

**CPC****COOPERATIVE PATENT CLASSIFICATION****F16D****COUPLINGS FOR TRANSMITTING ROTATION; CLUTCHES; BRAKES****NOTE**

Attention is drawn to the following places:

[A01D 69/08](#), [A01D 69/10](#) Clutches or brakes of harvesting machines for grass or cereals;  
[A61C 1/18](#) Clutches in dental machines for boring or cutting;  
[B21B 35/14](#) Drive couplings for metal-rolling mills;  
[B30B 15/10](#) Brakes specially adapted for presses;  
[B30B 15/12](#) Clutches specially adapted for presses;  
[B41J 33/52](#) Braking devices for ribbon-feed devices in selective printing mechanisms;  
[B60K 17/00](#) Arrangement or location of clutches in vehicles;  
[B61H](#) Brakes peculiar to rail vehicles;  
[B62B 5/04](#) Braking mechanisms for hand carts;  
[B62B 9/08](#) Braking mechanisms for children`s carriages or perambulators;  
[B62C 7/00](#) Braking mechanisms for animal-drawn vehicles;  
[B62L](#) Cycle brakes;  
[B66D 5/00](#) Braking devices for lifting or hoisting gear;  
[E21B 17/02](#) Couplings for drilling rods;  
[H02P 3/04](#) Brakes for electric motors, generators, dynamo-electric converters;  
[H04L 13/04](#) Clutches for apparatus for transmission of coded digital information.

**WARNING**

The following IPC groups are not used in the CPC scheme. Subject matter covered by these groups is classified in the following CPC groups:

[F16D 3/19](#) covered by [F16D 3/50](#);  
[F16D 3/27](#) covered by [F16D 3/26B](#);  
[F16D 13/69](#) covered by [F16D 13/52](#), [F16D 13/64C](#), [F16D 13/68B](#);  
[F16D 27/07](#) covered by [F16D 27/06](#), [F16D 27/14](#);  
[F16D 28/00](#) covered by [F16D 27/00B](#);  
[F16D 41/061](#) covered by [F16D 41/06F](#);  
[F16D 41/063](#) covered by [F16D 41/06C](#), [F16D 41/06D](#);  
[F16D 41/064](#) covered by [F16D 41/06H](#);  
[F16D 41/066](#) covered by [F16D 41/06H3](#), [F16D 41/06H3B](#);  
[F16D 41/067](#) covered by [F16D 41/06H3C](#);  
[F16D 41/069](#) covered by [F16D 41/06G](#);  
[F16D 48/12](#) covered by [B60K 23/08B](#);  
[F16D 65/35](#) covered by [F16D 63/00](#).

**Couplings** {for transmitting mechanical rotation}(fluid couplings [F16D 31/00](#) to [F16D 39/00](#); couplings or joints specially adapted for deep-drilling rods or sucker rods [E21B](#); for transmitting motion through a wall without relatively-moving surfaces [F16J 15/50](#))

**F16D 1/00**

**Couplings for rigidly connecting two coaxial shafts or other movable machine elements** (attachment of wheels to axles for railway carriages [B60B](#); for attachment of cranks to their shafts [F16C 3/10](#))

- F16D 1/02 . for connecting two abutting shafts or the like
- F16D 1/027 .. non-disconnectable, e.g. involving gluing, welding or the like
- F16D 1/033 .. by clamping together two faces perpendicular to the axis of rotation, e.g. with bolted flanges
- F16D 1/04 .. with clamping hub; with hub and longitudinal key
- F16D 1/05 ... with radial clamping due to axial loading of at least one pair of conical surfaces
- F16D 1/06 . for attachment of a member on a shaft or on a shaft-end ([attachment of marine propellers on shafts B63H 23/34](#))
- F16D 1/064 .. non-disconnectable
- F16D 1/068 ... involving gluing, welding or the like
- F16D 1/072 ... involving plastic deformation ([plastic welding F16D 1/068](#))
- F16D 1/076 .. by clamping together two faces perpendicular to the axis of rotation, e.g. with bolted flanges
- F16D 1/08 .. with clamping hub; with hub and longitudinal key
- F16D 1/0805 ... {with radial clamping due to deformation of a resilient body or a body of fluid (**F16D 1/09D** takes precedence; elastic couplings [F16D 3/80](#); fluid pressure clutches [F16D 25/04](#))}
- F16D 1/0811 ... {with radial clamping due to tilting of a hub part or ring about a diametral axis}
- F16D 1/0817 ... {with radial clamping due to rotation along an eccentric surface, e.g. arcuate wedging elements (similar clutches [F16D 17/00](#); similar free-wheel clutches [F16D 41/06](#))}
- F16D 1/0823 ... {with radial clamping of a helical wrap spring on the shaft or in the hub bore (similar clutches [F16D 13/025](#), [F16D 13/08](#), [F16D 27/025](#), **F16D 27/10C**; similar slip couplings [F16D 7/022](#); similar free-wheel clutches [F16D 41/206](#))}
- F16D 1/0829 ... {with radial loading of both hub and shaft by an intermediate ring or sleeve ([F16D 1/0817](#), [F16D 1/0823](#), **F16D 1/09C** take precedence)}
- F16D 1/0835 .... {due to the elasticity of the ring or sleeve}
- F16D 1/0841 .... {due to axial loading of the ring or sleeve, e.g. Belleville washers}
- F16D 1/0847 ... {with radial clamping due to a radial screw}
- F16D 1/0852 ... {with radial clamping between the mating surfaces of the hub and shaft ([F16D 1/0805](#) to [F16D 1/0817](#), [F16D 1/09](#) take precedence)}
- F16D 1/0858 .... {due to the elasticity of the hub (including shrink fits)}
- F16D 1/0864 .... {due to tangential loading of the hub, e.g. a split hub}
- F16D 1/087 .... {due to other loading elements in the hub or shaft}
- F16D 1/0876 ... {with axial keys and no other radial clamping}
- F16D 1/0882 .... {the key being axially tapered and tightening when loaded axially}
- F16D 1/0888 ..... {the key having two axially tapered interengaging parts}
- F16D 1/0894 ... {with other than axial keys, e.g. diametral pins, cotter pins and no other radial clamping}
- F16D 1/09 ... with radial clamping due to axial loading of at least one pair of conical surfaces {(tapered keys [F16D 1/0882](#))}
- F16D 1/091 .... and comprising a chamber including a tapered piston moved axially by fluid pressure to effect clamping
- F16D 1/092 .... the pair of conical mating surfaces being provided on the coupled hub and shaft

