



Selected Chapters from Textile and Single-purpose Machines

Drive systems in the construction of single-purpose machines III.



Content

- DC motors
- Methods used for speed control of an DC motor

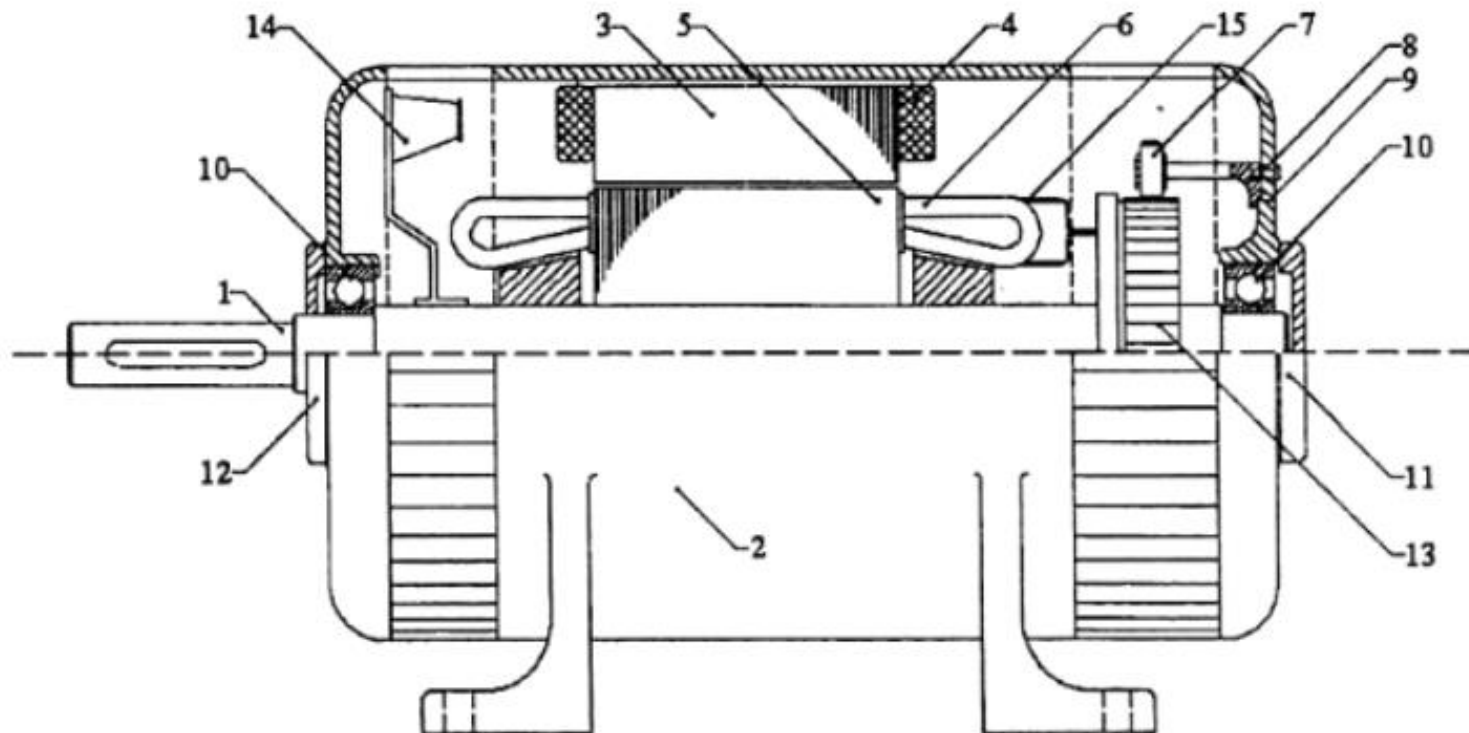


Direct current (DC) motors

- Commutator motors have an irreplaceable position in the field of small drives where there is DC voltage
- DC motors include a **stator with poles and a rotor with winding**, to which voltage is supplied via the commutator.
- Commutator motors contain a commutator, i.e. a contact part connected to the rotor.
- The mechanical commutator consists of rotatably mounted copper slats, separated from each other by insulation, which together with the so-called brushes (carbon collectors) make a sliding contact intended for supplying electric current to the rotor.



