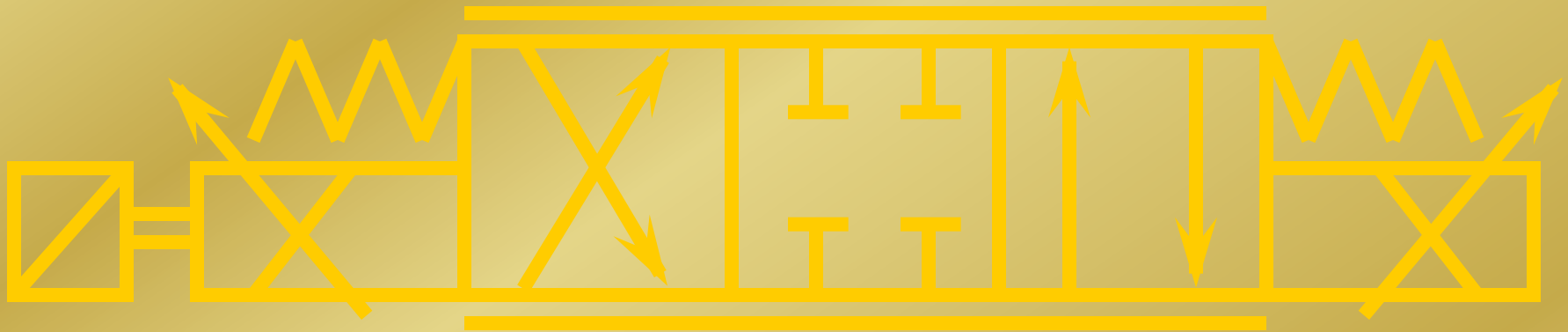


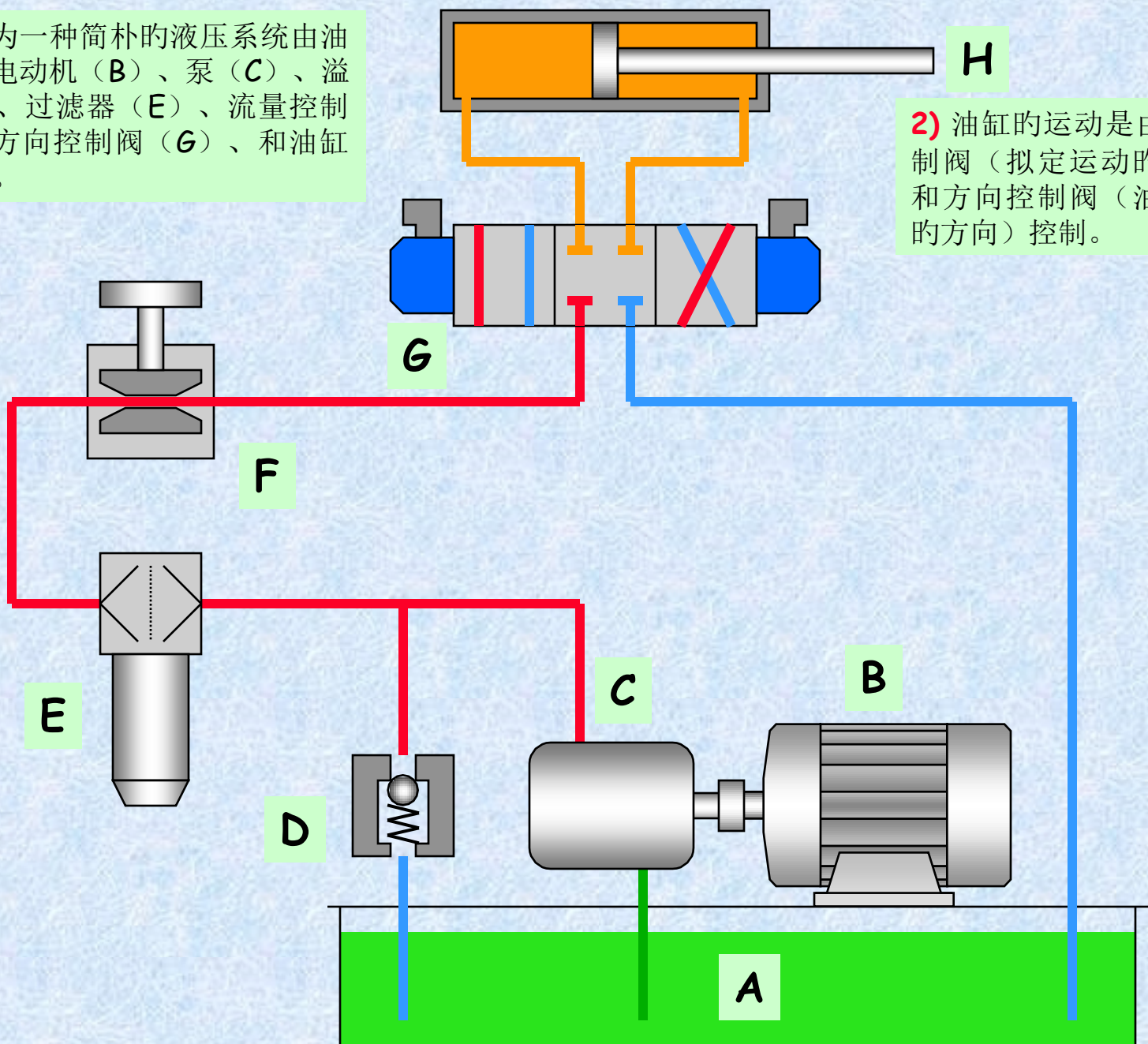
百分比阀基本原理



Steve Skinner, Eaton Hydraulics, Havant, UK

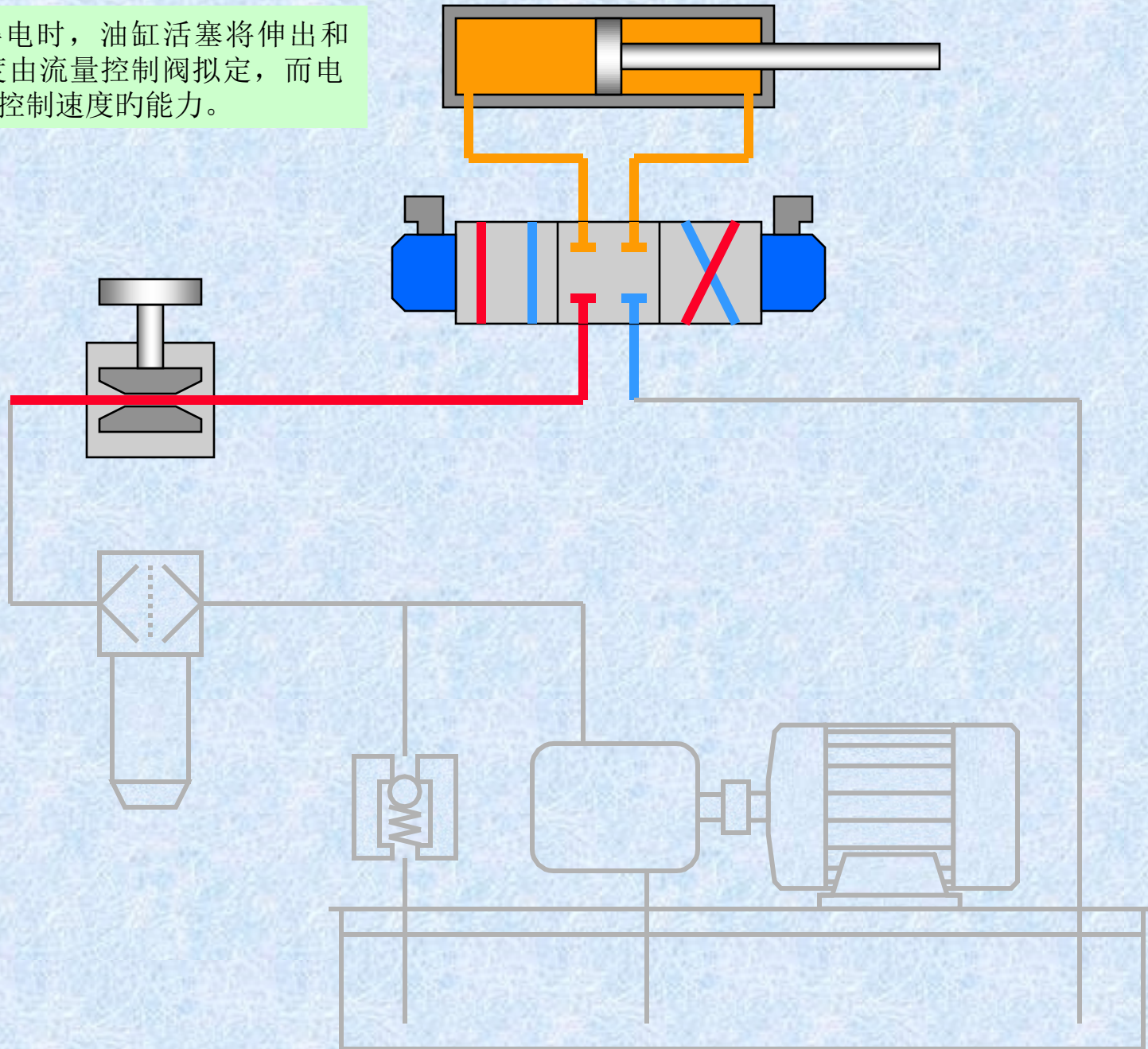
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1) 一般以为一种简朴的液压系统由油箱 (A)、电动机 (B)、泵 (C)、溢流阀 (D)、过滤器 (E)、流量控制阀 (F)、方向控制阀 (G)、和油缸 (H) 构成。