- F16D 1/093 . . . . using one of more elastic segmented conical rings forming at least one of the conical surfaces, the rings being expanded or contracted to effect clamping(**F16D 1/091T** takes precedence)
- F16D 1/094 . . . . . using one or more pairs of elastic or segmented rings with mutually mating conical surfaces, one of the mating rings being contracted and the other being expanded
- F16D 1/095 . . . . . with clamping effected by ring contraction only{(for connecting two abutting shafts [F16D 1/02](#))}
- F16D 1/096 . . . . . the ring or rings being located between the shaft and the hub
- F16D 1/097 . . . . . with clamping effected by ring expansion only, e.g. with an expanded ring located between hub and shaft
- F16D 1/10 . . Quick-acting couplings in which the parts are connected by simply bringing them together axially
- F16D 1/101 . . {without axial retaining means rotating with the coupling}
- F16D 1/104 . . having retaining means rotating with the coupling and acting only by friction
- F16D 1/108 . . having retaining means rotating with the coupling and acting by interengaging parts, i.e. positive coupling
- F16D 1/112 . . . the interengaging parts comprising torque-transmitting surfaces, e.g. bayonet joints
- F16D 1/116 . . . the interengaging parts including a continuous or interrupted circumferential groove in the surface of one of the coupling parts ([circlips for retaining hubs on shafts F16B 21/18](#))
- F16D 1/12 . . allowing adjustment of the parts about the axis ([during motion F16D 3/10](#))
- F16D 3/00** **Yielding couplings, i.e. with means permitting movement between the connected parts during the drive** ([couplings disconnectable simply by axial movement F16D 1/10](#); [slip couplings F16D 7/00](#))
- F16D 3/005 . . {incorporating leaf springs, flexible parts of reduced thickness or the like acting as pivots}
- F16D 3/02 . . adapted to specific functions ([universal joints, see the appropriate groups](#))
- F16D 3/04 . . specially adapted to allow radial displacement, e.g. Oldham coupling
- F16D 3/06 . . specially adapted to allow axial displacement
- F16D 3/065 . . . {by means of rolling elements}
- F16D 3/08 . . Couplings for intersecting shafts, provided with intermediate bars bent in an angle corresponding with the angle of intersection
- F16D 3/10 . . Couplings with means for varying the angular relationship of two coaxial shafts during motion
- F16D 3/12 . . specially adapted for accumulation of energy to absorb shocks or vibration ([by making use of fluid elements F16D 3/80](#))
- F16D 3/14 . . combined with a friction coupling for damping vibration or absorbing shock
- F16D 3/16 . . Universal joints in which flexibility is produced by means of pivots or sliding or rolling connecting parts
- F16D 3/18 . . the coupling parts (1) having slidably-interengaging teeth
- F16D 3/185 . . . {radial teeth connecting concentric inner and outer coupling parts}

- F16D 3/20 .. one coupling part entering a sleeve of the other coupling part and connected thereto by sliding or rolling members ([F16D 3/18](#), [F16D 3/24](#) take precedence)

### **NOTE**

"coupling parts" means the driving member and the driven member of the coupling to be mounted on and rotate as a unit with the shafts or their equivalents between which the coupling is placed. An intermediate member interconnecting these parts is regarded as such an equivalent.

- F16D 3/202 ... { one coupling part having radially projecting pins, e.g. tripod joints}  
 F16D 3/205 .... the pins extending radially outwardly from the coupling part  
 F16D 3/2052 ..... {having two pins}  
 F16D 3/2055 ..... {having three pins, i.e. true tripod joints}  
 F16D 3/2057 ..... {having four or more pins, e.g. with compensation for relative pin movement}  
 F16D 3/207 .... the pins extending radially inwardly from the coupling part  
 F16D 3/22 .. the rolling members being balls, rollers, or the like, guided in grooves or sockets in both coupling parts  
 F16D 3/221 .... the rolling members being located in sockets in one of the coupling parts  
 F16D 3/223 .... the rolling members being guided in grooves in both coupling parts

### **WARNING**

Groups [F16D 3/2233](#) and [F16D 3/2237](#) are not yet complete pending a reorganisation; see also this group

- F16D 3/2233 ..... where the track is made up of two curves with a point of inflexion in between, i.e. S-track joints  
 F16D 3/2237 ..... where the grooves are composed of radii and adjoining straight lines, i.e. undercut free [UF] type joints  
 F16D 3/224 ..... the groove centre-lines in each coupling part lying on a sphere  
 F16D 3/2245 ..... where the groove centres are offset from the joint centre

### **WARNING**

Not complete pending a reorganisation, see also group [F16D 3/224](#)

- F16D 3/226 ..... the groove centre-lines in each coupling part lying on a cylinder co-axial with the respective coupling part  
 F16D 3/2265 ..... {the joints being non-telescopic}  
 F16D 3/227 ..... the joints being telescopic  
 F16D 3/229 ..... Prismatic coupling parts having each groove centre-line lying on planes parallel to the axis of the respective coupling part ([F16D 3/224](#), [F16D 3/226](#) take precedence)  
 F16D 3/24 .. comprising balls, rollers, or the like between overlapping driving faces, e.g. cogs, on both coupling parts  
 F16D 3/26 .. Hooke`s joints or other joints with an equivalent intermediate member to which each coupling part is pivotally or slidably connected ([F16D 3/18](#), [F16D 3/20](#) take