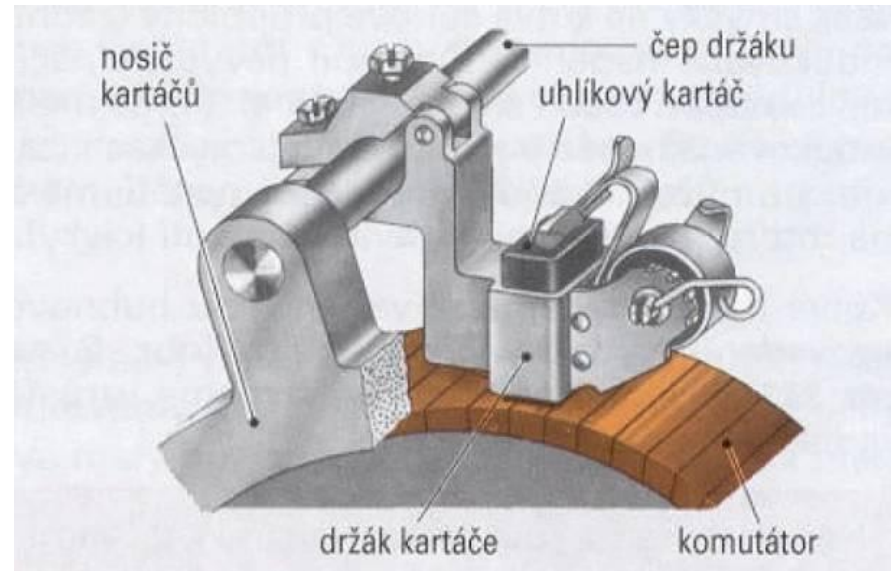
DC motors - construction



Commutator

copper slats

carbon collectors

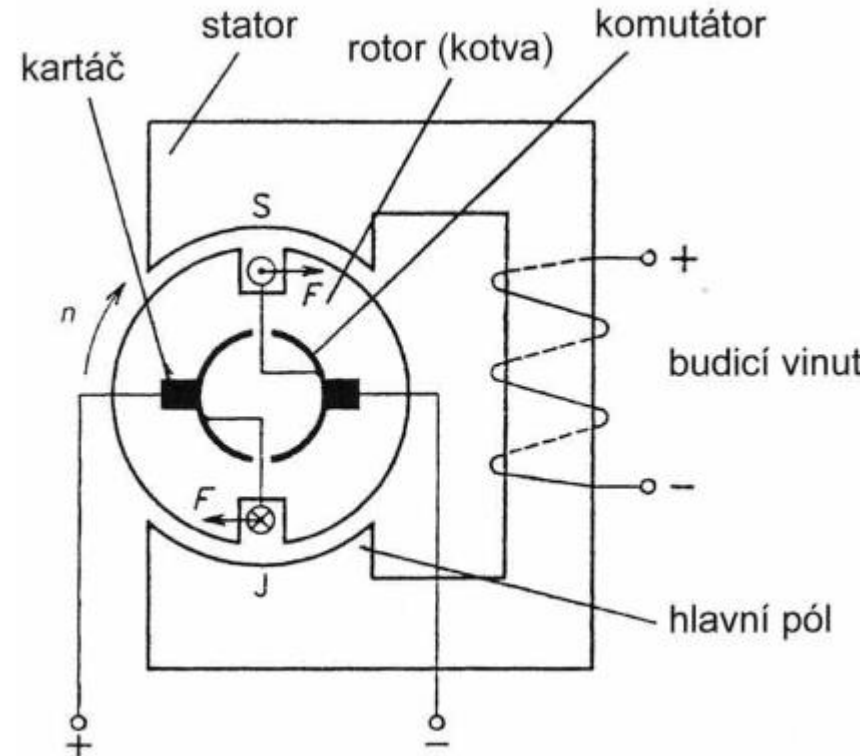


DC motors - principle

The stator produces a constant magnetic flux that can rotate.

The commutator also changes its polarity twice per revolution.

Since the common poles of the magnets repel each other, if the commutator is set so that the polarity of the magnets changes as soon as their opposite poles are closest, the moving magnet will constantly be subjected to forces that will force it to move.