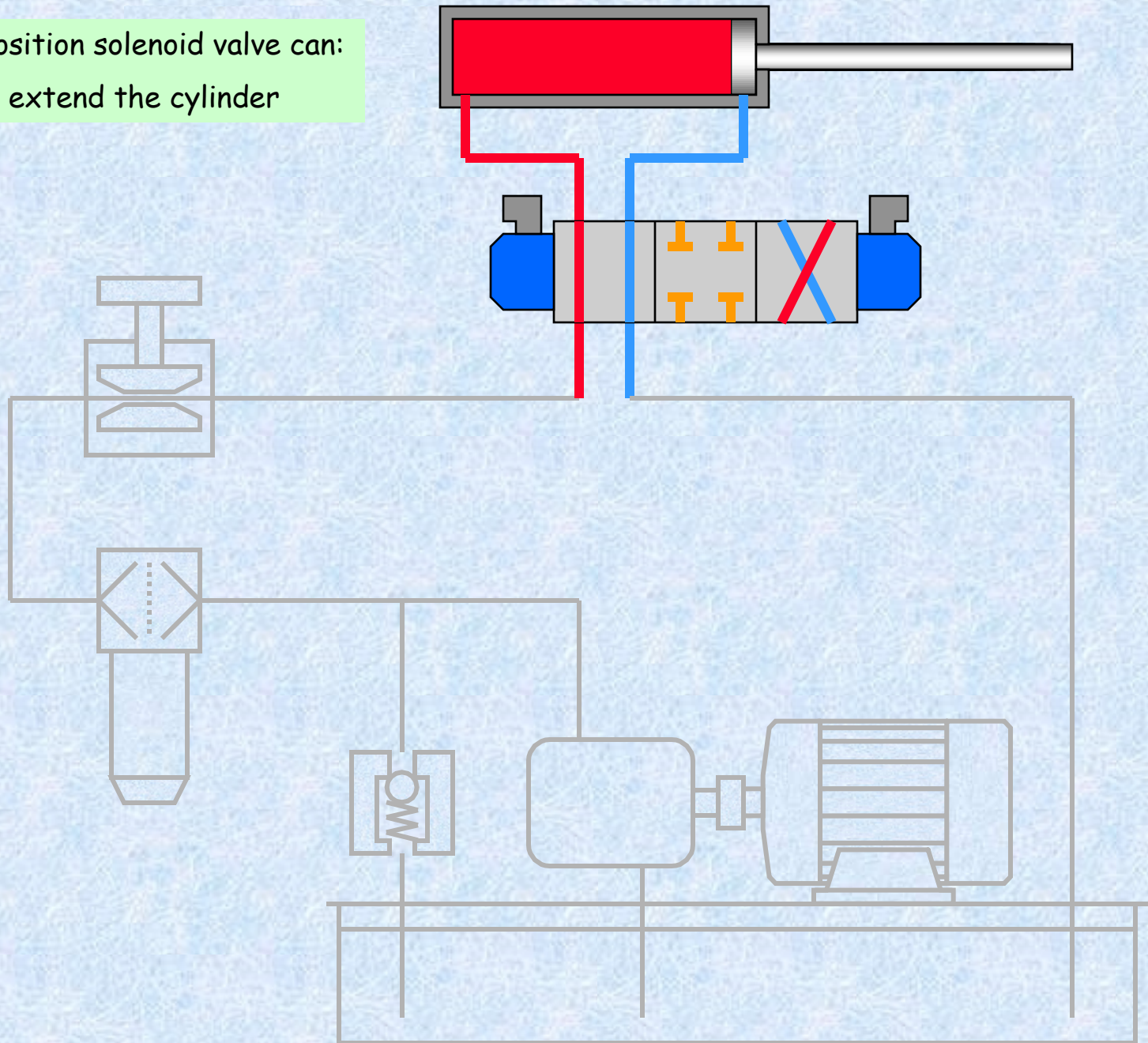


2) 油缸的运动是由流量控制阀 (拟定运动的速度) 和方向控制阀 (油缸运动的方向) 控制。

当电磁阀得电时，油缸活塞将伸出和回缩,其速度由流量控制阀拟定，而电磁阀不具有控制速度的能力。

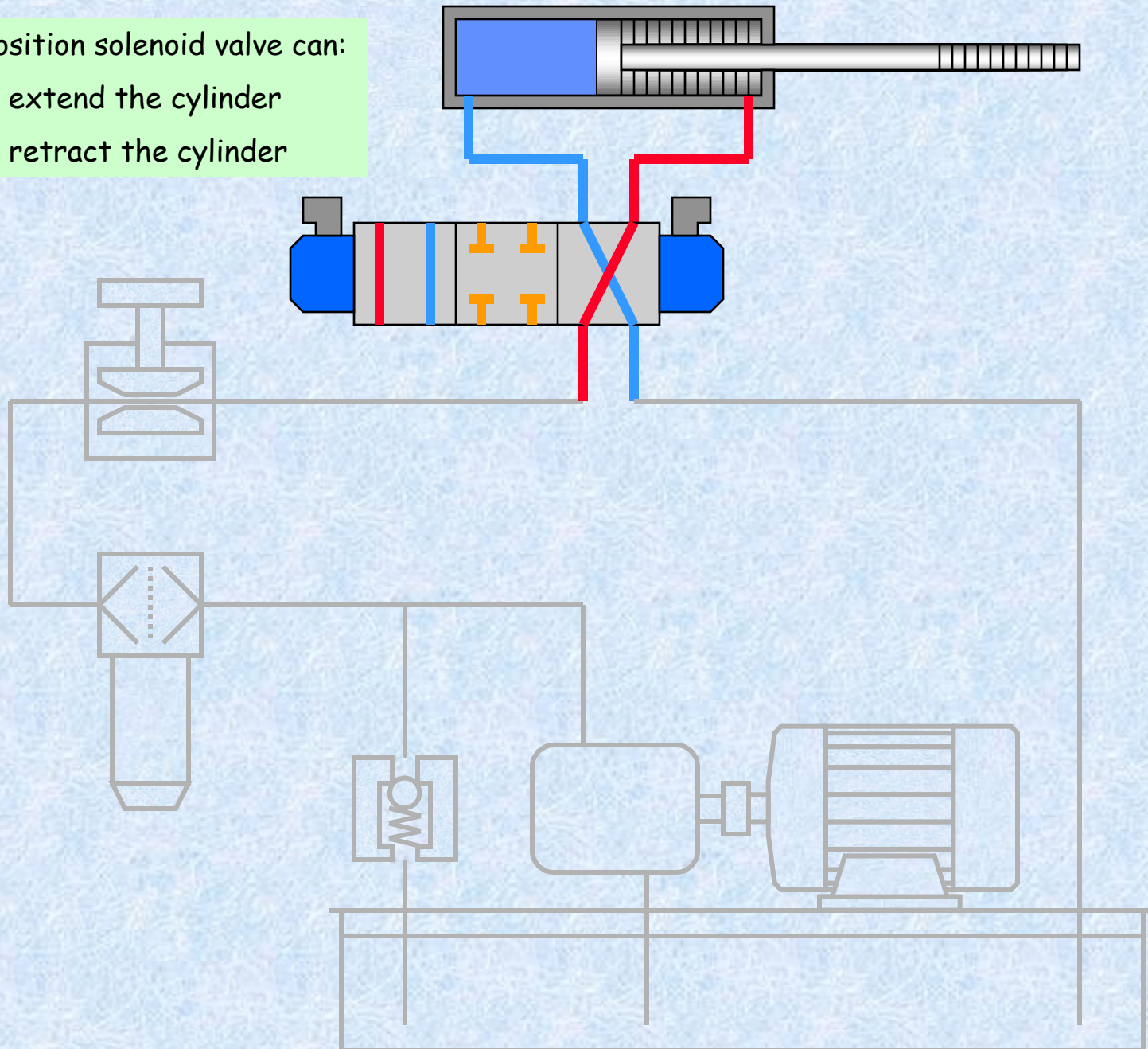


A three position solenoid valve can:
- extend the cylinder



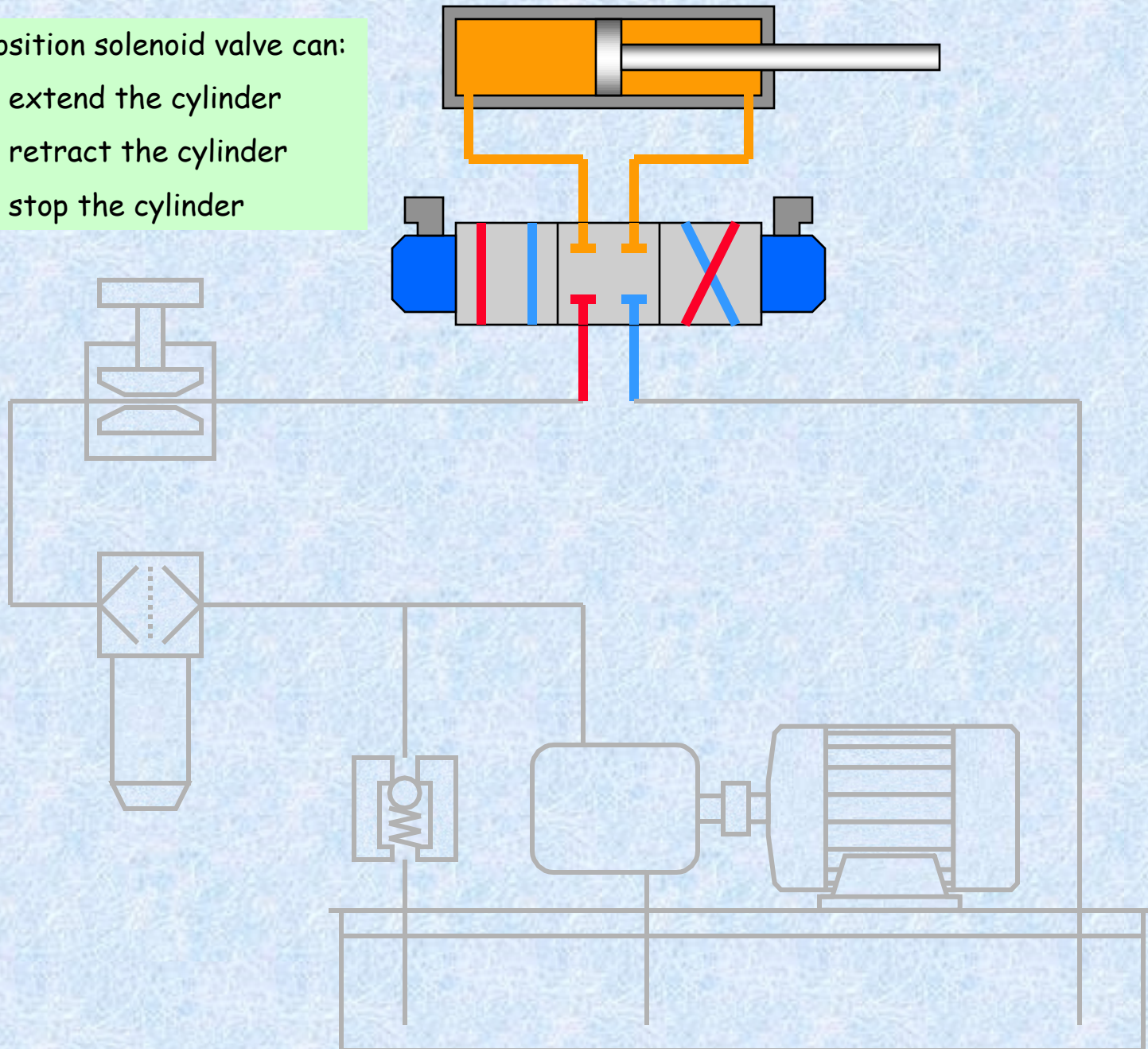
A three position solenoid valve can:

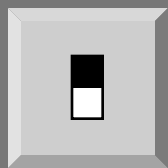
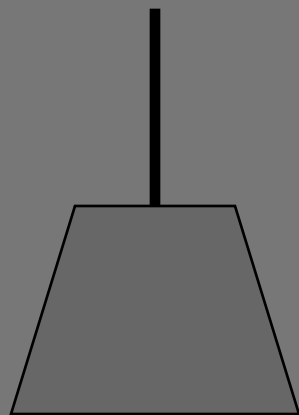
- extend the cylinder
- retract the cylinder



A three position solenoid valve can:

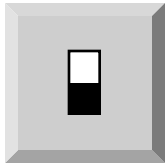
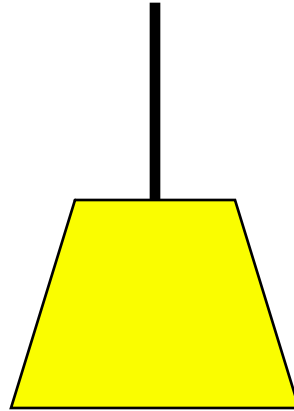
- extend the cylinder
- retract the cylinder
- stop the cylinder





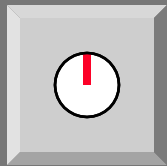
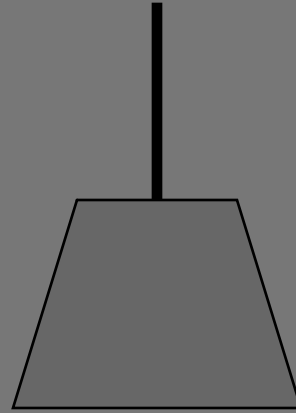
所以电磁阀的动作非常象一种电路中的开关

在此位置灯是关闭状态.



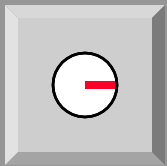
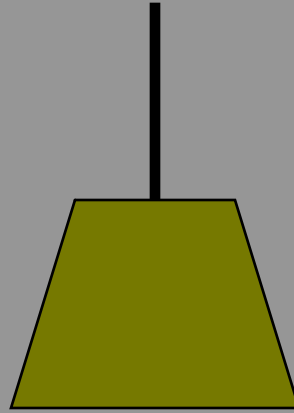
... 在另外一种位置是开启状态，
而没有中间状态。

and in the other position it is
switched on but there are no
intermediate states.



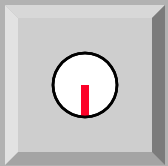
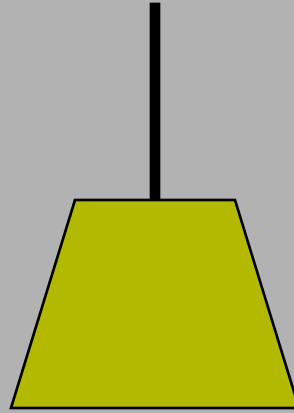
然而众所周知，另一种形式的开关能够用来控制灯泡，调光开关

However, another type of switch can be used for controlling a light bulb known as a *dimmer switch*.

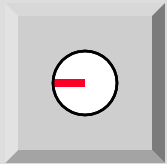
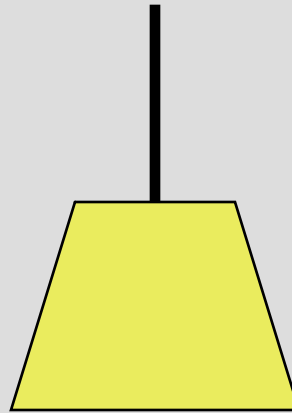


在这个例子中，这个开关能够被转到全开和全关的任一位置，来调整灯泡的亮度

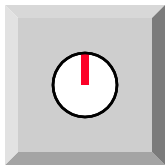
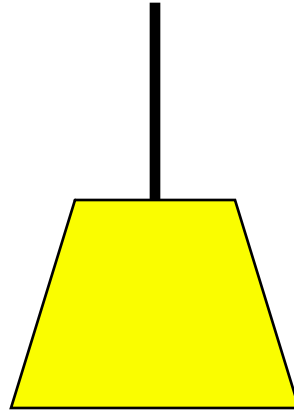
In this case, the switch can be turned to any position between fully off and fully on to vary the brightness of the bulb.



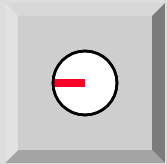
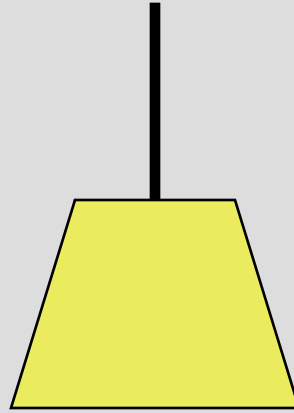
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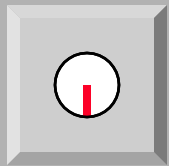
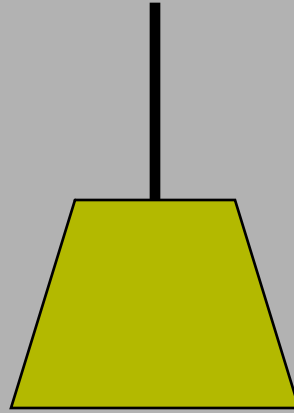
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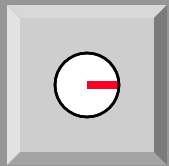
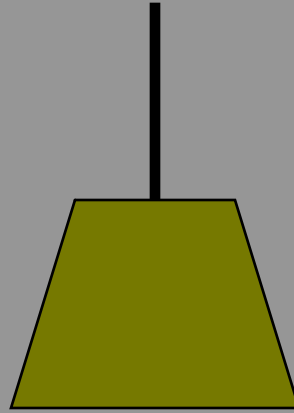
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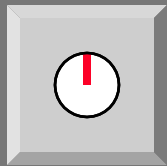
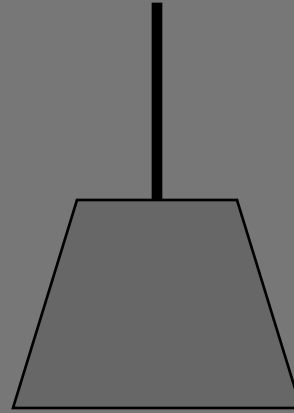


In this case, the switch can be turned to any position between fully off and fully on to vary the brightness of the bulb.



在这个例子中，这个开关能够被转到全开和全关的任一位置，来调整灯泡的亮度。

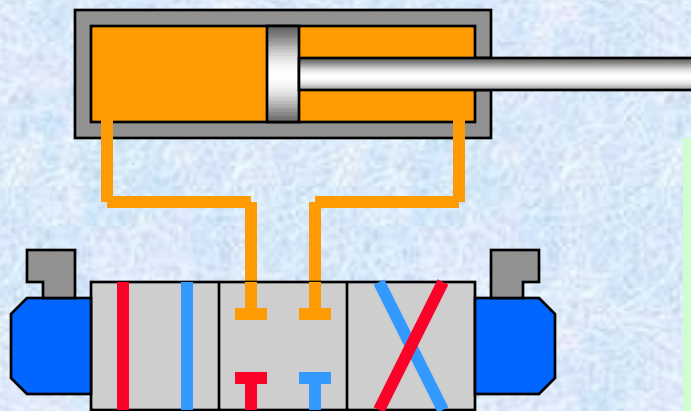
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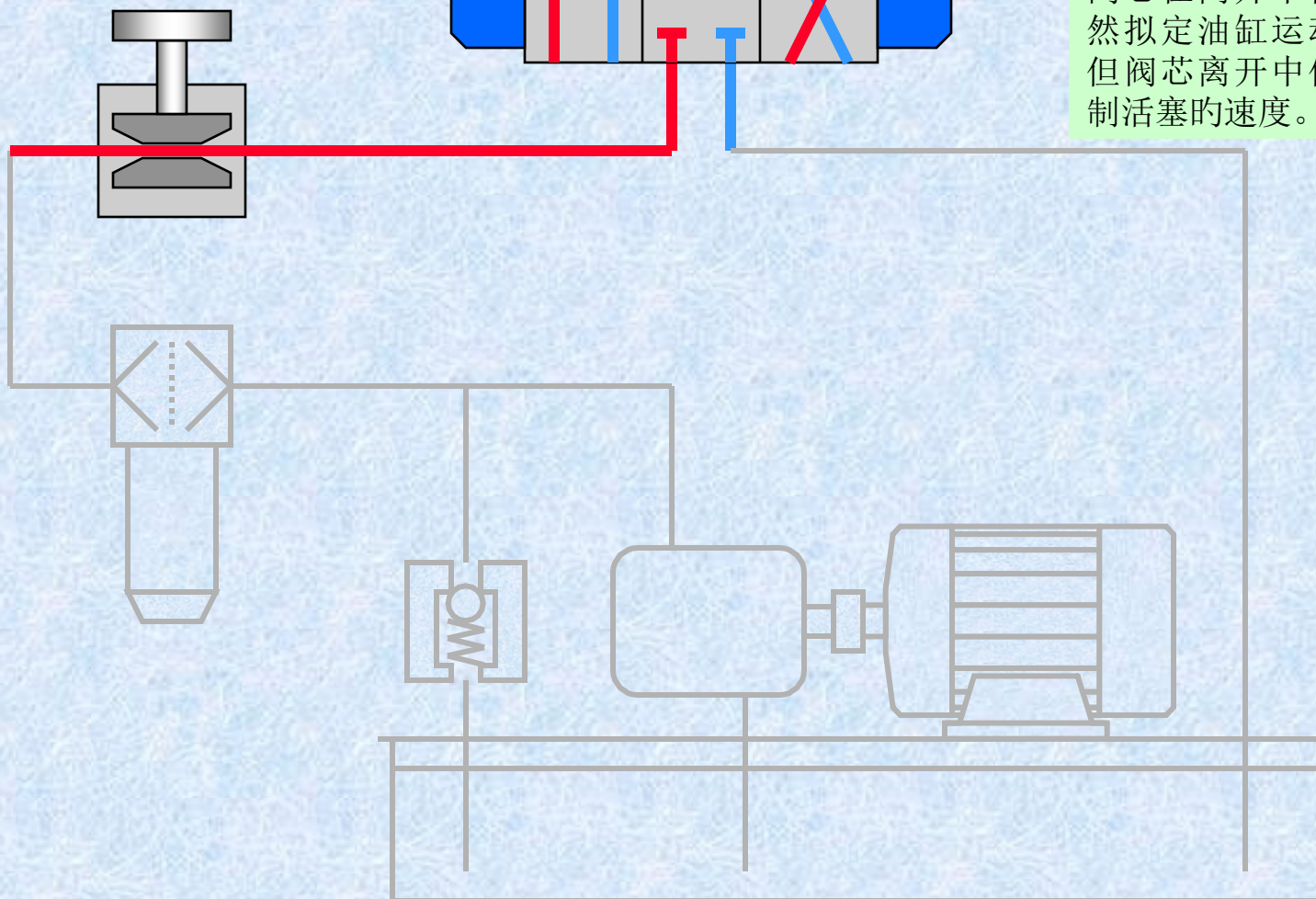
1) 百分比方向阀能够被看作与调光开关具有一样功能。

A proportional directional valve can be thought of as the dimmer switch equivalent of an electrical switch.