- precedence)
- F16D 3/265 . . . {in which one coupling part has a tongue received with the intermediate member(s) in a recess with a transverse axis in the other coupling part}
  - F16D 3/28 . . . in which the interconnecting pivots include elastic members
  - F16D 3/30 . . . in which the coupling is specially adapted to constant velocity-ratio
  - F16D 3/32 . . . . . by the provision of two intermediate members each having two relatively perpendicular trunnions or bearings
  - F16D 3/33 . . . . . with ball or roller bearings
  - F16D 3/34 . . . . . parts being connected by ridges, pins, balls, or the like guided in grooves or between cogs
  - F16D 3/36 . . . in which each pivot between the coupling parts and the intermediate member comprises a single ball
  - F16D 3/38 . . . with a single intermediate member with trunnions or bearings arranged on two axes perpendicular to one another ([F16D 3/36 takes precedence](#))
  - F16D 3/382 . . . . . {constructional details of other than the intermediate member}
  - F16D 3/385 . . . . . {Bearing cup; Bearing construction; Bearing seal; Mounting of bearing on the intermediate member ([mounting of bearing in fork F16D 3/382](#))}
  - F16D 3/387 . . . . . {Fork construction; Mounting of fork on shaft; Adapting shaft for mounting of fork}
  - F16D 3/40 . . . . . with intermediate member provided with two pairs of outwardly-directed trunnions on intersecting axes
  - F16D 3/405 . . . . . {Apparatus for assembling or dismantling}
  - F16D 3/41 . . . . . with ball or roller bearings
  - F16D 3/42 . . . . . with ring-shaped intermediate member provided with bearings or inwardly-directed trunnions
  - F16D 3/43 . . . . . with ball or roller bearings
  - F16D 3/44 . . . the intermediate member being connected to the coupling parts by ridges, pins, balls, or the like guided in grooves or between cogs
  - F16D 3/46 . . . . . each coupling part embracing grooves or ridges on the intermediate member
  - F16D 3/48 . . . one coupling part having pins arranged parallel to the axis and entering holes in the other coupling part
  - F16D 3/50 . . . with the coupling parts connected by one or more intermediate members ([F16D 3/16 takes precedence](#))
  - F16D 3/52 . . . comprising a continuous strip, spring, or the like engaging the coupling parts at a number of places
  - F16D 3/54 . . . Couplings comprising a chain or strip surrounding two wheels arranged side by side and provided with teeth or the equivalent
  - F16D 3/56 . . . comprising elastic metal lamellae, elastic rods, or the like, e.g. arranged radially or parallel to the axis, the member being shear-loaded collectively by the total load
  - F16D 3/58 . . . the intermediate members being made of rubber or like material
  - F16D 3/60 . . . comprising pushing or pulling links attached to both parts ([F16D 3/64 takes precedence](#))
  - F16D 3/62 . . . the links or their attachments being elastic
  - F16D 3/64 . . . comprising elastic elements arranged between substantially-radial walls of both coupling parts
  - F16D 3/66 . . . the elements being metallic, e.g. in the form of coils

- F16D 3/68 . . . the elements being made of rubber or similar material
- F16D 3/70 . . comprising elastic elements arranged in holes in one coupling part and surrounding pins on the other coupling part
- F16D 3/72 . . with axially-spaced attachments to the coupling parts ([F16D 3/56](#) takes precedence)
- F16D 3/725 . . . {with an intermediate member made of fibre-reinforced resin (made of rubber-like material [F16D 3/74](#); shafts made of fibre-reinforced resin [F16C 3/026](#))}
- F16D 3/74 . . . the intermediate member or members being made of rubber or other {rubber-like} flexible material
- F16D 3/76 . . shaped as an elastic ring centered on the axis, surrounding a portion of one coupling part and surrounded by a sleeve of the other coupling part
- F16D 3/77 . . . the ring being metallic
- F16D 3/78 . . shaped as an elastic disc or flat ring, arranged perpendicular to the axis of the coupling parts, different sets of spots of the disc or ring being attached to each coupling part, e.g. Hardy couplings
- F16D 3/79 . . . the disc or ring being metallic
- F16D 3/80 . in which a fluid is used (fluid couplings allowing continuous slip [F16D 31/00](#) to [F16D 35/00](#))
- F16D 3/82 . . with a coupling element in the form of a pneumatic tube (similar clutches [F16D 25/04](#))
- F16D 3/84 . Shrouds, e.g. casings, covers; Sealing means specially adapted therefor
- F16D 3/841 . . {Open covers, e.g. guards for agricultural p.t.o. shafts}
- F16D 3/843 . . {enclosed covers}
- F16D 3/845 . . . {allowing relative movement of joint parts due to the flexing of the cover}
- F16D 3/848 . . . {allowing relative movement of joint parts due to sliding between parts of the cover}
- F16D 5/00** **Impulse couplings, i.e. couplings that alternately accelerate and decelerate the driven member**
- F16D 7/00** **Slip couplings, e.g. slipping on overload, for absorbing shock (combined with yielding shaft couplings [F16D 3/14](#); fluid slip couplings [F16D 31/00](#) to [F16D 35/00](#))**
- F16D 7/002 . {the torque being transmitted and limited by yielding of an elastomeric race}
- F16D 7/005 . {the torque being transmitted and limited by rolling friction, e.g. ball bearings axially loaded}
- F16D 7/007 . {the torque being transmitted and limited by rolling surfaces skidding, e.g. skew needle rollers}
- F16D 7/02 . of the friction type (couplings in which overload initiates a decrease of coupling pressure or a disconnection, see the relevant groups for clutches {e.g. for friction overload clutches [F16D 43/21](#)})
- F16D 7/021 . . {with radially applied torque-limiting friction surfaces ([F16D 7/022](#) takes precedence)}

