖之间转动时,尾轴则保持不动。

Headstock: a part of a lathe that holds the revolving spindle and its attachment.

主轴箱:车床的一部分,其上安装有主轴及附件。

Tailstock: the adjusted or sliding head of a lathe containing the dead center.

尾架:车床上可调节的或滑动的头架,里面有死顶尖。

Center:one of two tapered metal rods that support work in a lathe or grinding machine and about or with which the work revolves.

顶尖:车床或磨床上两个锥形金属棒中的一个,它用来支持工件,工件围绕着顶尖转动,或依靠顶尖转动。

Spindle:a short shaft is a spindle. It may be slender or tapered, a spindle is capable of rotating or of having a body rotate upon it.

主轴:主轴是一个较短的轴,可能是细长的,也可能是锥形的,主轴能转动,或者有一物体绕其转动。

Countershaft:a secondary shaft that is driven by a main shaft and from which power is supplied to a machine part.

副轴:从动轴,由主动轴带动,将动力传到机器零件上。

Reaming:a manufacturing process in which a multi-cutting-edge tool is used to enlarge or accurately size and finish an existing hole in solid material by remove of a small amount of stock.

铰孔:一种加工工艺,使用多刃刀具对预先钻过的孔进行扩孔,或者使其达到一定的尺寸精度及光洁度,铰孔只切去少量的原材料。

Boring:a machining process that increases the size of an existing hole in a workpiece. The usual purpose of boring is to machine a hole to a desired diameter while obtaining required accuracy and finish.

镗孔:一种加工工艺,增加工件中原有孔的尺寸。镗孔的一般目的是将原有孔加工到所需的直径,同时获得要求的精度和光洁度。

词　汇

1. lathe	*n.* 车床
2. swing	*n.* 最大的回转直径,车床床面上的最大加工直径
3. spindle	*n.* (心,主)轴
4. diameter	*n.* 直径
5. headstock	*n.* 头架,车床头,车头箱,主轴箱[头]
6. foundation	*n.* 基础[地,金],(底,机)座
7. rigid	*adj.* 刚性的,坚固的,硬式的
8. casting	*n.* 铸件[锭,模],铸造(法)
9. backbone	*n.* 脊骨,构架,支柱
10. way	*n.* 滑道,槽,导轨
11. make	*n.* 种类,型号,牌号
12. integral	*adj.* 整体的
13. fasten	*v.* (使)固定,连接
14. gear	*n.* 齿轮,(齿轮)传动装置,起落架
15. pulley	*n.* 皮带轮,滑轮

16. attachment　*n.* 附[配,备]件,夹具
17. bearing　*n.* 轴承(座),支撑[座,架]
18. accessory　*n.* 附[零,配,备]件,辅助设备
19. assemble　*v.* 装配[备],安装,总装
20. tailstock　*n.* 尾架[座],后顶尖[针]座
21. clamp　*n.* 夹(紧,持,住),卡紧,定位
22. screw　*n.* 螺旋[钉,丝,杆],丝杆
23. handwheel　*n.* 手轮
24. reamer　*n.* 铰刀,锪钻
25. shank　*n.* (刀,手)柄
26. carriage　*n.* (支,车)架,刀架,机床的拖板
27. live center　机床活顶尖
28. carriage cross-feed slide　拖板横向进给滑道
29. heavy duty　*adj.* 重型的
30. hardened steel　淬火[淬硬]钢
31. flame-hardened　*adj.* 火焰淬火的
32. taper turning　圆锥车削
33. dead center　死点,死顶尖
34. stock　*n.* 原料,毛坯
35. reaming　*n.* 铰[扩]孔
36. boring　*n.* 镗[穿,扩]孔
37. countersinking　*n.* 钻(埋头)孔
38. counterboring　*n.* (用平底扩孔钻)扩孔
39. tapping　*n.* 攻丝,攻出螺纹
40. disk　*n.* (圆,轮)盘,圆片[板,面]
41. column　*n.* (圆,立,支)柱
42. quill　*n.* 主[钻,套管,空心]轴
43. mechanism　*n.* 机(械结)构,(机械)装置
44. belt　*n.* (皮,布,钢,传动,子弹,地)带
45. transfer　*v.* 传递[导,送,输,动,热]
46. power　*n.* (动,电,能)力,功率
47. pulley　*n.* 皮带轮,滑轮
48. countershaft　*n.* 副[中间,并行]轴
49. crank　*n.* 曲柄[臂],曲轴,手[摇]柄,摇把
50. lever　*n.* (杠,拉,控制)杆,(手)柄
51. threaded　*adj.* 车[刻]螺纹的
52. chuck　*n.* 夹盘[具,头],卡头[盘]
53. gage = gauge　*n.* (测量仪)表,(计)量[传感]器,量测仪器
54. stop　*n.* 挡块
55. mount　*v.* 安装,装配