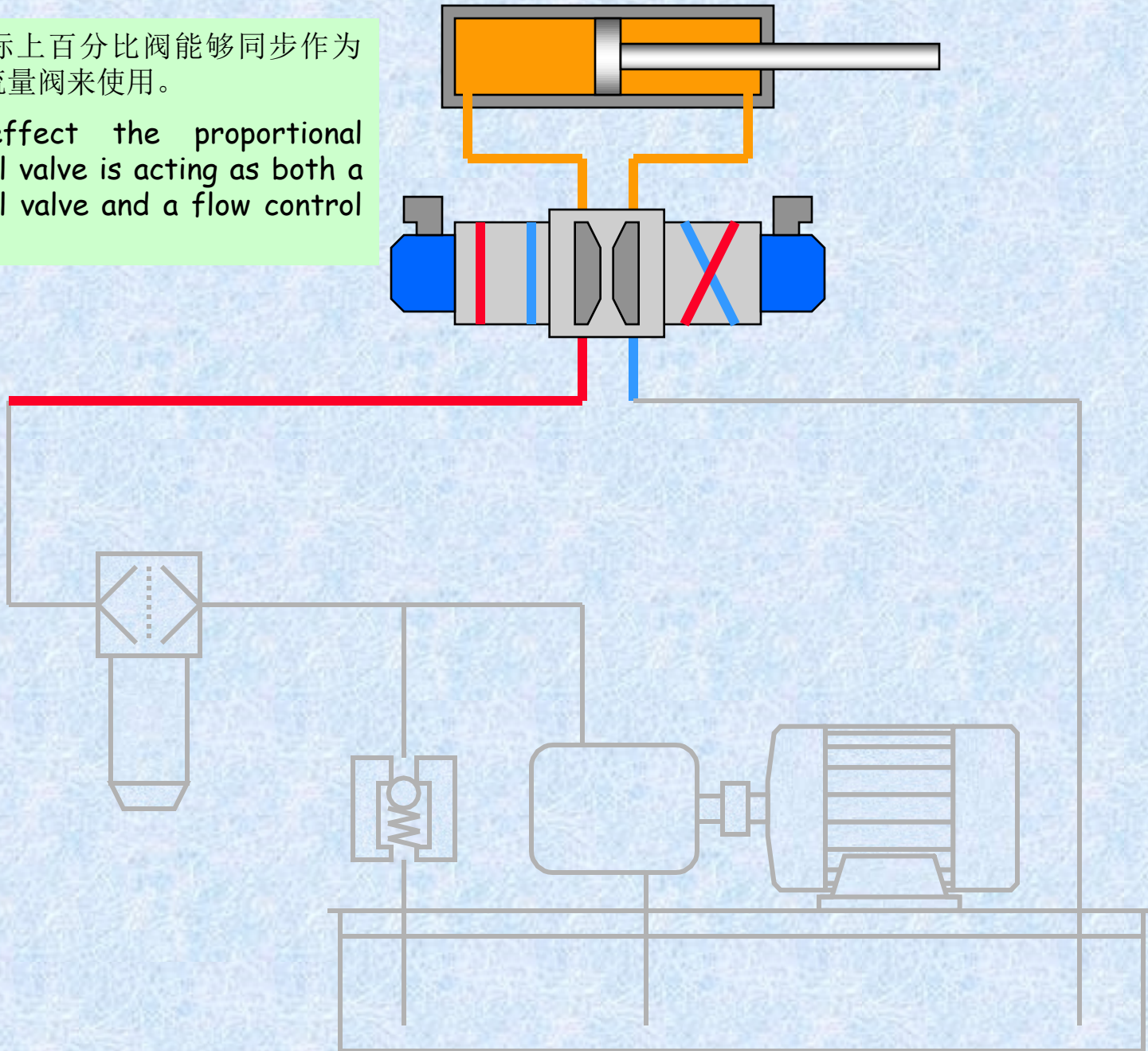
2) 阀芯能够移动到在任一位置，而不但仅是三个不连续的位置。

阀芯在离开中位的方向依然拟定油缸运动的方向，但阀芯离开中位的距离控制活塞的速度。



于是在实际上百分比阀能够同步作为方向阀和流量阀来使用。

So in effect the proportional directional valve is acting as both a directional valve and a flow control valve.

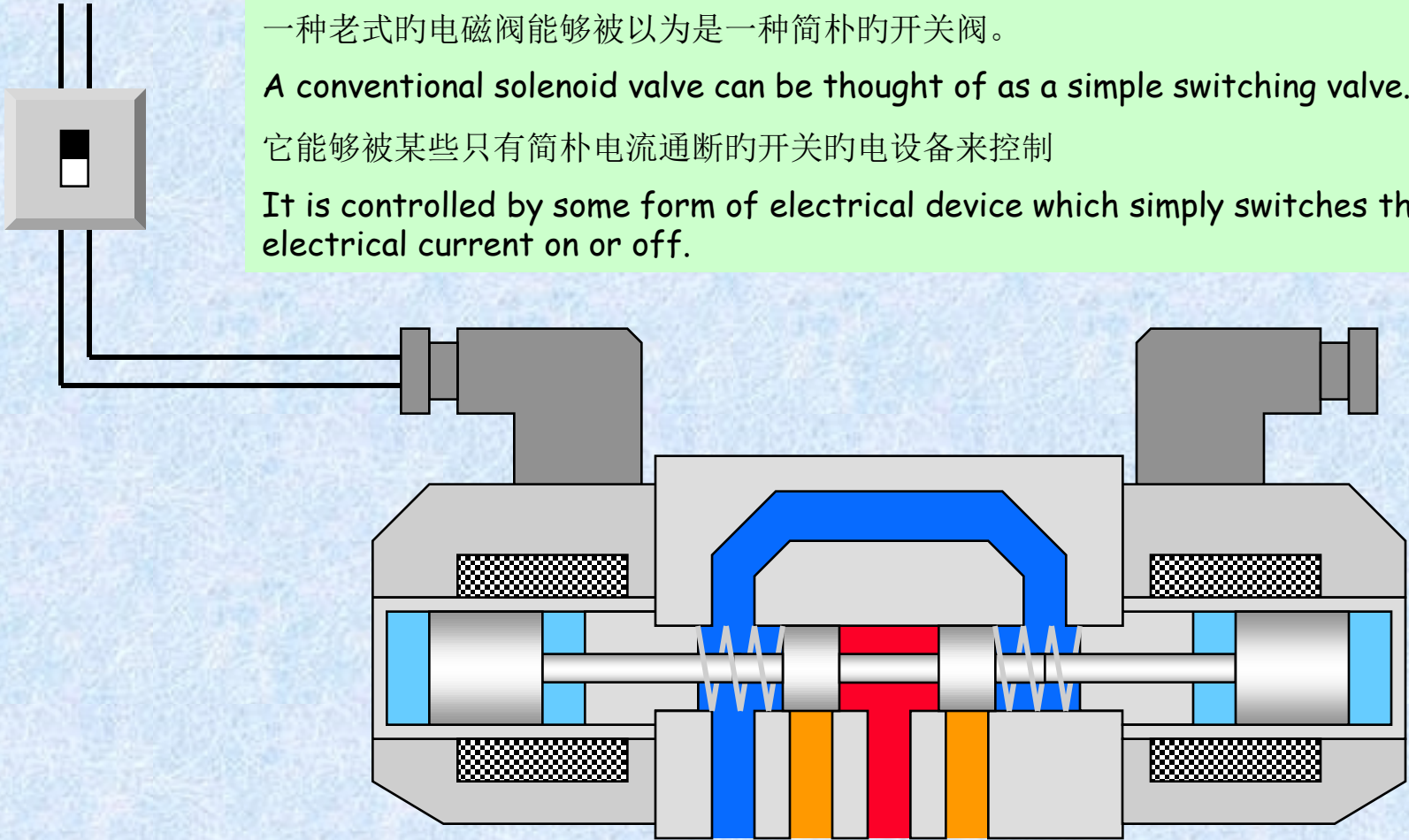


一种老式的电磁阀能够被以为是一种简朴的开关阀。

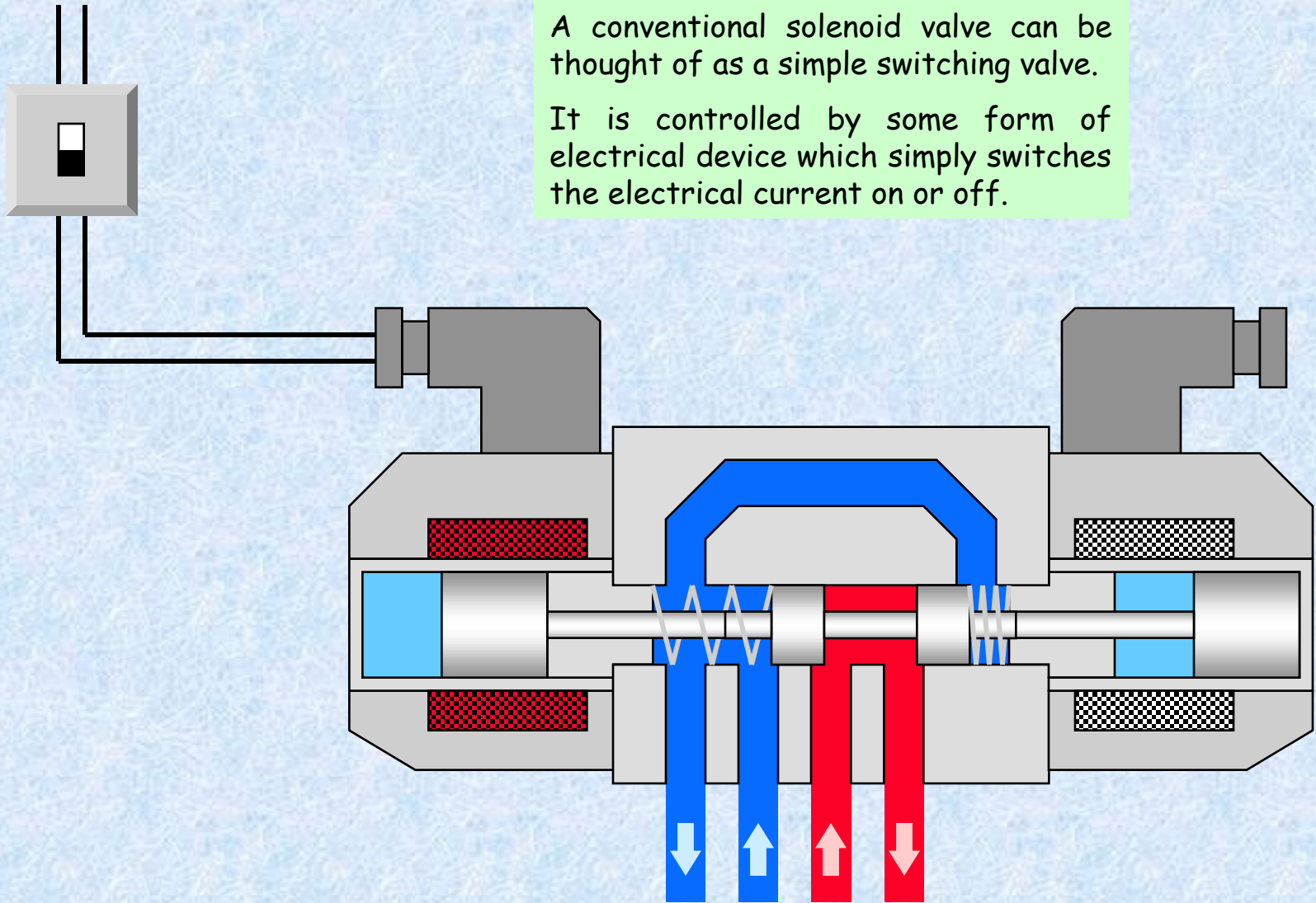
A conventional solenoid valve can be thought of as a simple switching valve.

它能够被某些只有简朴电流通断的开关的电设备来控制

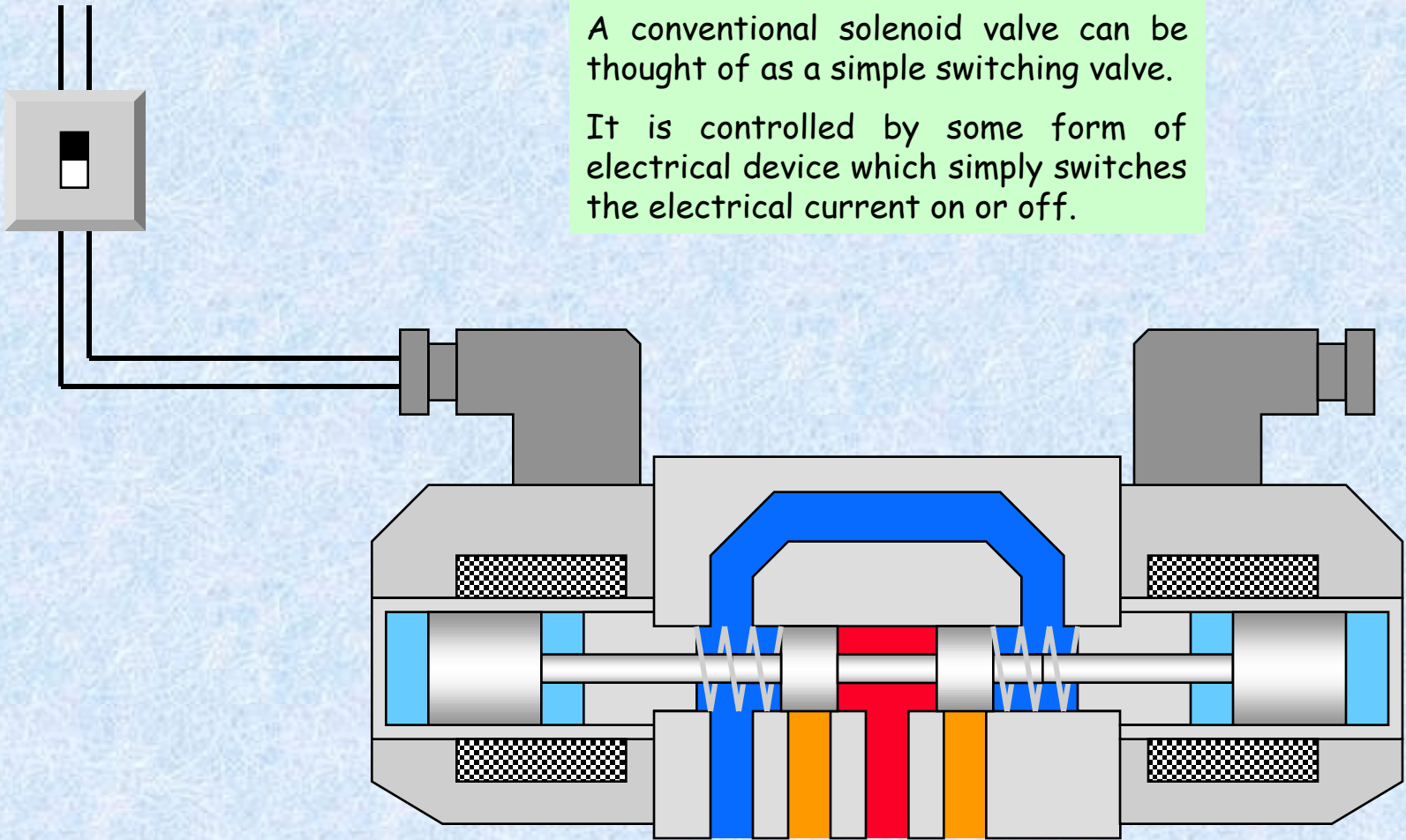
It is controlled by some form of electrical device which simply switches the electrical current on or off.



A conventional solenoid valve can be thought of as a simple switching valve. It is controlled by some form of electrical device which simply switches the electrical current on or off.