- F16D 7/022 .. {with a helical band or equivalent member co-operating with a cylindrical torque limiting coupling surface}
- F16D 7/024 .. {with axially applied torque limiting friction surfaces}
- F16D 7/025 ... {with flat clutching surfaces, e.g. discs}
- F16D 7/027 ..... {with multiple lamellae}
- F16D 7/028 ... {with conical friction surfaces}
  
- F16D 7/04 . of the ratchet type (similar gearings based on repeated accumulation and delivery of inertia-energy [F16H 33/08](#); {overload clutches of the ratchet type [F16D 43/202](#)})
- F16D 7/042 .. {with at least one part moving axially between engagement and disengagement ([F16D 7/08](#) takes precedence)}
- F16D 7/044 ... {the axially moving part being coaxial with the rotation, e.g. a gear with face teeth}
- F16D 7/046 ... {with a plurality of axially moving parts}
- F16D 7/048 .. {with parts moving radially between engagement and disengagement ([F16D 7/10](#) takes precedence)}
- F16D 7/06 .. with intermediate ball or rollers
- F16D 7/08 ... moving axially between engagement and disengagement
- F16D 7/10 ... moving radially between engagement and disengagement

#### **F16D 9/00 Couplings with safety member for disconnecting, e.g. breaking or melting member**

- F16D 9/02 . by thermal means, e.g. melting member
- F16D 9/04 . by tensile breaking
- F16D 9/06 . by breaking due to shear stress
- F16D 9/08 .. over a single area encircling the axis of rotation, e.g. shear necks on shafts ([F16D 9/10](#) takes precedence)
- F16D 9/10 .. having a part movable after disconnection so as to provide reconnection, e.g. advanceable shear pins

#### **Clutches with mechanically-actuated clutching members (automatic clutches [F16D 41/00](#) to [F16D 45/00](#))**

#### **F16D 11/00 Clutches in which the members have interengaging parts (arrangements for synchronisation [F16D 23/02](#))**

- F16D 11/02 . disengaged by a contact of a part mounted on the clutch with a stationarily-mounted member
- F16D 11/04 .. with clutching members movable only axially
- F16D 11/06 .. with clutching member movable otherwise than only axially, e.g. rotatable keys
- F16D 11/08 . actuated by moving a non-rotating part axially (actuating-mechanism in the relevant groups)
- F16D 11/10 .. with clutching members movable only axially
- F16D 11/12 .. with clutching members movable otherwise than only axially

- F16D 11/14 . with clutching members movable only axially ([F16D 11/02](#), [F16D 11/08](#) take precedence)
- F16D 11/16 . with clutching members movable otherwise than only axially ([F16D 11/02](#), [F16D 11/08](#) take precedence)
- F16D 13/00** **Friction clutches** ([arrangements for synchronisation F16D 23/02](#))
- F16D 13/02 . disengaged by the contact of a part mounted on the clutch with a stationarily-mounted member
- F16D 13/025 . . {with a helical band or equivalent member with two or more turns embracing a drum or the like (**electromagnetically actuated F16D 27/10C**)}
- F16D 13/04 . with means for actuating or keeping engaged by a force derived at least partially from one of the shafts to be connected ([automatic clutches F16D 43/00](#))
- F16D 13/06 . . with clutching members movable otherwise than only axially ([F16D 13/08](#), [F16D 13/12](#) take precedence)
- F16D 13/08 . with a helical band or equivalent member, which may be built up from linked parts, with more than one turn embracing a drum or the like, with or without an additional clutch actuating the end of the band ([F16D 13/02](#) takes precedence; {similar slip couplings [F16D 7/022](#); similar clutches electromagnetically actuated [F16D 27/025](#), **F16D 27/10C**}; similar free-wheel clutches [F16D 41/20](#); similar brakes [F16D 49/02](#))
- F16D 13/10 . with clutching members co-operating with the periphery of a drum, a wheel-rim, or the like ([F16D 13/02](#) to [F16D 13/08](#) take precedence; similar brakes [F16D 49/00](#))
- F16D 13/12 . with an expansible band or coil co-operating with the inner surface of a drum or the like ([F16D 13/02](#) takes precedence; similar brakes [F16D 51/02](#))
- F16D 13/14 . with outwardly-movable clutching members co-operating with the inner surface of a drum or the like ([F16D 13/02](#), [F16D 13/06](#), [F16D 13/12](#) take precedence; similar brakes [F16D 51/00](#))
- F16D 13/16 . . shaped as radially-movable segments
- F16D 13/18 . . shaped as linked or separately-pivoted segments
- F16D 13/20 . with clutching members co-operating with both the periphery and the inner surface of a drum or wheel-rim ([similar brakes F16D 53/00](#))
- F16D 13/22 . with axially-movable clutching members ([similar brakes F16D 55/00](#))
- F16D 13/24 . . with conical friction surfaces {[cone clutches](#)}
- F16D 13/26 . . . in which the or each axially-movable member is pressed exclusively against an axially-located member
- F16D 13/28 . . . . with means for increasing the effective force between the actuating sleeve or equivalent member and the pressure member
- F16D 13/30 . . . . . in which the clutching pressure is produced by springs only
- F16D 13/32 . . . in which two or more axially-movable members are pressed from one side towards an axially-located member
- F16D 13/34 . . . . with means for increasing the effective force between the actuating sleeve or equivalent member and the pressure member