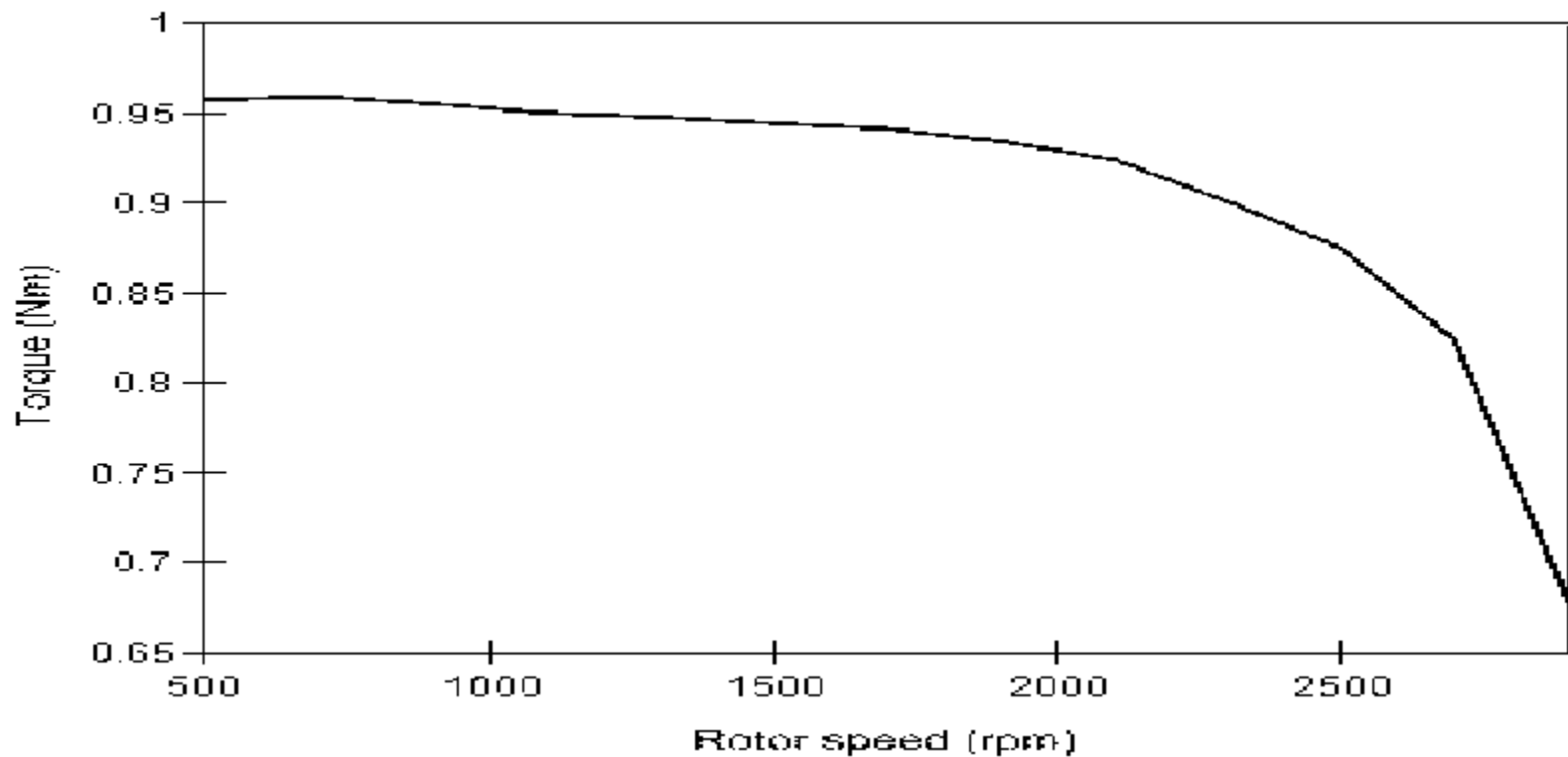


DC motors problematic

- The sliding contact has a limited service life. This limited service life is sufficient for the operation of rotary drives in cars and households usage.
- Problems usually arise in industrial applications, especially when used in continuous operation.
- An unpleasant feature of the sliding **contact between** the commutator and the brushes is the **sparking**, whose disturbing effect can very negatively affect the electromagnetic compatibility (EMC - Electro Magnetic Compatibility) of the motor and the whole device. With the development of electronics, the requirements for EMC continue to grow and solving is sometimes a serious problem



Speed-torque characteristic of a DC motor



DC motor - control

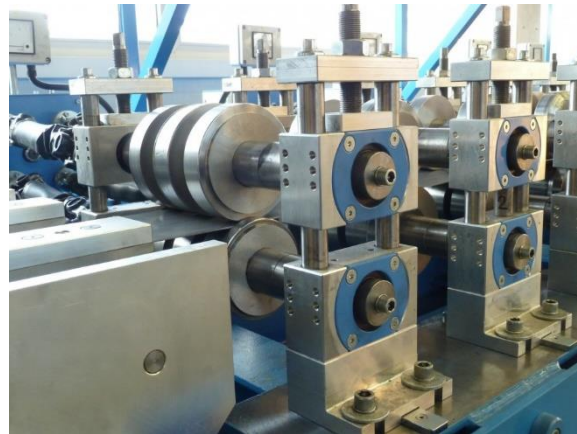
Speed control can be realized by:

- By changing the **voltage** on the **rotor winding**
 - *as the voltage in the rotor winding increases, its speed increases*
- By changing the **electric current** to the **excitation stator winding**
 - *as the excitation current changes, the excitation magnetic field changes and thus the rotor speed changes*
 - it is used especially for variable load torque



DC motor - use

- In general, the use of DC motors can be applied to a wide range of machines where **constant speed** is required at **variable load**
- Hand tools, kitchen appliances ... machine tools, forming and pressing machines, mining machines, etc.



Review

- Draw and describe the torque characteristic of the DC drive
- List some types of DC motor control.
- Describe the physical principle of DC motors.

Thanks for your attention