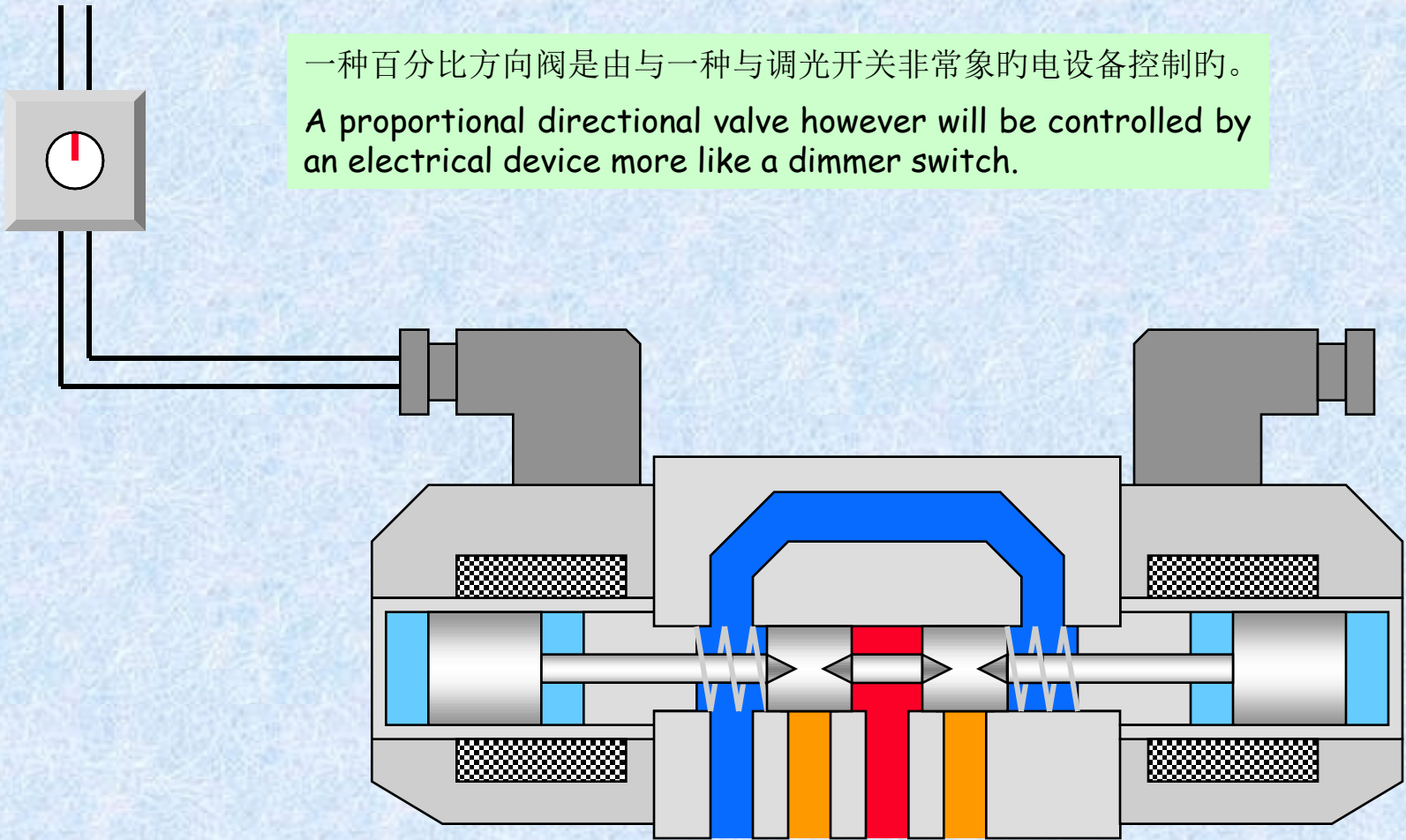


A conventional solenoid valve can be thought of as a simple switching valve. It is controlled by some form of electrical device which simply switches the electrical current on or off.



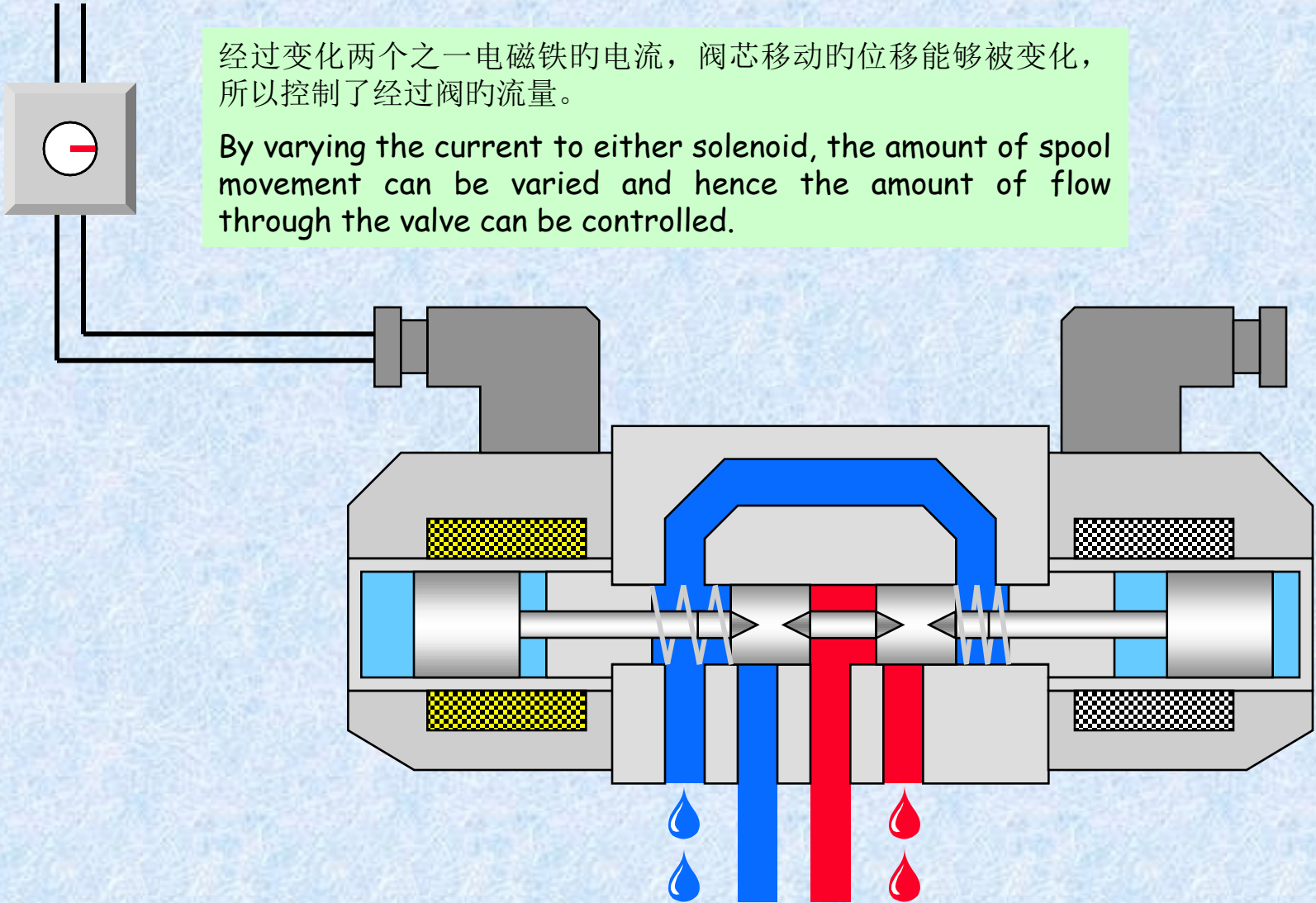
一种百分比方向阀是由与一种与调光开关非常象的电设备控制的。

A proportional directional valve however will be controlled by an electrical device more like a dimmer switch.

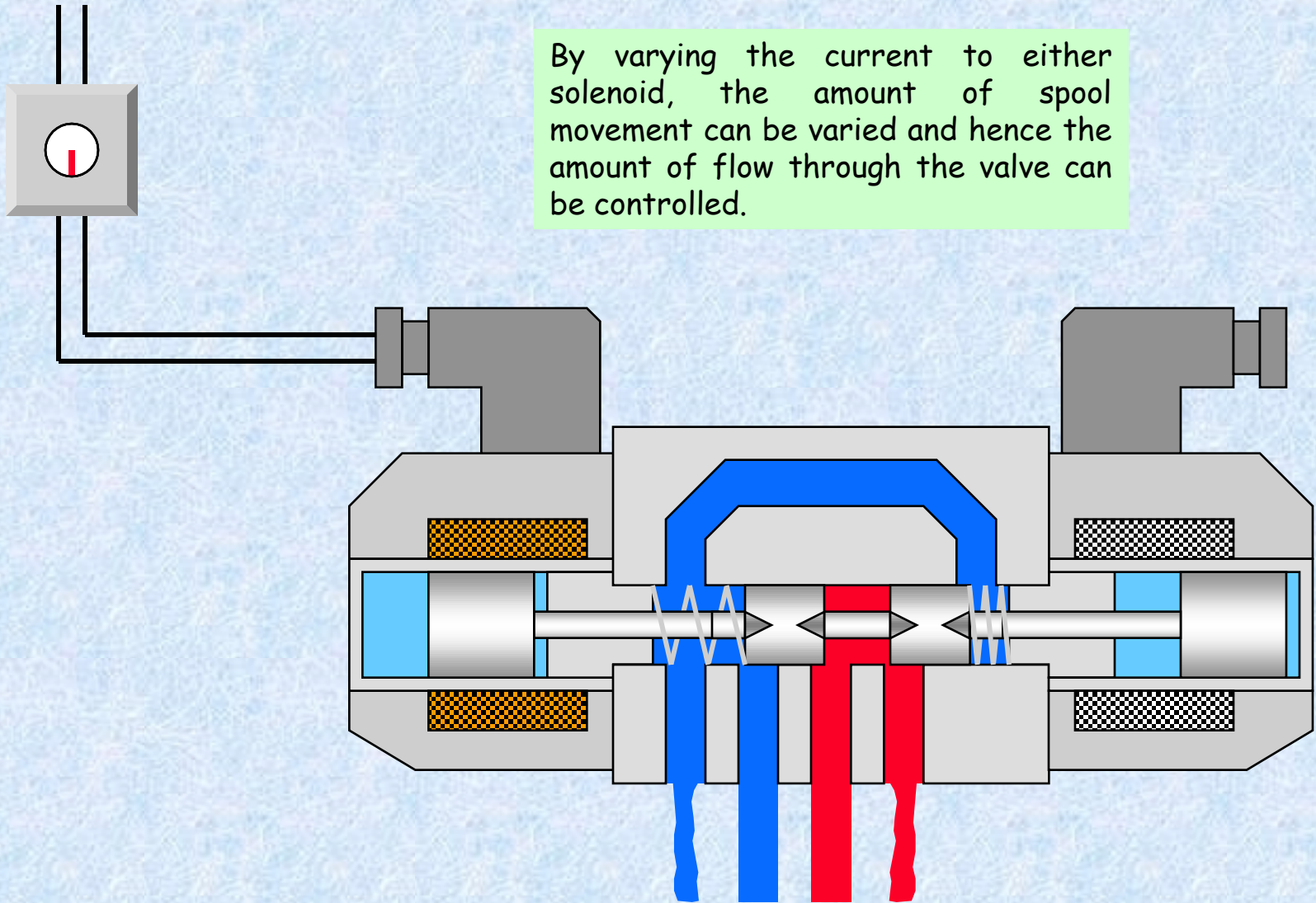


经过变化两个之一电磁铁的电流，阀芯移动的位移能够被变化，所以控制了经过阀的流量。

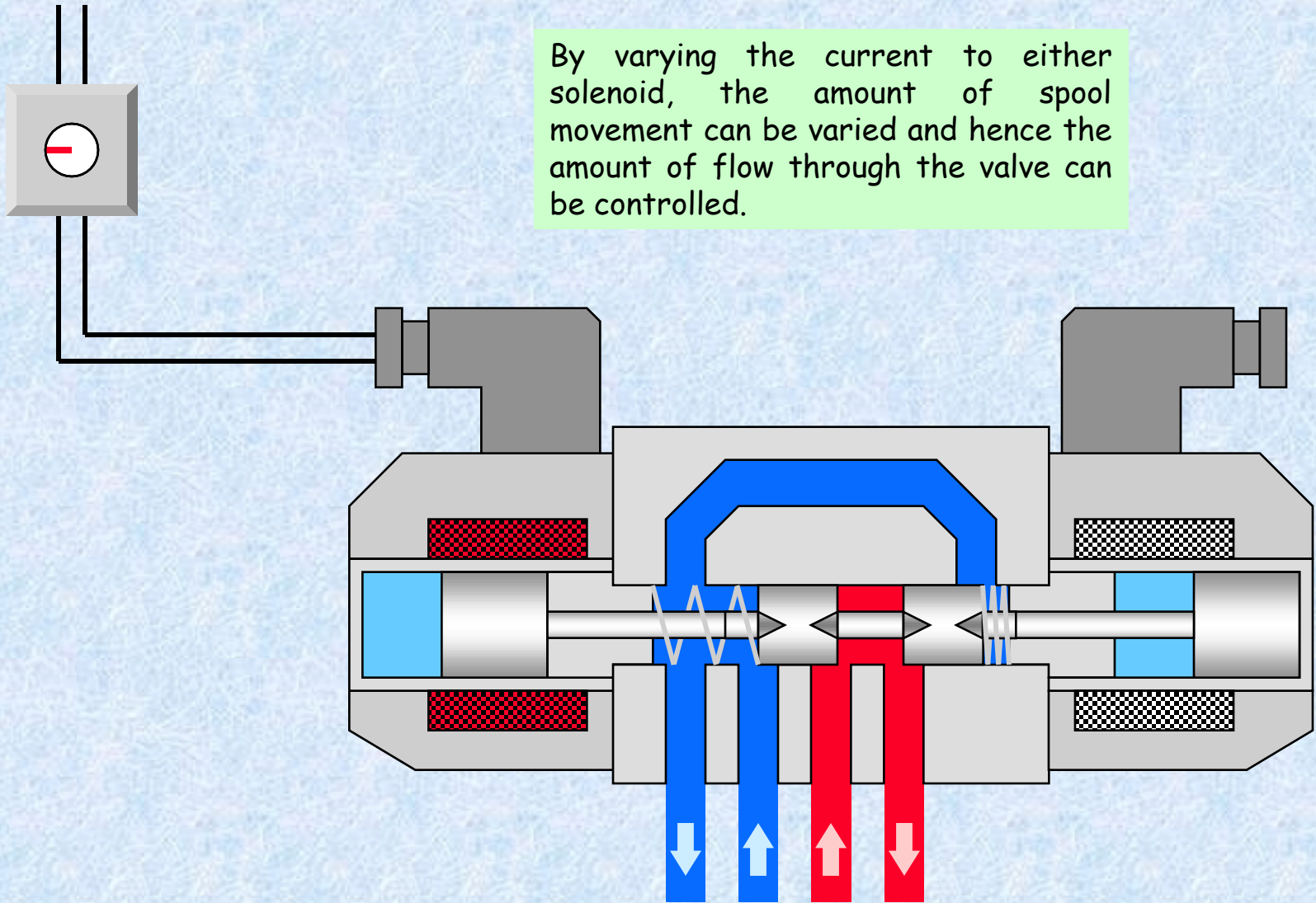
By varying the current to either solenoid, the amount of spool movement can be varied and hence the amount of flow through the valve can be controlled.