- F16D 13/36 . . . . . in which the clutching pressure is produced by springs only
- F16D 13/38 .. with flat clutching surfaces, e.g. discs
- F16D 13/385 ... {double clutches, i.e. comprising two friction disc mounted on one driven shaft (with two concentric driven shafts [F16D 21/06](#))}
- F16D 13/40 ... in which the or each axially-movable member is pressed exclusively against an axially-located member
- F16D 13/42 . . . . . with means for increasing the effective force between the actuating sleeve or equivalent member and the pressure member
- F16D 13/44 . . . . . in which the clutching pressure is produced by springs only
- F16D 13/46 ... in which two axially-movable members, of which one is attached to the driving side and the other to the driven side, are pressed from one side towards an axially-located member
- F16D 13/48 . . . . . with means for increasing the effective force between the actuating sleeve or equivalent member and the pressure member
- F16D 13/50 . . . . . in which the clutching pressure is produced by springs only
- F16D 13/505 . . . . . {Devices located between the flywheel and the driven disc, and biasing the driven disc away from the flywheel towards the disengaged position}
- F16D 13/52 ... Clutches with multiple lamellae {Clutches in which three or more axially moveable members are fixed alternately to the shafts to be coupled and are pressed from one side towards an axially-located member ([F16D 13/385](#) takes precedence)}
- F16D 13/54 . . . . . with means for increasing the effective force between the actuating sleeve or equivalent member and the pressure member
- F16D 13/56 . . . . . in which the clutching pressure is produced by springs only
- F16D 13/58 . Details {(tools for assembling or disassembling clutches [B25B 27/0064](#))}
- F16D 13/583 .. {Diaphragm-springs, e.g. Belleville (co-operation with a disengaging thrust ring or bearing [F16D 23/14](#))}
- F16D 13/585 ... {Arrangements or details relating to the mounting or support of the diaphragm on the clutch on the clutch cover or the pressure plate}
- F16D 13/60 .. Clutching elements (friction lining or attachment thereof [F16D 69/00](#))
- F16D 13/62 ... Clutch-bands; Clutch shoes; Clutch-drums (brake-bands, brake-shoes, brake-drums [F16D 65/00](#))
- F16D 13/64 ... Clutch-plates; Clutch-lamellae (brake-plates, brake-lamellae [F16D 65/12](#))
- F16D 13/644 . . . . . {Hub construction}
- F16D 13/646 . . . . . {Mounting of the discs on the hub}
- F16D 13/648 . . . . . {for clutches with multiple lamellae}
- F16D 13/66 . . . . . of conical shape
- F16D 13/68 . . . . . Attachments of plates or lamellae to their supports {(one or more discs connected to the linings transmitting torque to one or more discs connected to the hub by helical springs in windows in the discs, i.e. rotary vibration dampers [F16F 15/12](#))}
- F16D 13/683 . . . . . {for clutches with multiple lamellae}
- F16D 13/686 . . . . . {with one or more intermediate members made of rubber or like material transmitting torque from the linings to the hub}
- F16D 13/69 . . . . . Arrangements for spreading lamellae in the released state
- F16D 13/70 .. Pressure members, e.g. pressure plates, for clutch-plates or lamellae; Guiding

- arrangements for pressure members **{(clutch flywheels comprising two or more masses with a rotational damper F16F 15/12K)}**
- F16D 13/71 . . . in which the clutching pressure is produced by springs only
  - F16D 13/72 . . Features relating to cooling
  - F16D 13/74 . . Features relating to lubrication
  - F16D 13/75 . . Features relating to adjustment, e.g. slack adjusters
  - F16D 13/752 . . . {the adjusting device being located in the actuating mechanism arranged outside the clutch (adjusting "Bowden" mechanisms F16C 1/22)}
  - F16D 13/755 . . . {the adjusting device being located in or near the release bearing}
  - F16D 13/757 . . . {the adjusting device being located on or inside the clutch cover, e.g. acting on the diaphragm or on the pressure plate}
- F16D 13/76 . specially adapted to incorporate with other transmission parts, i.e. at least one of the clutch parts also having another function, e.g. being the disc of a pulley
- F16D 15/00 Clutches with wedging balls or rollers or with other wedgeable separate clutching members (freewheels, freewheel clutches F16D 41/00)**
- F16D 17/00 Clutches in which the drive is transmitted solely by virtue of the eccentricity of the contacting surfaces of clutch members which fit one around the other**
- F16D 19/00 Clutches with mechanically-actuated clutching members not otherwise provided for**
- F16D 21/00 Systems comprising a plurality of actuated clutches (for synchronisation F16D 23/04)**
- F16D 21/02 . for interconnecting three or more shafts or other transmission members in different ways (in endless-track vehicles B62D)
  - F16D 21/04 . . with a shaft carrying a number of rotatable transmission members, e.g. gears, each of which can be connected to the shaft by a clutching member or members between the shaft and the hub of the transmission member
  - F16D 21/06 . . at least two driving shafts or two driven shafts being concentric
  - F16D 21/08 . Serially-arranged clutches interconnecting two shafts only when all the clutches are engaged (F16D 13/08, F16D 13/12 take precedence)
- F16D 23/00 Details of mechanically-actuated clutches not specific for one distinct type**
- F16D 23/02 . Arrangements for synchronisation, also for power-operated clutches (shape or mounting of interengaging parts of clutch members to facilitate engagement F16D 11/08)
  - F16D 23/025 . . Synchro rings
  - F16D 23/04 . . with an additional friction clutch (synchro rings per se F16D 23/025)
  - F16D 23/06 . . . and a blocking mechanism preventing the engagement of the main clutch prior to synchronisation
  - F16D 23/0606 . . . . {the blocking mechanism comprising an axially-extending shouldered pin passing through a hole in a radial wall}

- F16D 23/0612 . . . . {the blocking mechanism comprising a radial pin in an axial slot with at least one branch}
- F16D 23/08 . . with a blocking mechanism that only releases the clutching member on synchronisation (in combination with an additional friction clutch [F16D 23/06](#))
- F16D 23/10 . . automatically producing the engagement of the clutch when the clutch members are moving at the same speed; Indicating synchronisation
- F16D 23/12 . Mechanical clutch-actuating mechanisms arranged outside the clutch as such (specific for combined clutches [F16D 21/00](#); mechanisms specific for synchronisation [F16D 23/02](#))
- F16D 23/14 . . Clutch-actuating sleeves {or bearings}; Actuating members directly connected to clutch-actuating sleeves{or bearings}
- F16D 23/142 . . . {with a resilient member acting radially between the bearing and its guide means}
- F16D 23/143 . . . {Arrangements or details for the connection between the release bearing and the diaphragm}
- F16D 23/144 . . . . {With a disengaging thrust-ring distinct from the release bearing, and secured to the diaphragm}
- F16D 23/145 . . . . . {Arrangements for the connection between the thrust-ring and the diaphragm}
- F16D 23/146 . . . . . {Arrangements for the connection between the thrust-ring and the release bearing}
- F16D 23/147 . . . {bearing with rolling elements having at least one race or part fixed to the race blind axially, e.g. cup-shaped}
- F16D 23/148 . . . {Guide-sleeve receiving the clutch release bearing}

