



§ 3 键、花键和销联接

Key, spline and pin joints

§ 3-1 键联接 Key joints

§ 3-2 花键联接 Spline joints

§ 3-3 销联接 Pin joints



§ 3-1 键联接 Key joints

➤ 分类 Types of the key joints

➤ 平键联接的尺寸选择和强度计算

Option of sizes and strength calculations for straight key joints



一、分类 Types of the key joints

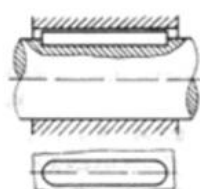
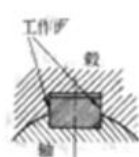


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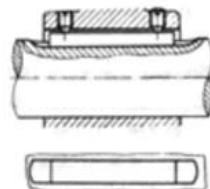
1. 普通平键联接

Ordinary straight key joints



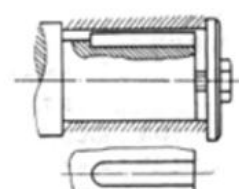
a) 圆头 (A型)

Rounded end



b) 方头 (B型)

Square end



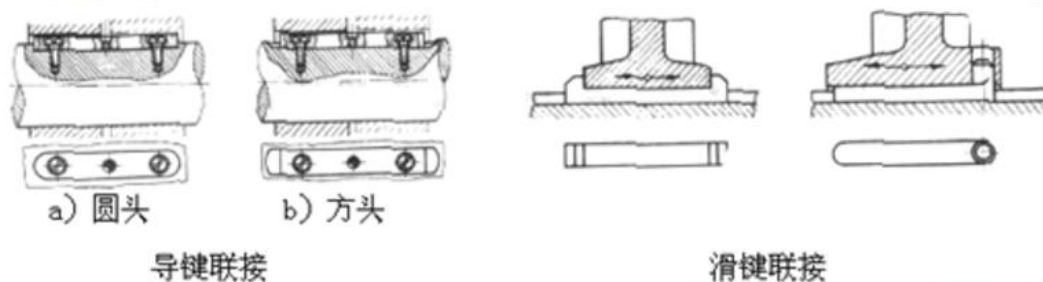
c) 圆一方头 (C型)

One rounded and one square end



2. 导向平键和滑键

Guiding and sliding straight key

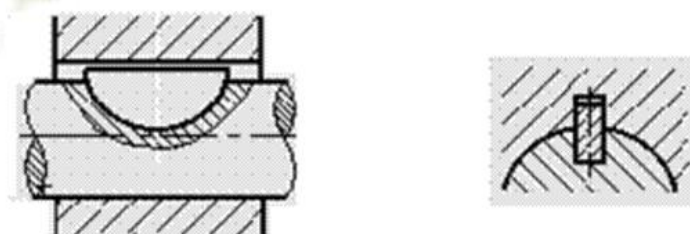


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3. 半圆键 Woodruff key



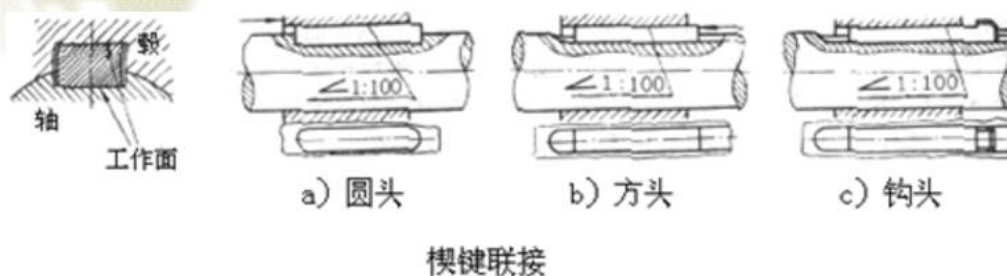
半圆键联接

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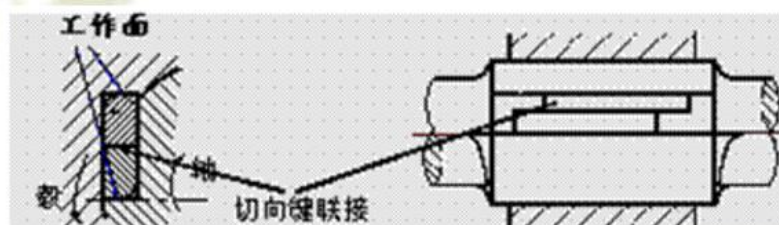
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4. 楔键联接 Taper key joint