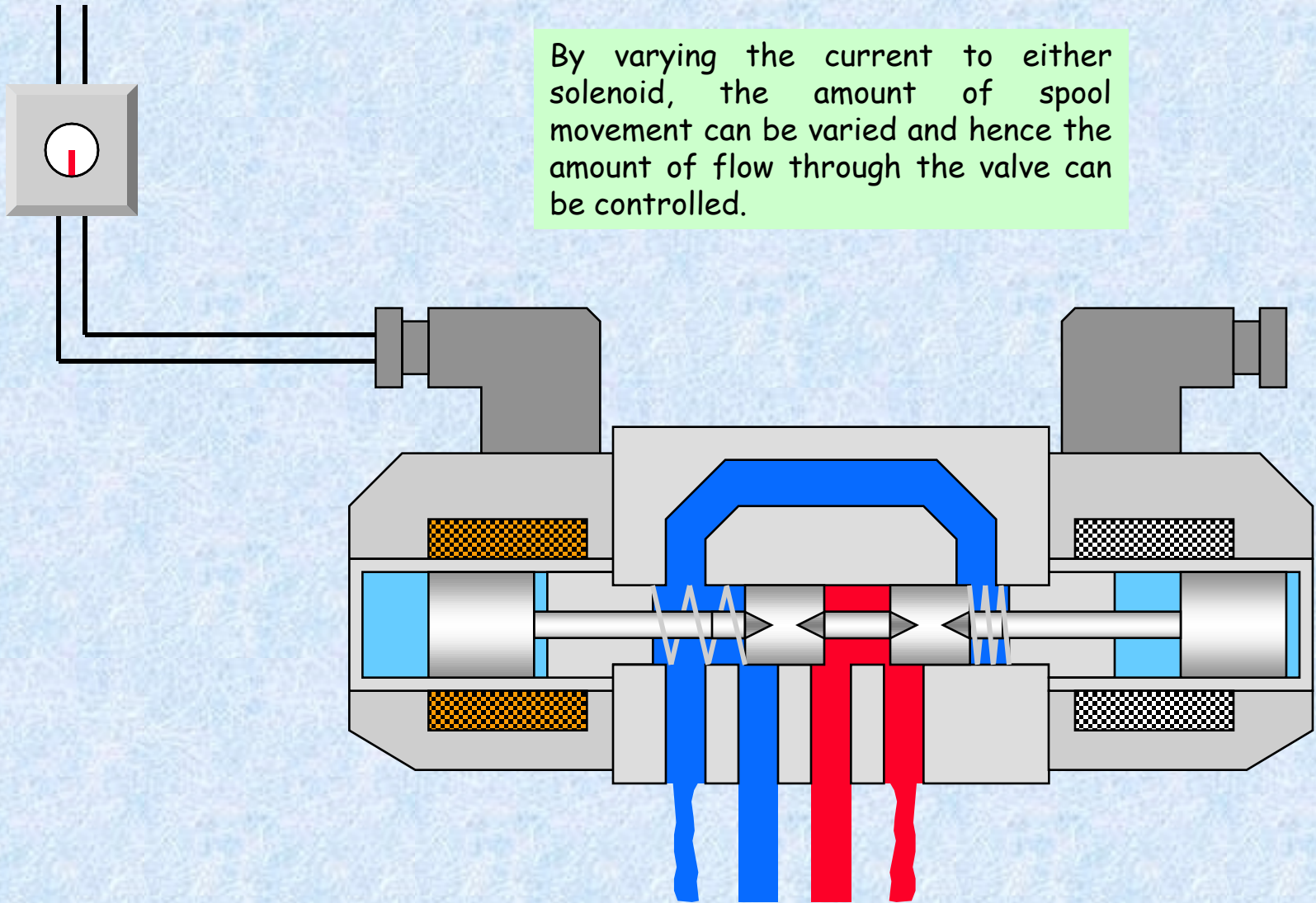
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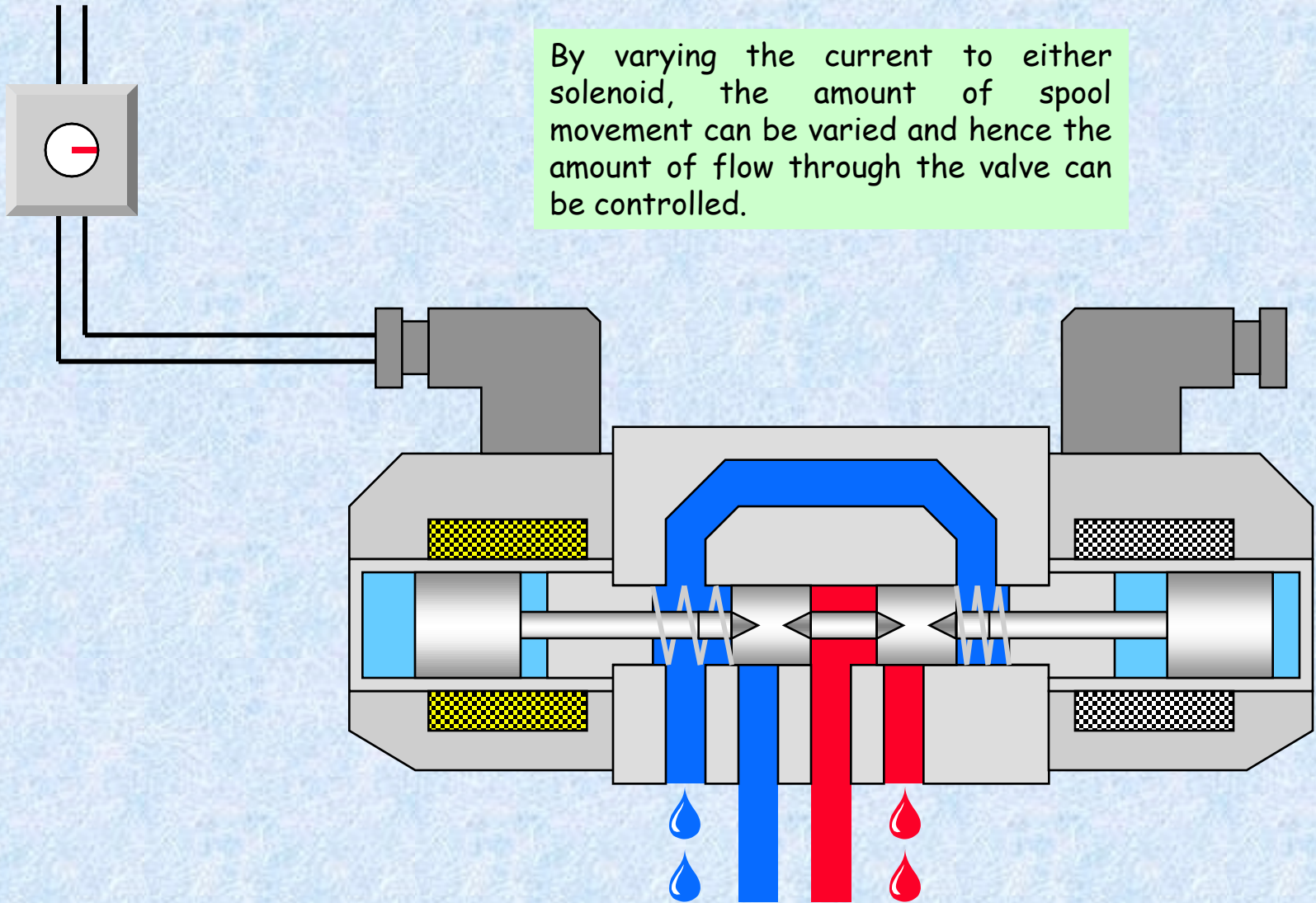
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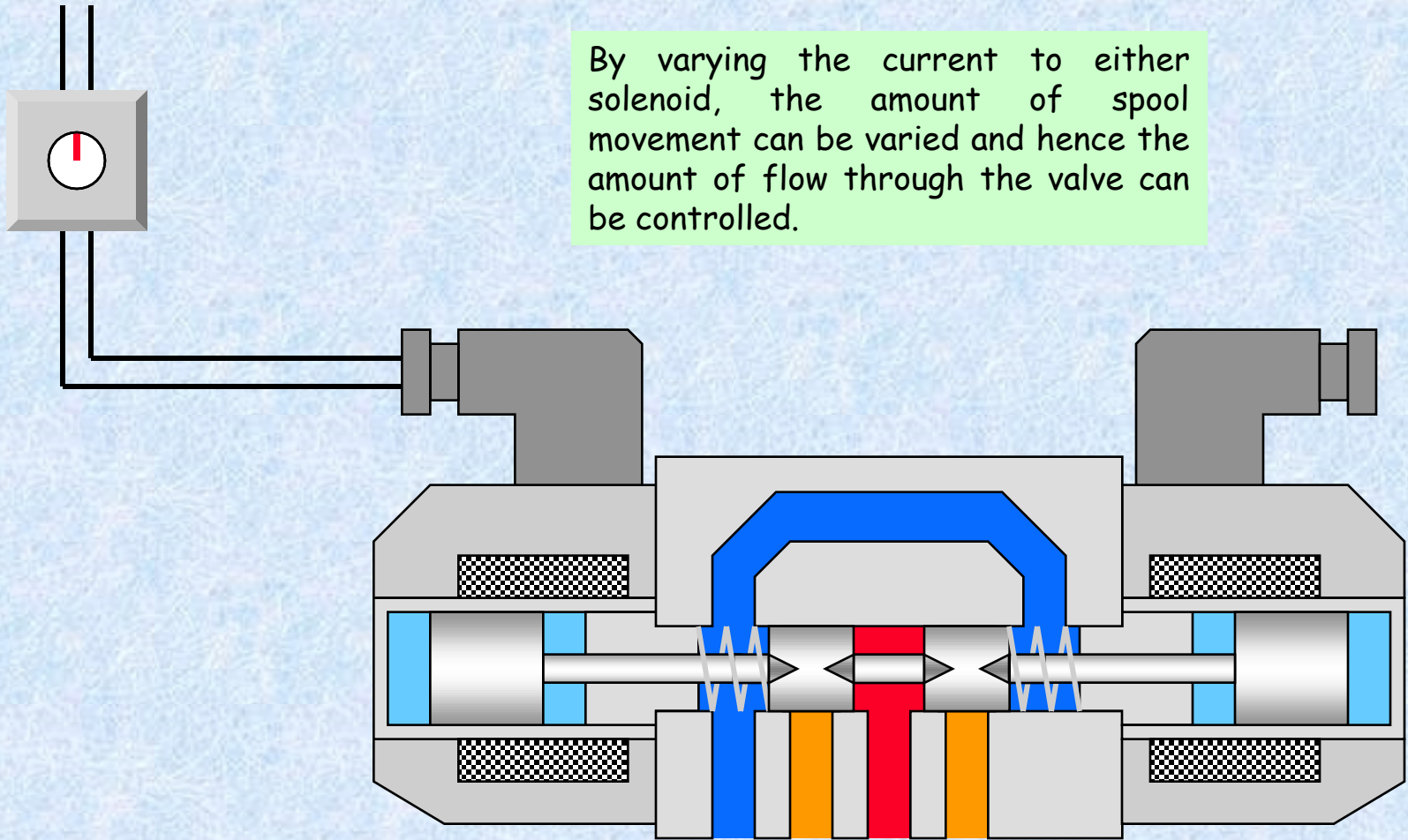
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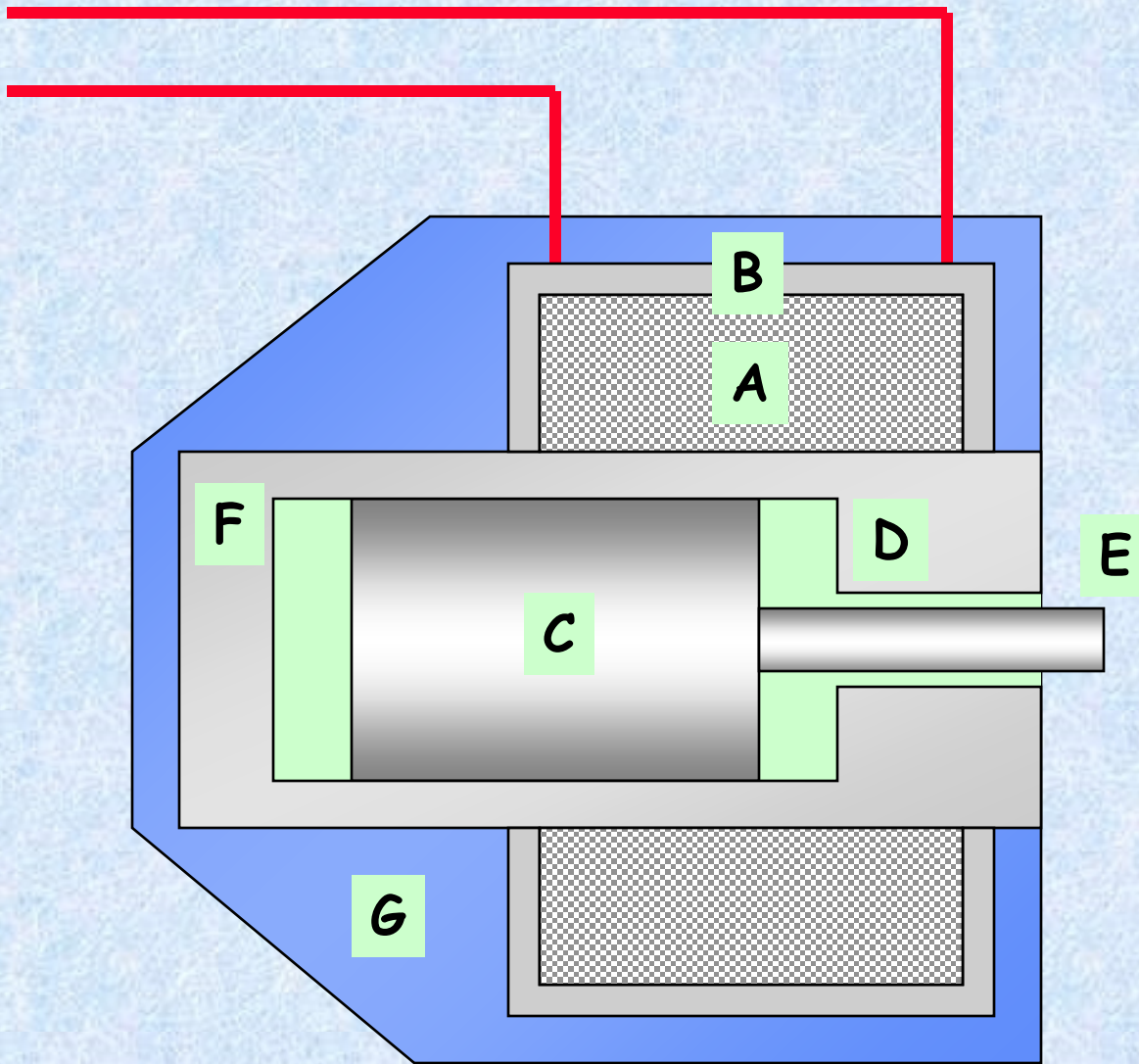


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所以不像老式的电磁阀，经过百分比阀线圈的电流需要被调整，而不仅仅是开关式的通断。