**Clutches actuated non-mechanically** (arrangements for synchronisation [F16D 23/02](#); fluid clutches [F16DE31/00](#) to [F16D 39/00](#); automatic clutches [F16D 41/00](#) to [F16D 45/00](#); dynamo-electric clutches [H02K 49/00](#); clutches using electrostatic attraction [H02N 13/00](#))

## **F16D 25/00 Fluid-actuated clutches**

- F16D 25/02 . with means for actuating or keeping engaged by a force derived at least partially from one of the shafts to be connected
- F16D 25/04 . in which the fluid actuates an elastic clutching, {i.e. elastic actuating} member, e.g. a diaphragm or a pneumatic tube ([F16D 25/02](#) takes precedence; coupling using a pneumatic tube [F16D 3/82](#))
  - F16D 25/042 . . {the elastic actuating member rotating with the clutch}
  - F16D 25/044 . . . {and causing purely axial movement}
  - F16D 25/046 . . . {and causing purely radial movement}
  - F16D 25/048 . . {the elastic actuating member not rotating with a coupling part}
- F16D 25/06 . in which the fluid actuates a piston incorporated in, {i.e. rotating with} the clutch ([F16D 25/02](#) takes precedence)
  - F16D 25/061 . . the clutch having interengaging clutch members
  - F16D 25/062 . . the clutch having friction surfaces
  - F16D 25/063 . . . with clutch members exclusively moving axially

- F16D 25/0632 . . . . with conical friction surfaces, e.g. cone clutches
- F16D 25/0635 . . . . with flat friction surfaces, e.g. discs
- F16D 25/0638 . . . . . with more than two discs, e.g. multiple lamellae
- F16D 25/064 . . . . the friction surface being grooved
- F16D 25/065 . . . with clutching members having a movement which has at least a radial component
  
- F16D 25/08 . with fluid-actuated member not rotating with a clutching member ([F16D 25/02](#) takes precedence){[F16D 25/048](#) takes precedence}
- F16D 25/082 . . {the line of action of the fluid-actuated members co-inciding with the axis of rotation}
- F16D 25/083 . . . {Actuators therefor ([F16D 25/085](#) to [F16D 25/087](#) take precedence)}
- F16D 25/085 . . . {the clutch actuation being of the pull type}
- F16D 25/086 . . . {the clutch being actuated by a push rod extending coaxially through the input or output shaft}
- F16D 25/087 . . . {the clutch being actuated by the fluid-actuated member via a diaphragm spring or an equivalent array of levers ([F16D 25/085](#), [F16D 25/086](#) take precedence)}
- F16D 25/088 . . {the line of action of the fluid-actuated members being distinctly separate from the axis of rotation}
  
- F16D 25/10 . Clutch systems with a plurality of fluid-actuated clutches ([arrangements or mounting of clutches in vehicles B60K 17/00](#))
  
- F16D 25/12 . Details not specific to one of the before-mentioned types
- F16D 25/123 . . {in view of cooling and lubrication}
- F16D 25/126 . . {adjustment for wear or play}
- F16D 25/14 . . Fluid pressure control
  
- F16D 27/00** **Magnetically-~~or electrically-~~actuated clutches; Control or electric circuits therefor** ([clutches with magnetisable particles F16D 37/02](#); {[with electro-rheological fluids F16D 37/008](#)})
  
- F16D 27/004 . {[with permanent magnets combined with electromagnets](#)}
  
- F16D 27/01 . with permanent magnets
  
- F16D 27/02 . with electromagnets incorporated in the clutch, i.e. with collecting rings {([F16D 27/004](#) takes precedence)}
- F16D 27/025 . . {[and with a helical band or equivalent member co-operating with a cylindrical coupling surface](#)}
- F16D 27/04 . . with axially-movable friction surfaces
- F16D 27/06 . . . with friction surfaces arranged within the flux
- F16D 27/08 . . . with friction surfaces arranged externally to the flux
- F16D 27/09 . . and with interengaging jaws or gear-teeth
  
- F16D 27/10 . with an electromagnet not rotating with a clutching member, i.e. without collecting rings {([F16D 27/004](#) takes precedence)}
- F16D 27/102 . . with radially movable clutching members ([F16D 27/105](#) takes precedence)

- F16D 27/105 . . . with a helical band or equivalent member co-operating with a cylindrical coupling surface
- F16D 27/108 . . . with axially movable clutching members
- F16D 27/11 . . . . . with conical friction surfaces, e.g. cone clutches
- F16D 27/112 . . . . . with flat friction surfaces, e.g. discs
- F16D 27/115 . . . . . with more than two discs, e.g. multiple lamellae
- F16D 27/118 . . . with interengaging jaws or gear teeth
  
- F16D 27/12 . . Clutch systems with a plurality of electro-magnetically-actuated clutches  
{(F16D 27/004 takes precedence)}
  
- F16D 27/14 . . Details
  
- F16D 28/00** **Electrically-actuated clutches** (arrangements for synchronisation [F16D 23/02](#); clutches actuated directly by means of an electromagnet [F16D 27/00](#); automatic clutches [F16D 43/00](#) to [F16D 45/00](#); external control [F16D 48/00](#))
  
- F16D 29/00** **Clutches and systems of clutches involving both fluid and magnetic actuation**
  
- F16D 29/005 . . {with a fluid pressure piston driven by an electric motor}
  
- Couplings or clutches with a fluid or a semi-fluid as a power-transmitting means**  
(fluid gearing [F16H 39/00](#) to [F16H 49/00](#))
  