5. 切向键联接 Tangent double-taper key joint





二、平键联接的尺寸选择和强度计算

Selection of sizes and strength calculations for straight key joints

1、失效形式Types of failure

(1)主要失效形式 The main types of failure:

工作面压溃Crushing（静联接 Fixed joints）

工作面磨损 Wear（动联接 Sliding joints）



❖ (2)有时：键剪断shear failure of the key（一般不计算，重要时验算 No such strength calculations are required in designing.）

工作面的压溃或磨损发生在键、轴和毂三者中较弱的零件上，一般为毂。Crushing or wear of the operating surfaces usually take place on the elements of which the strength is weakest among the key, shaft and hub. And it usually occurs on the hub.



2. 计算公式 Calculations

$$\sigma_p = \frac{2T}{dh'l'} \approx \frac{4T}{dhl'} \leq [\sigma]_p$$

$$p = \frac{2T}{dh'l'} \approx \frac{4T}{dhl'} \leq [p]$$



3. 平键联接的计算步骤

Design procedure for straight key joints

由工作情况选A, B, C型 → 由轴的直径d选键的高h和宽b

→ 由轮毂宽度B选键长l → 强度校核

若校核后发现强度不够, 可采取下列措施:

1. 增大轴径d 以增大b, h ;
2. 增大B以增大l;
3. 改变键的材料使其许用应力增大;
4. 用双键 (180度方向布置, 按1.5个键强度校核)



§ 3-2 花键联接 Spline joints

依靠轴和毂上齿的互压传递转矩，可用于动联接和静联接。

The teeth of shaft and hub press each other, through which the torque is transmitted. The spline joints can be used for both fixed and sliding joints.

- 花键联接的特点 Features of spline joints
- 花键联接的分类 Types of spline joints



一、花键联接的特点

Features of spline joints

与平键联接相比较，花键联接有以下特点：

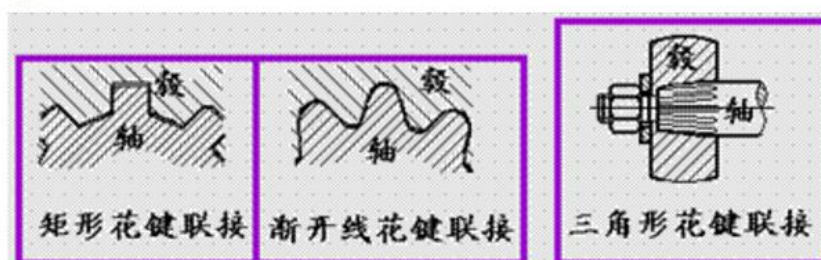
1. 齿对称分布，使轴毂受力匀称。Uniform force distribution
2. 齿根的应力集中较小，被联接件强度削弱较少，具有较高的承载能力。Less stress concentration
3. 被联接件能得到较好的定心，轴上零件沿轴移动时能得到较好的导引，且零件互换性易保证。More accurately centered
4. 齿的制造要用专门的设备和工具，使其应用受到限制。

Teeth are difficult to be manufactured



二、花键联接的分类 Types of spline joints

(矩形花键 Rectangle spline、渐开线花键 Involute spline 、三角形花键 Triangle spline)

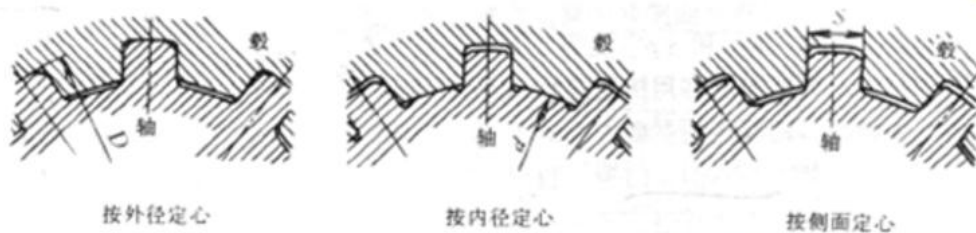


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三、花键的定心方式 Centering methods of spline