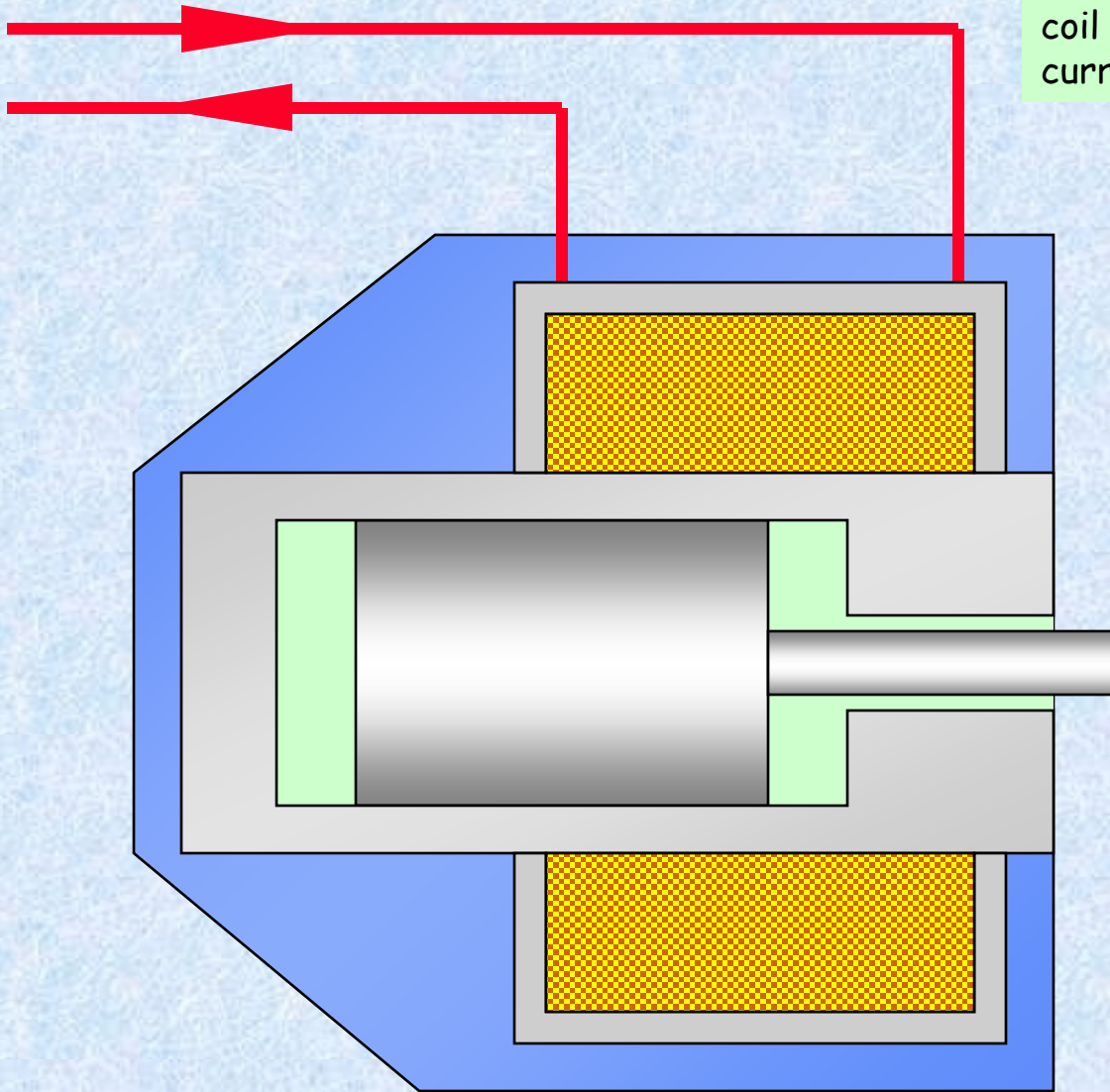
百分比阀电磁铁的构造与开关式电磁铁是相同的。

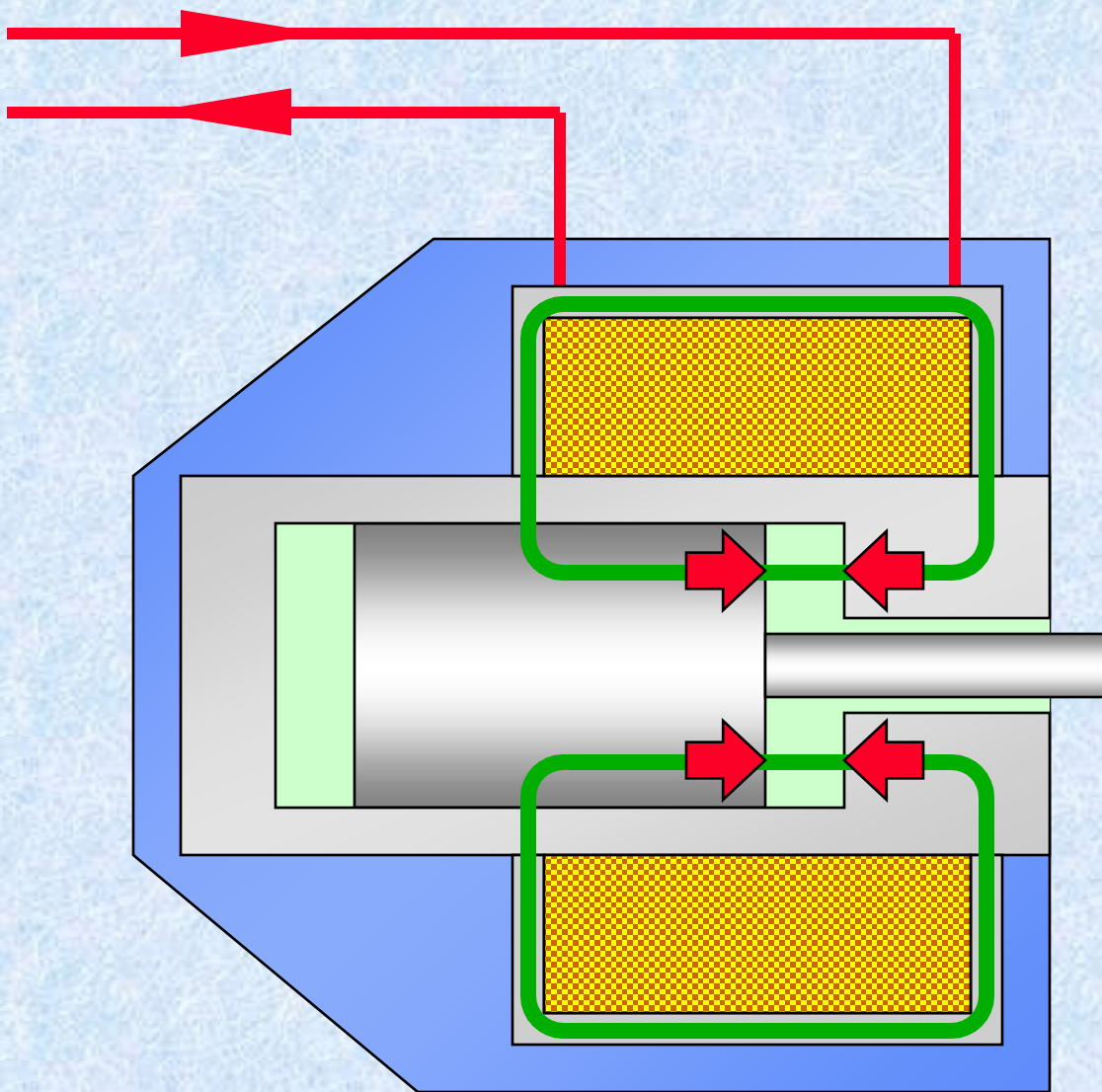
电磁铁涉及：

- 线圈 (A)
- 框架 (B)
- 电枢 (C)
- 电极片 (D)
- 顶针 (E)

电枢被包在一种芯轴管 (F) 中。(同步全部的总成经常被压进一种树脂塑料的外罩 (G) 中)

When a voltage is applied to the coil connections, an electrical current will flow through the coil.



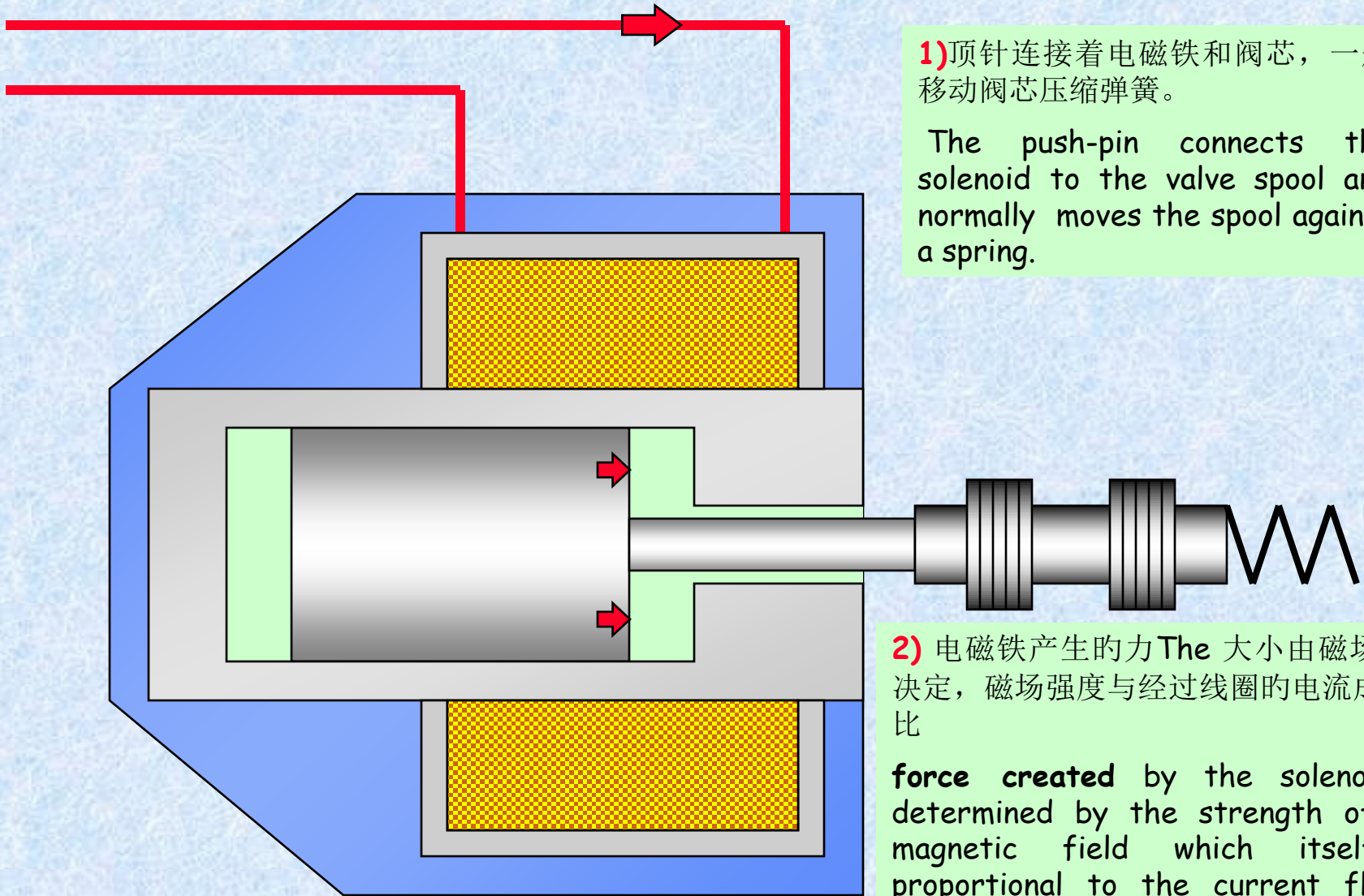


1) 接下来，电流生成一种磁场，磁场主要集中在金属框架、电机片和电枢中

In turn, the electrical current creates a magnetic field which is concentrated in the metal frame, pole piece and armature.

2) 然而在磁回路的电机片和电枢之间有一种间隙，于是产生一种力，其作用是关闭这个间隙以完毕这个磁回路。

There is however a gap in the magnetic circuit between the pole piece and armature so a force is created which acts to close this gap and complete the magnetic circuit.

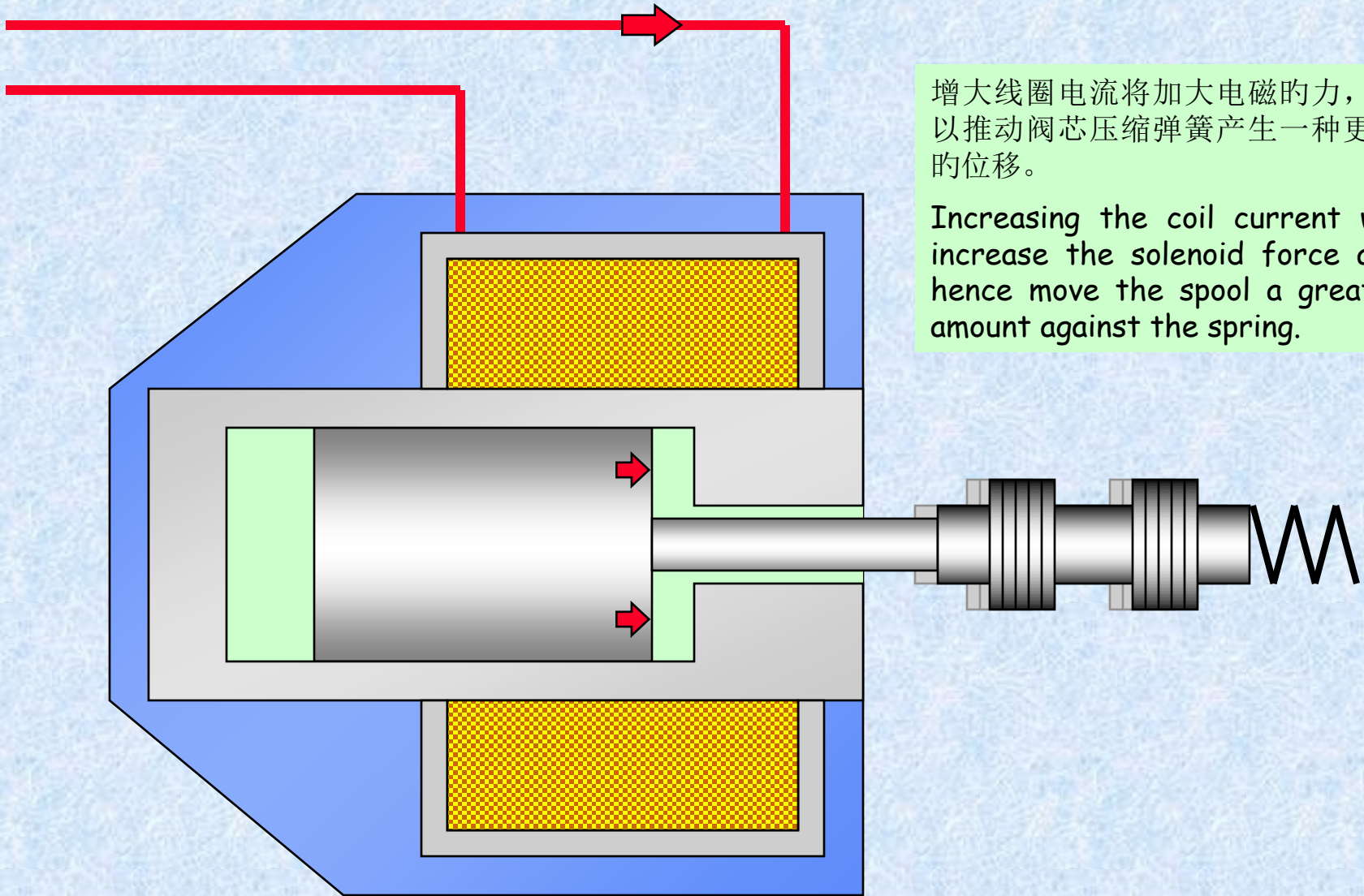


1) 顶针连接着电磁铁和阀芯，一般移动阀芯压缩弹簧。

The push-pin connects the solenoid to the valve spool and normally moves the spool against a spring.