- F16D 31/00** **Fluid couplings or clutches with pumping sets of the volumetric type, i.e. in the case of liquid passing a predetermined volume per revolution**
  
- F16D 31/02 . . using pumps with pistons or plungers working in cylinders
- F16D 31/04 . . using gear-pumps
- F16D 31/06 . . using pumps of types differing from those before-mentioned
- F16D 31/08 . . Control of slip
  
- F16D 33/00** **Rotary fluid couplings or clutches of the hydro-kinetic type**
  
- F16D 33/02 . . controlled by changing the flow of the liquid in the working circuit, while maintaining a completely filled working circuit
- F16D 33/04 . . . by altering the position of blades
- F16D 33/06 . . controlled by changing the amount of liquid in the working circuit
- F16D 33/08 . . . by devices incorporated in the fluid coupling, with or without remote control
- F16D 33/10 . . . . . consisting of controllable supply and discharge openings
- F16D 33/12 . . . . . controlled automatically by self-actuated valves
- F16D 33/14 . . . . . consisting of shiftable or adjustable scoops

F16D 33/16 . . . by means arranged externally of the coupling or clutch ([mounting of such means in vehicles B60K 23/00](#), e.g. [B60K 23/02](#))

F16D 33/18 . . Details ([applicable also to fluid gearing F16H 41/24](#))

F16D 33/20 . . . Shape of wheels, blades, or channels with respect to function

**F16D 35/00** **Fluid clutches in which the clutching is predominantly obtained by fluid adhesion** ([F16D 37/00 takes precedence](#)){([arrangements of viscous clutches in four-wheel drives - B60K 17/3465 and B60K 17/351](#))}

F16D 35/005 . . {with multiple lamellae}

F16D 35/02 . . with rotary working chambers and rotary reservoirs, e.g. in one coupling part

F16D 35/021 . . . {actuated by valves}

F16D 35/022 . . . {the valve being actuated by a bimetallic strip ([F16D 35/026 takes precedence](#))}

F16D 35/023 . . . {the valve being actuated by a bimetallic coil ([F16D 35/026 takes precedence](#))}

F16D 35/024 . . . {the valve being actuated electrically, e.g. by an electromagnet ([F16D 35/026 takes precedence](#))}

F16D 35/025 . . . {the valve being actuated by inertia, e.g. using a flyweight or a centrifugal mass ([F16D 35/026 takes precedence](#))}

F16D 35/026 . . . {actuated by a plurality of valves; the valves being actuated by a combination of mechanisms covered by more than one of groups [F16D 35/022](#) to [F16D 35/025](#)}

F16D 35/027 . . . {actuated by emptying and filling with viscous fluid from outside the coupling during operation}

F16D 35/028 . . . {actuated electrically, e.g. by an electromagnet ([valves actuated electrically F16D 35/024](#))}

F16D 35/029 . . . {actuated by varying the volume of the reservoir chamber}

**F16D 37/00** **Clutches in which the drive is transmitted through a medium consisting of small particles, e.g. centrifugally speed-responsive**

F16D 37/008 . . {the particles being carried by a fluid, to vary viscosity when subjected to electric change, i.e. electro-rheological or smart fluids ([composition of such fluids C10M 171/001](#))}

F16D 37/02 . . the particles being magnetisable

**F16D 39/00** **Combinations of couplings according to two or more of the groups [F16D 31/00](#) to [F16D 37/00](#)**

**Freewheels or freewheel clutches; Automatic clutches** ([F16D 31/00](#) to [F16D 39/00](#) take precedence)

**F16D 41/00** **Freewheels or freewheel clutches** ([cycle brakes controlled by back-peddalling B62L 5/00](#); [one-way linear clutches F16B 7/16](#))

- F16D 41/02 . . disengaged by contact of a part of or on the freewheel or freewheel clutch with a stationarily-mounted member
- F16D 41/04 . . combined with a clutch for locking the driving and driven members ([F16D 41/02](#), [F16D 41/24](#) take precedence)
- F16D 41/06 . . with intermediate wedging coupling members between an inner and an outer surface ([F16D 41/02](#), [F16D 41/24](#) take precedence)
- F16D 41/061 . . . the intermediate members wedging by movement having an axial component
- F16D 41/063 . . . the intermediate members wedging by moving along the inner and the outer surface without pivoting or rolling, e.g. sliding wedges ([F16D 41/061](#) takes precedence)
- F16D 41/064 . . . the intermediate members wedging by rolling and having a circular cross-section, e.g. balls ([F16D 41/061](#) takes precedence)
- F16D 41/066 . . . . all members having the same size and only one of the two surfaces being cylindrical
- F16D 41/067 . . . . . and the members being distributed by a separate cage encircling the axis of rotation
- F16D 41/069 . . . the intermediate members wedging by pivoting or rocking, e.g. sprags ([F16D 41/061](#) takes precedence)
- F16D 41/07 . . . . between two cylindrical surfaces
- F16D 41/073 . . . . . { each member comprising at least two elements at different radii}
- F16D 41/076 . . . . . { the wedging coupling members being non-releasably joined to form a single annular piece, e.g. either the members being integral projections from the piece, or the piece being an elastic ring cast round the radial centres of the members}
- F16D 41/08 . . . with provision for altering the freewheeling action
- F16D 41/082 . . . . {the intermediate coupling members wedging by movement other than pivoting or rolling}
- F16D 41/084 . . . . {the intermediate coupling members wedging by pivoting or rocking}
- F16D 41/086 . . . . {the intermediate members being of circular cross-section and wedging by rolling ([F16D 41/10](#) takes precedence)}
- F16D 41/088 . . . . . {the intermediate members being of only one size and wedging by a movement not having an axial component, between inner and outer races, one of which is cylindrical}
- F16D 41/10 . . . . with self-actuated reversing
- F16D 41/105 . . . . . {the intermediate members being of circular cross-section, of only one size and wedging by rolling movement not having an axial component between inner and outer races, one of which is cylindrical}
- F16D 41/12 . . . with hinged pawl co-operating with teeth, cogs, or the like ([F16D 41/02](#), [F16D 41/24](#) take precedence)
- F16D 41/125 . . . . {the pawl movement having an axial component}
- F16D 41/14 . . . the effective stroke of the pawl being adjustable
- F16D 41/16 . . . the action being reversible
- F16D 41/18 . . . with non-hinged detent ([F16D 41/02](#), [F16D 41/24](#) take precedence)
- F16D 41/185 . . . . {the engaging movement having an axial component}