Major diameter fit

Minor diameter fit

Fit on sides of spline

矩形花键定心方式

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按外径定心

按齿形定心

Major diameter fit

Side fit

渐开线花键定心方式



§ 3-3 销联接 Pin joints

- 销联接的功用 Functions of pin joints
- 销的分类 Types of pin joints



一、销联接的功用 Functions of pin joints

- (1) 定位 Locating
- (2) 安全装置 Safety device
- (3) 传递不大的载荷 Transmit relatively small loads

用作联接的销，其设计时，根据联接的构造和工作要求选择销的类型、材料、尺寸，并作适当的强度验算。用作安全装置的销，尺寸按过载时被剪断的条件决定。

定位销通常不受或只受很小的载荷，尺寸由经验决定。同一面上的定位销至少要用两个。



二、销的分类 Types of pin

- (1) 普通圆柱销 Plain cylindrical pins

(多次装拆，定位精度下降)

Locating precision is lowered after disassembled many times

- (2) 普通圆锥销 Plain taper pins

(锥度1: 50、自锁、可以多次装拆)

With a taper of 1:50, selflocking,

may be disassembled for many times)



❖ (3) 特殊形式销 Special types of pin

❖ ① 孔未开通或拆卸困难

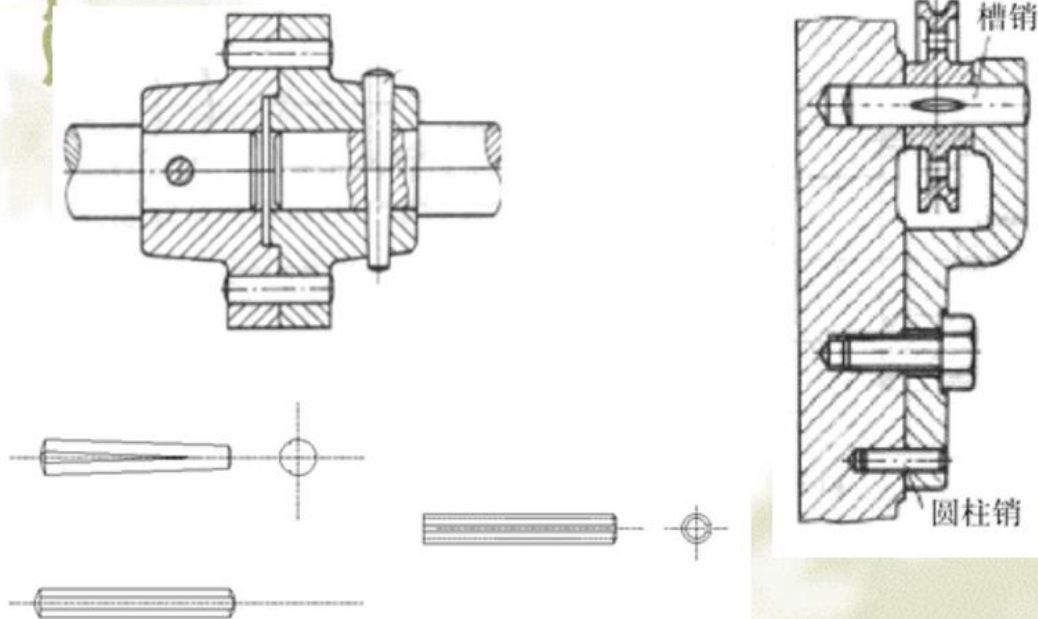
时：螺尾锥销 With thread for

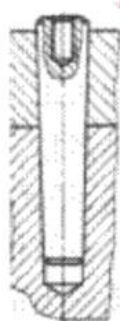
disassembly

② 冲击、振动或变载荷

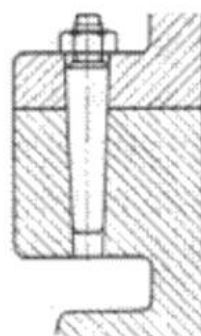
时：开尾锥销、槽销或弹性圆柱销

(防松) With open slot for fastening

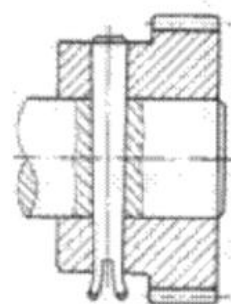




a) 内螺纹圆锥销



b) 螺尾圆锥销



c) 开尾圆锥销

几种特殊结构的圆锥销