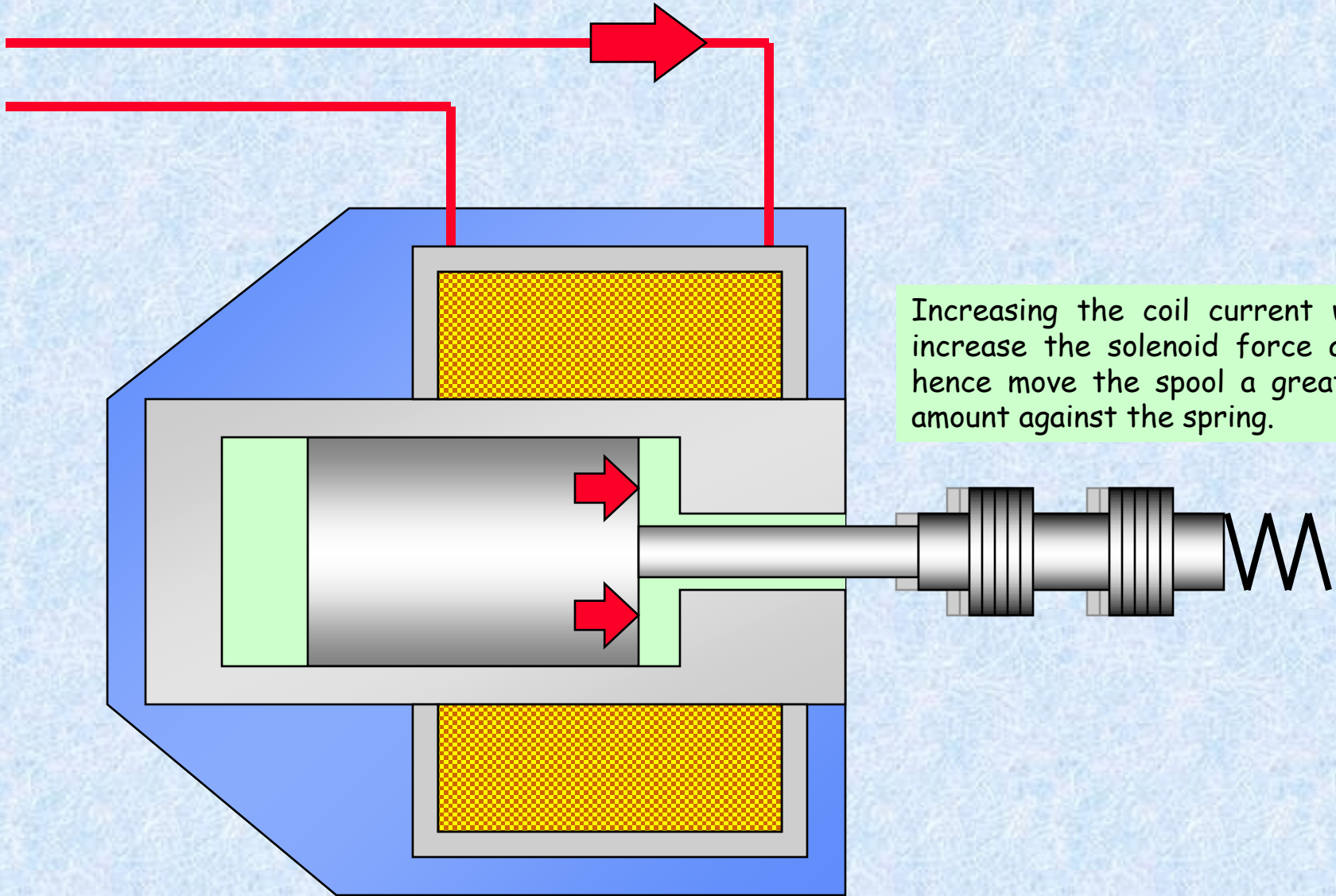
2) 电磁铁产生的力 F 大小由磁场强度决定，磁场强度与经过线圈的电流成百分比

force created by the solenoid is determined by the strength of the magnetic field which itself is proportional to the current flowing through the coil.

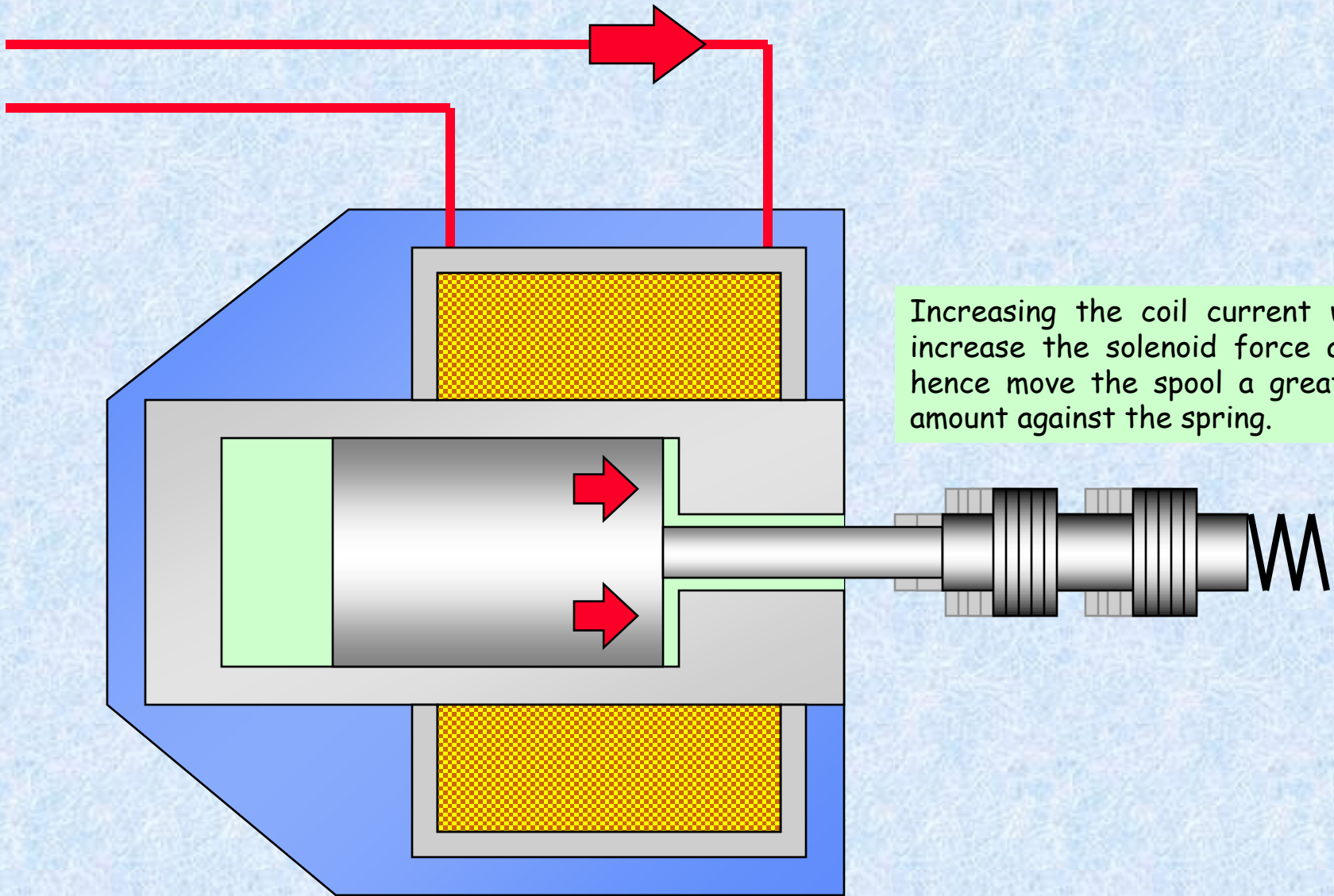


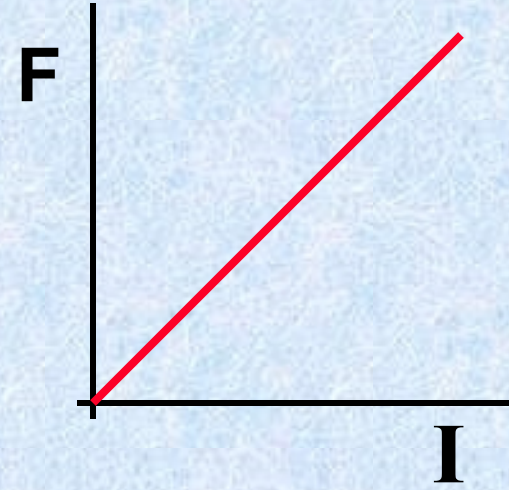
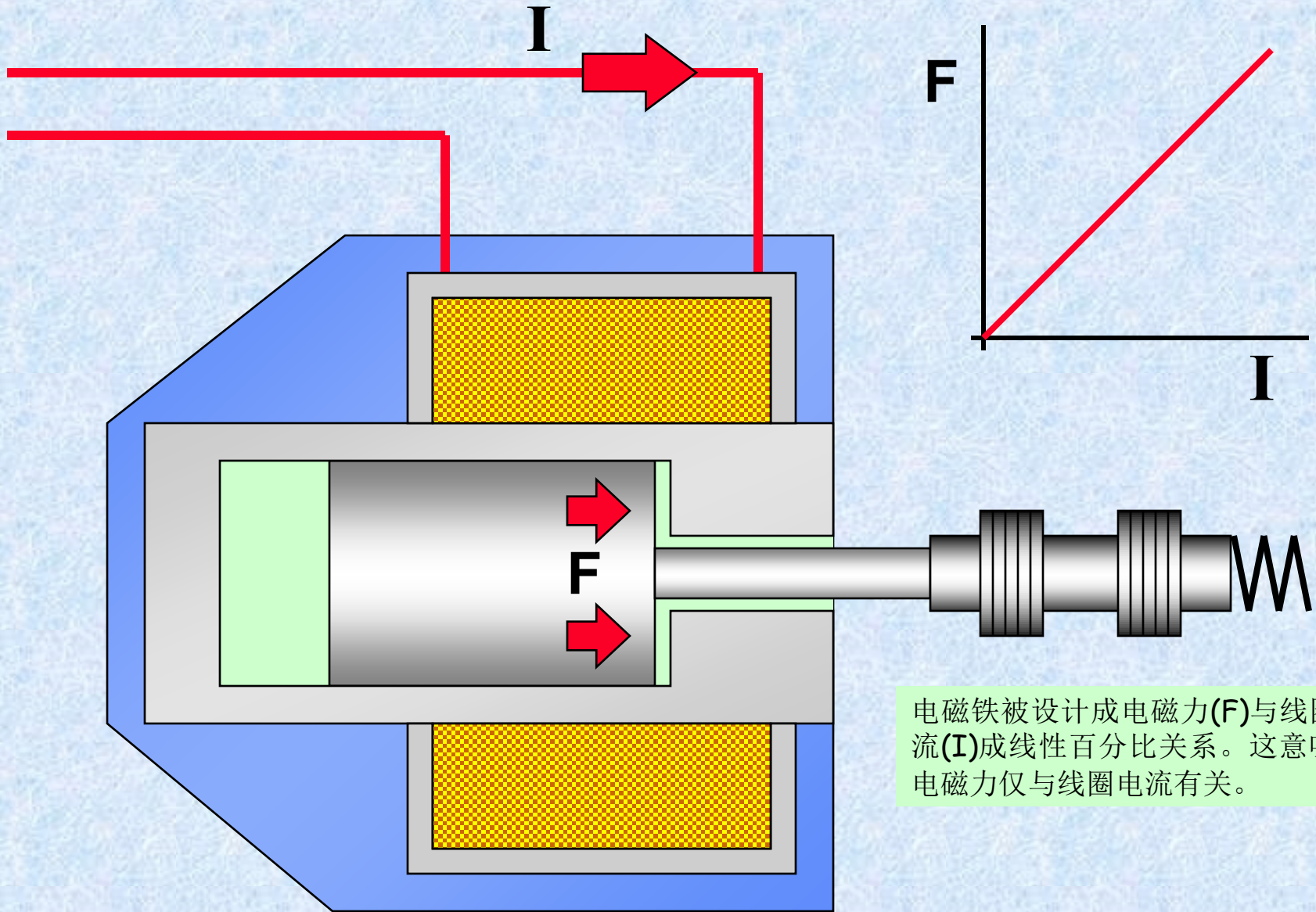
增大线圈电流将加大电磁的力，所以推动阀芯压缩弹簧产生一种更大的位移。

Increasing the coil current will increase the solenoid force and hence move the spool a greater amount against the spring.



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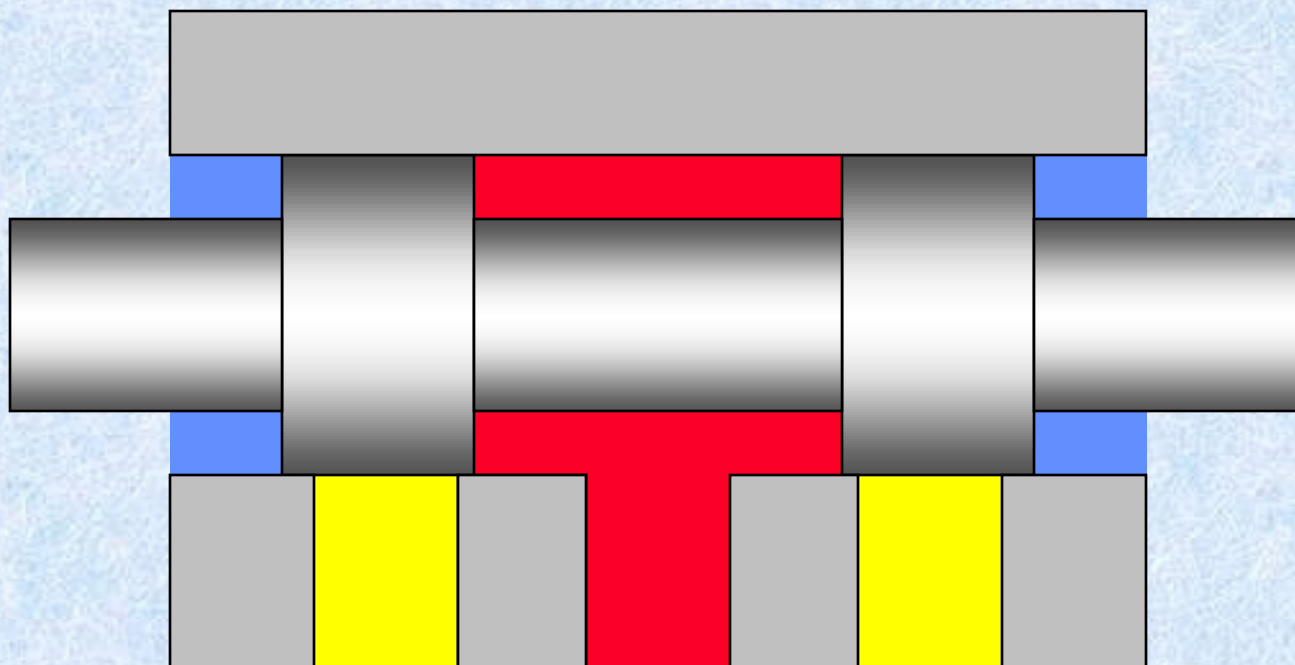




电磁铁被设计成电磁力(F)与线圈电流(I)成线性百分比关系。这意味着电磁力仅与线圈电流有关。

百分比阀与开关电磁阀之间的另一种区别是阀芯的设计。

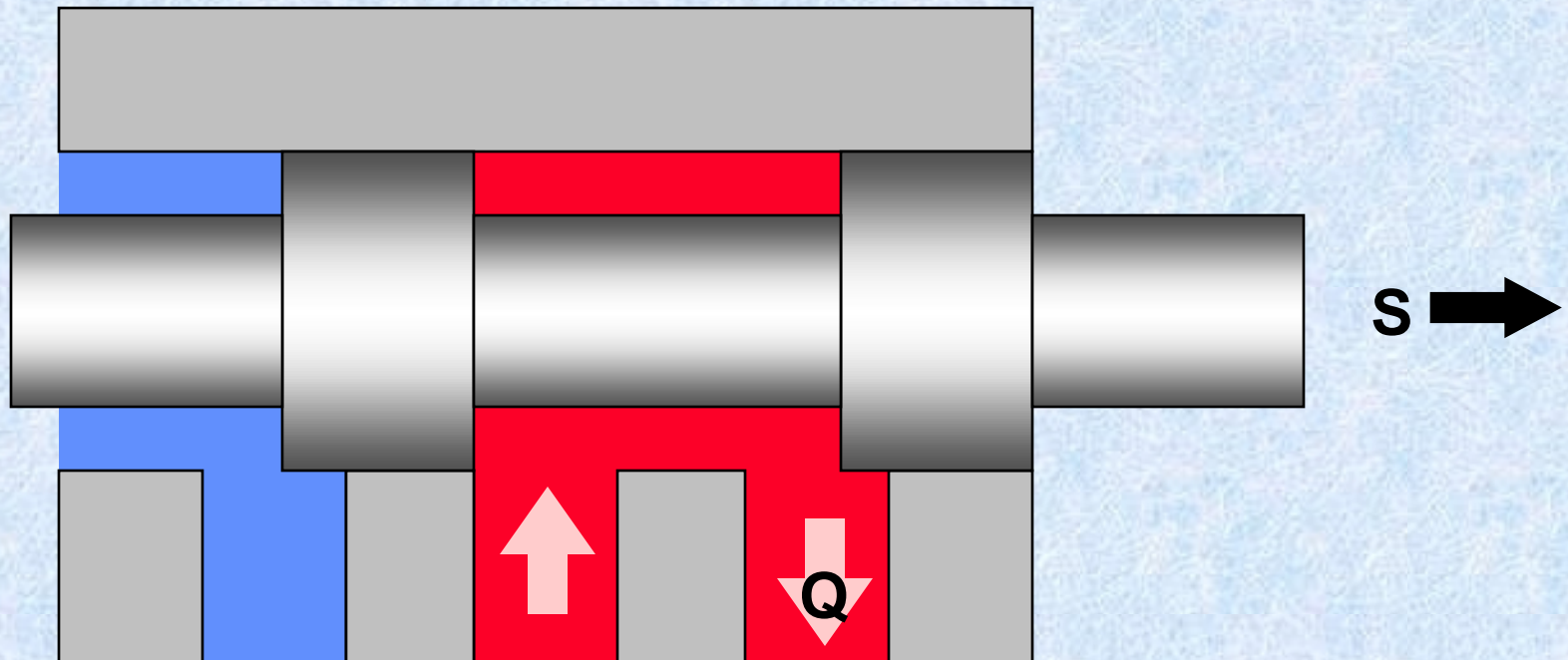
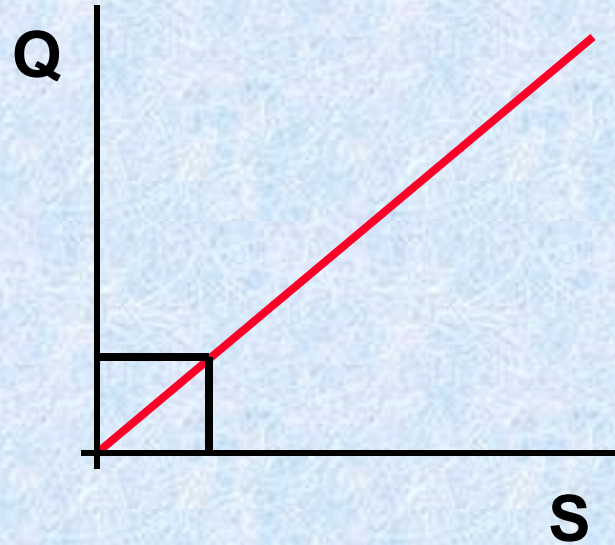
A further difference between a switching solenoid valve and a proportional valve is in the design of the spool.



