

5.1 Mechanic drives

The mechanic drive, or gear, have to transmit at the driving wheel the torque developed by the traction motors.

Between the body of traction vehicle, its bogie frame and the axle boxes, some suspension devices are to be found. Motors are generally fixed on bogie frame or at body ground. Motors are called full-suspended if all their weight is on frame or semi-suspended if a part of weight is directly laid on the axle. The mechanical drive has to hold relatives movements between motor axis and axle axis. If the motors are fixed under body, the mechanical drive has also do hold relative movements between body and bogie, which needs telescopic cardan shaft (TGV, ICN).

The mechanic drive follows two targets:

- For a defined power output, a motor which turns fast is smaller and lighter than a slow motor. The drive contains a gear box between speeds of motor ω_m and axle ω_e .

$$\omega_e = k_G \omega_m \quad (5.1)$$

- To provide that shocks encountered by wheels (passing on rail joints or switches) go until the motors the drive contains also elastic elements.

The suspension of motors also contribute to track longevity: the track received shocks only with the mass of axles and not axle and motor. Drives can be classified in three classes, from the quality of its suspension:

- Class 1: Nose suspended motors are fixed on one side at frame with silent-blocs and on the over side at axle with bearings. They are not full-suspended (N1 – N3). The *gearless* drives and the planetary gears are also in this class.
- Class 2: The cardan shaft is put between motor shaft and the gear. It is installed inner of motor tubular shaft (*BBC with discs, Sécheron with blades, ASEA, Sumitomo*). The motor is fixed on frame of bogie or vehicle. The great cog-wheel is fixed on the axle (B1, B2, B6, B8, K1, K4, K5).
- Class 3: The cardan shaft is put between axle and the gear. This shaft is a tube around the axle (*Jaquemin, BBC with rubber joint, Alstom, Kaelble-Gmeinder*) (K2, B3, B4, B7). Drives with free shaft are also put in this class (B5, K3).

The figure 5.0 presents a more complete inventory of different solutions.

The mechanical power of motors is not fully transmitted at wheel rim, but with an efficiency η_G comprised between 0,95 and 0,99.

$$P_j = \eta_G P_{\text{mot}} \quad (5.4)$$

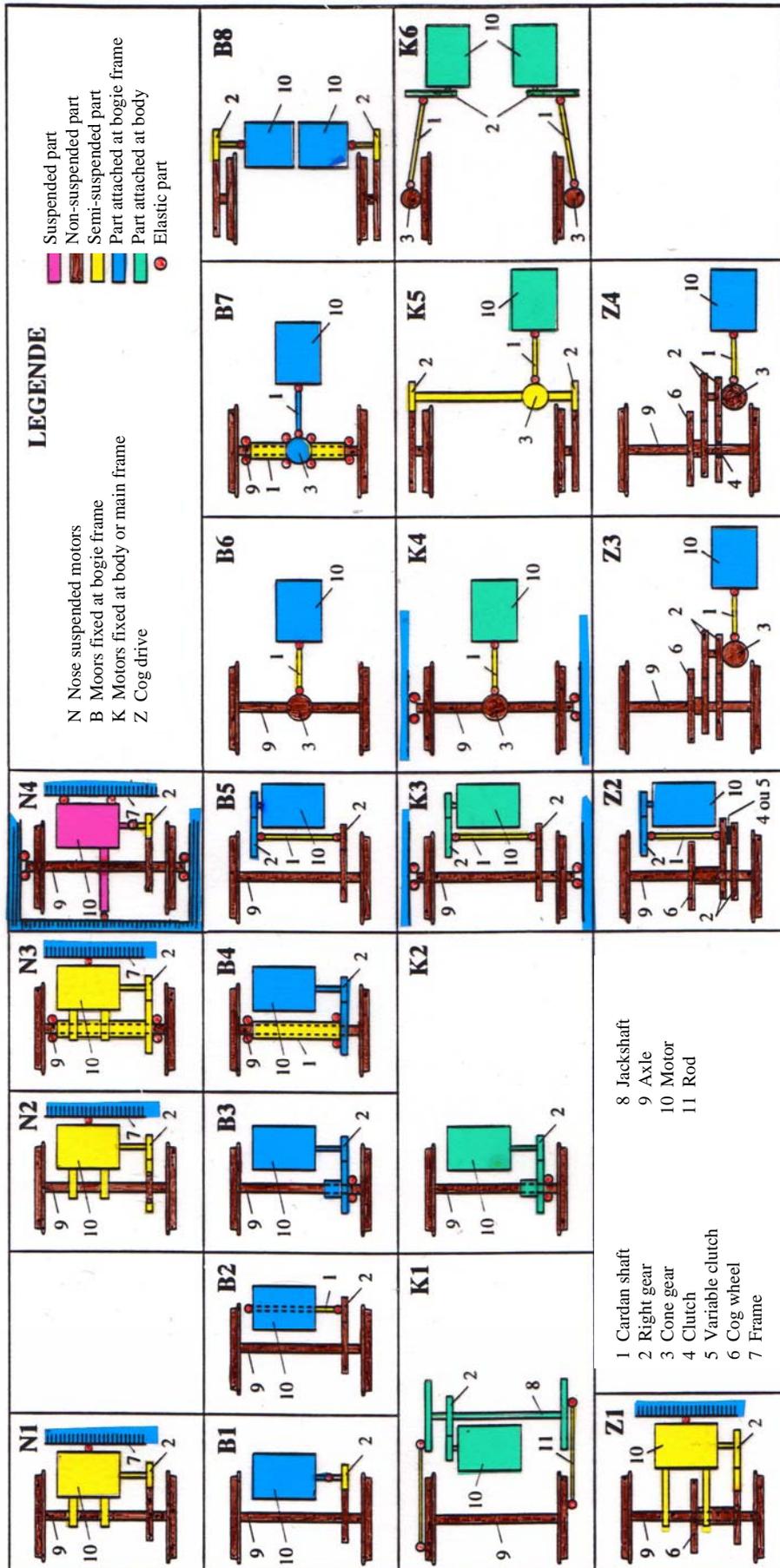


Fig. 5.0 Applications of transmissions.