1) 对于开关阀，阀芯被设计为当阀得电时，将压降最小化。

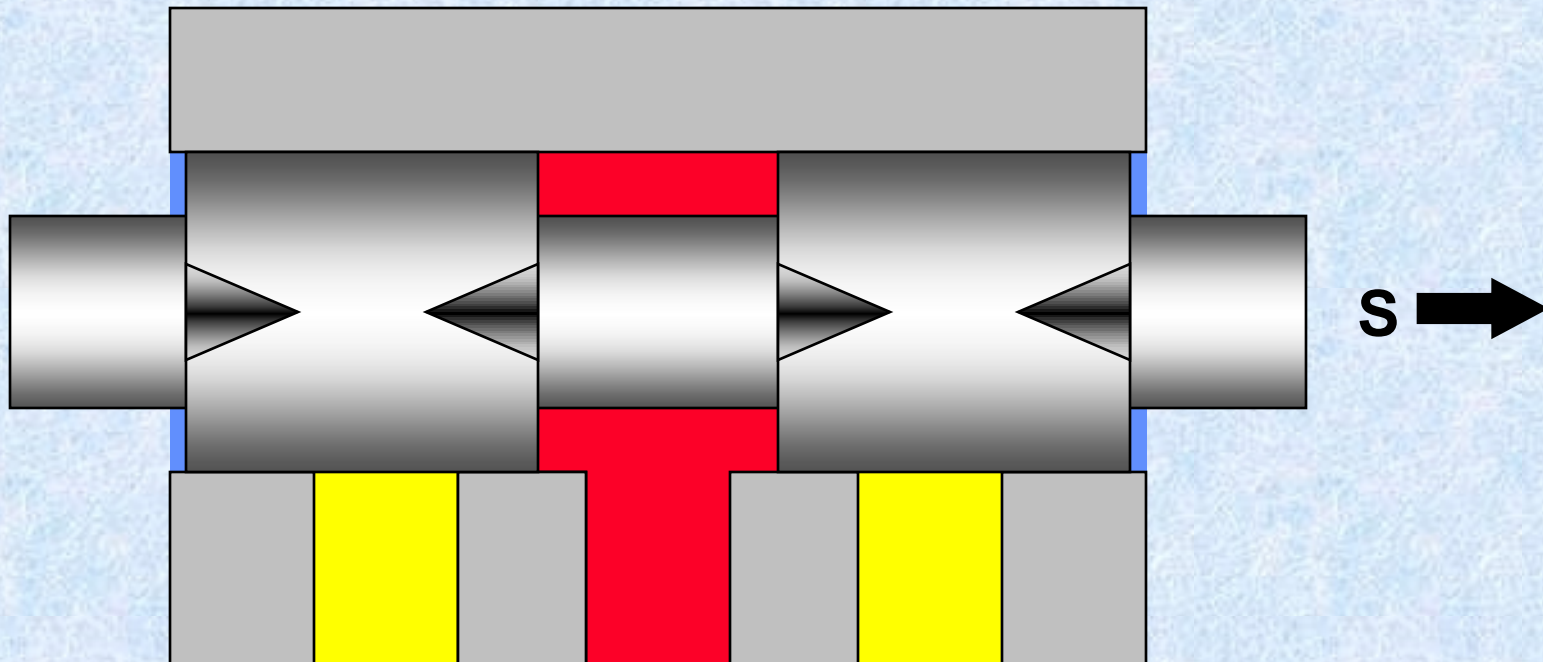
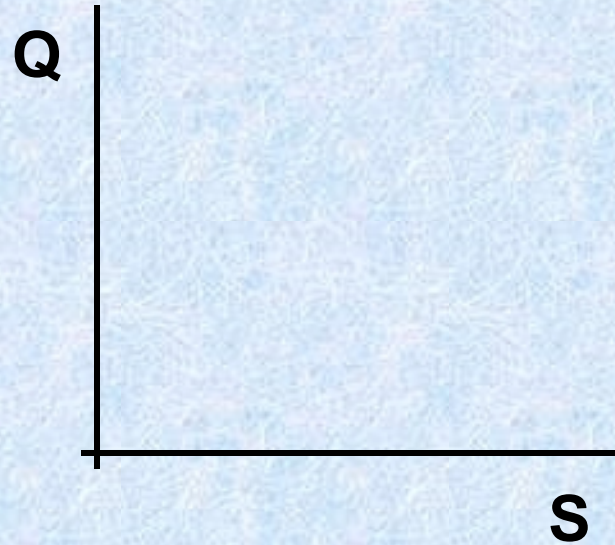
2) 这意味着，控制小流量 阀开口要求非常小而且很困难。

Which would mean that to control low flow rates, the amount of spool opening required would be very small and difficult to control.



1) 百分比阀阀芯具有比较宽的边沿带有槽口的台肩。

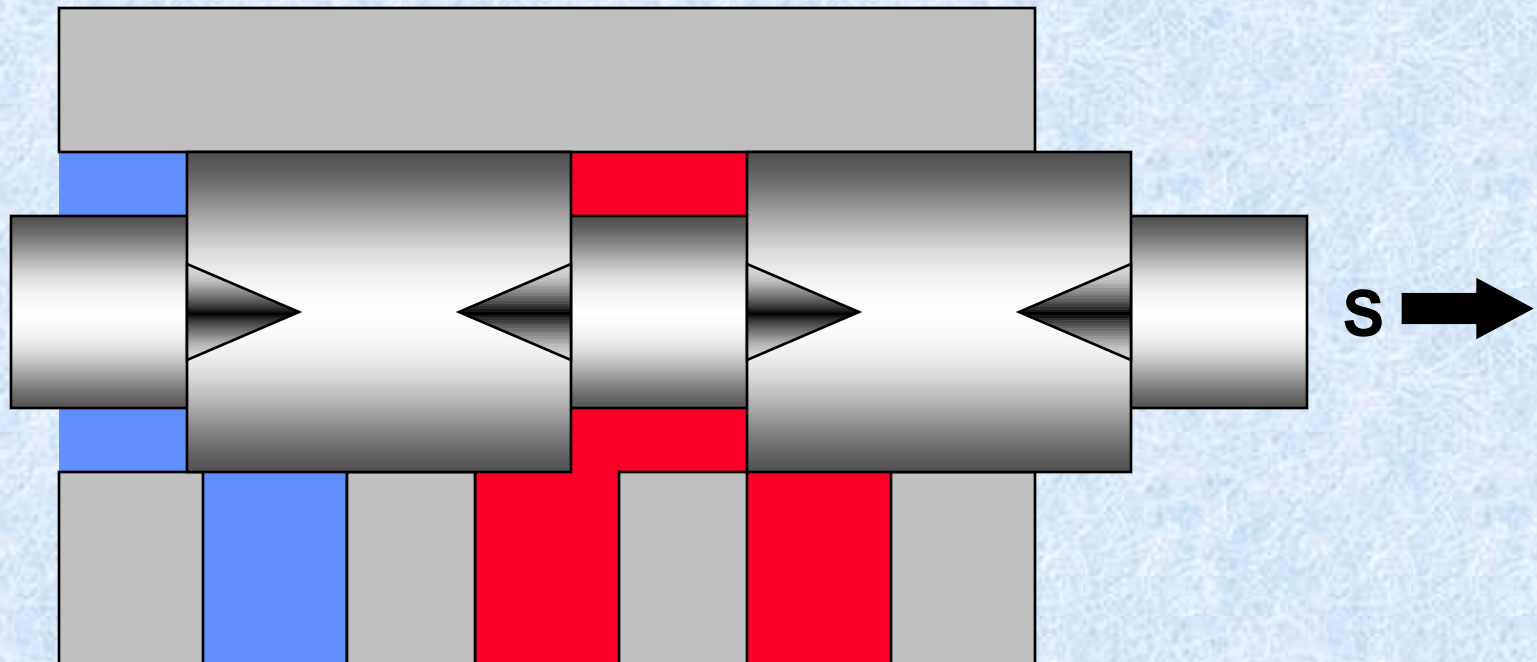
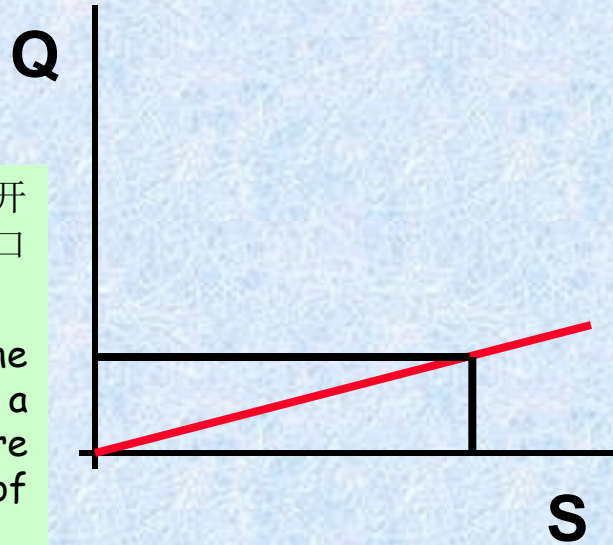
A proportional valve spool therefore has wider lands with notches cut into the edges.



1) 百分比阀阀芯具有比较宽的边沿带有槽口的台肩。

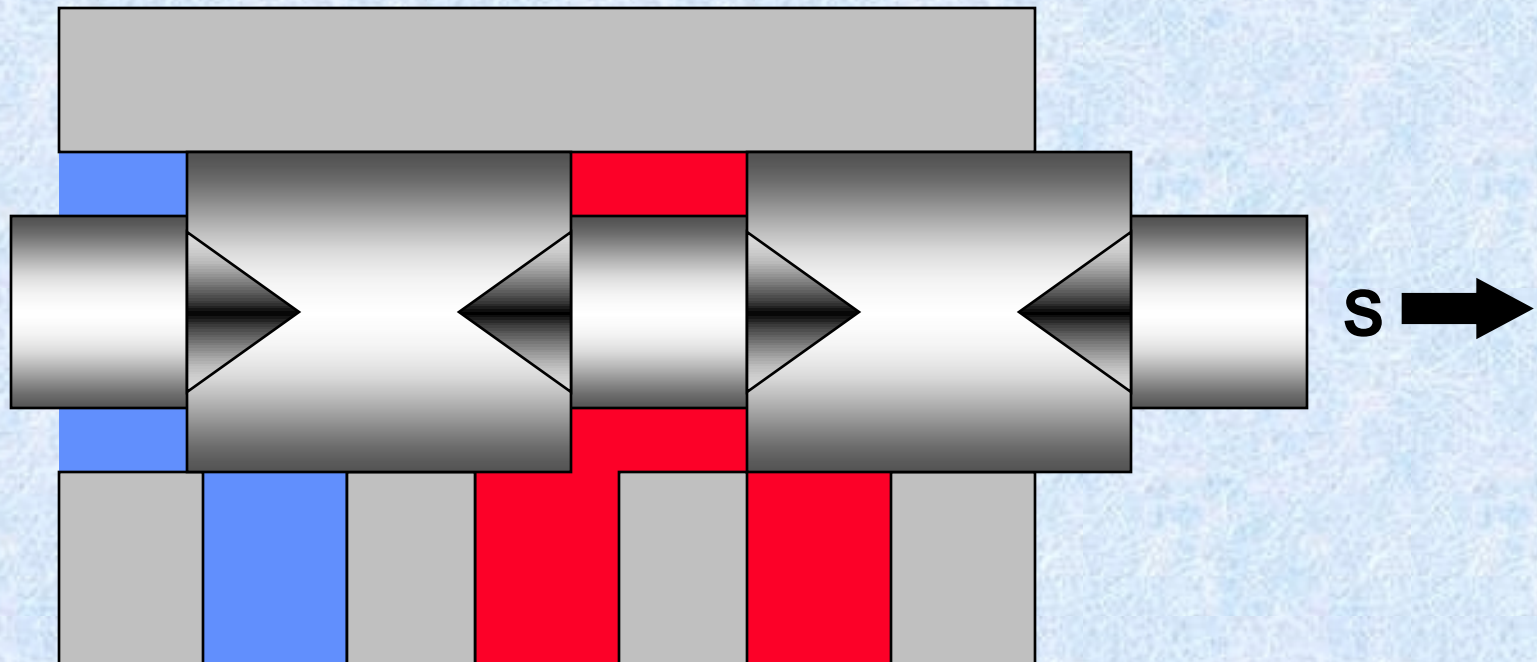
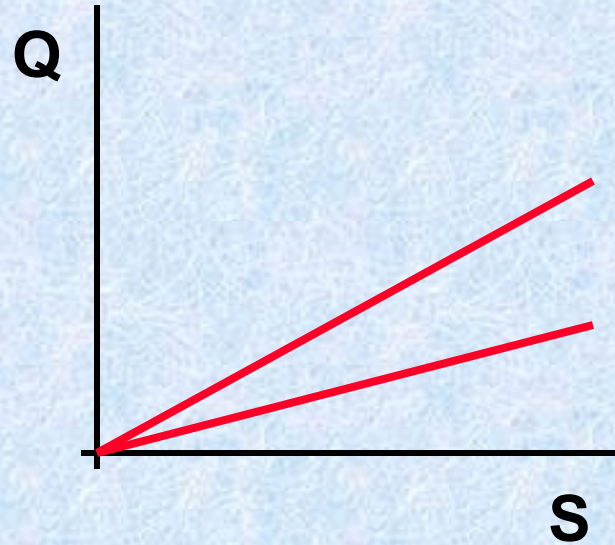
2) 所以尽管经过阀的最大流量被降低了（与开关阀对照）但小流量尤其轻易控制，阀的开口更有规则。

So although the maximum flow through the valve may be reduced (compared to a switching valve) low flows in particular are more easily controlled and the opening of the valve is more gradual.



根据控制的最大流量，不同的阀芯能被合用于不同形状、大小或阀芯槽口的大小特定的阀

Depending upon the maximum flow to be controlled, different spools can be fitted to a particular valve which have different shape, size or number of spool notches.



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