- F16D 41/20 . with expandable or contractable clamping ring or band ([F16D 41/02](#), [F16D 41/24](#) take precedence)
- F16D 41/203 .. {having coils overlapping in a single radial plane, e.g. Archimedian spiral}
- F16D 41/206 .. {having axially adjacent coils, e.g. helical wrap-springs}
  
- F16D 41/22 . with clutching ring or disc axially shifted as a result of lost motion between actuating members ([F16D 41/02](#), [F16D 41/24](#) take precedence)
  
- F16D 41/24 . specially adapted for cycles
- F16D 41/26 .. with provision for altering the action
- F16D 41/28 .. with intermediate wedging coupling members
- F16D 41/30 .. with hinged pawl co-operating with teeth, cogs, or the like
- F16D 41/32 .. with non-hinged detent
- F16D 41/34 .. with expandable or contractable clamping ring or band
- F16D 41/36 .. with clutching ring or disc axially shifted as a result of lost motion between actuating members
  
- F16D 43/00** **Automatic clutches** (varying the relationship between two coaxial shafts [F16D 3/10](#); freewheels, freewheel clutches [F16D 41/00](#))
  
- F16D 43/02 . actuated entirely mechanically
- F16D 43/04 .. controlled by angular speed ([F16D 43/24](#) takes precedence; clutches in which the drive is transmitted through a medium consisting of small particles [F16D 37/00](#))
- F16D 43/06 ... with centrifugal masses actuating axially a movable pressure ring or the like
- F16D 43/08 .... the pressure ring actuating friction plates, cones or similar axially-movable friction surfaces
- F16D 43/09 ..... in which the carrier of the centrifugal masses can be stopped
- F16D 43/10 ..... the centrifugal masses acting directly on the pressure ring, no other actuating mechanism for the pressure ring being provided
- F16D 43/12 ..... the centrifugal masses acting on, or forming a part of, an actuating mechanism by which the pressure ring can also be actuated independently of the masses
- F16D 43/14 ... with centrifugal masses actuating the clutching members directly in a direction which has at least a radial component; with centrifugal masses themselves being the clutching members
- F16D 43/16 .... with clutching members having interengaging parts
- F16D 43/18 .... with friction clutching members
- F16D 43/20 .. controlled by torque, e.g. overload-release clutches, slip-clutches with means by which torque varies the clutching pressure
- F16D 43/202 ... of the ratchet type (slip couplings of the ratchet type [F16D 7/04](#))
- F16D 43/2022 .... {with at least one part moving axially between engagement and disengagement ([F16D 43/206](#) takes precedence)}
- F16D 43/2024 ..... {the axially moving part being coaxial with the rotation, e.g. a gear with face teeth}
- F16D 43/2026 ..... {with a plurality of axially moving parts}
- F16D 43/2028 .... {with at least one part moving radially between engagement and disengagement ([F16D 43/208](#) takes precedence)}

- F16D 43/204 . . . . with intermediate balls or rollers
- F16D 43/206 . . . . . moving axially between engagement and disengagement
- F16D 43/208 . . . . . moving radially between engagement and disengagement
- F16D 43/21 . . . with friction members (*{slip couplings of the friction type [F16D 7/02](#)}*)
- F16D 43/211 . . . . *{with radially applied torque-limiting friction surfaces}*
- F16D 43/213 . . . . *{with axially applied torque-limiting friction surfaces}*
- F16D 43/215 . . . . . *{with flat friction surfaces, e.g. discs}*
- F16D 43/216 . . . . . *{with multiple lamellae}*
- F16D 43/218 . . . . . *{with conical friction surfaces}*
- F16D 43/22 . . controlled by both speed and torque
- F16D 43/24 . . controlled by acceleration or deceleration of angular speed
- F16D 43/25 . . controlled by thermo-responsive elements
- F16D 43/26 . . acting at definite angular position or disengaging after *{consecutive}* definite number of rotations (*actuating by means of stationary abutment [F16D 11/02](#), [F16D 13/02](#), [F16D 15/00](#); control of change-speed or reversing-gearings conveying rotary motion [F16H 59/00](#) to [F16H 63/00](#)*)
  
- F16D 43/28 . . actuated by fluid pressure
- F16D 43/284 . . controlled by angular speed
- F16D 43/286 . . controlled by torque
  
- F16D 43/30 . . Systems of a plurality of automatic clutches

#### **F16D 45/00 Freewheel or freewheel clutches combined with automatic clutches**

#### **F16D 47/00 Systems of clutches, or clutches and couplings, comprising devices of types grouped under at least two of the preceding guide headings**

- F16D 47/02 . . of which at least one is a coupling (*elastic attachment of clutch parts, see the groups for the clutches*){(*clutch flywheels with damping devices [F16D 15/10+s.gr.](#)*)}
- F16D 47/04 . . of which at least one is a freewheel ([F16D 47/02](#), [F16D 47/06](#) take precedence; freewheels combined with a clutch to lock the driving and driven members of the freewheel [F16D 41/04](#), [F16D 41/26](#))
- F16D 47/06 . . of which at least one is a clutch with a fluid or a semi-fluid as power-transmitting means

#### **F16D 48/00 External control of clutches**

##### **WARNING**

Groups [F16D 48/00](#), [F16D 48/06](#), [F16D 48/08](#), [F16D 48/10](#), introduced in September 1998, are not complete. Documents from the groups [F16D 48/062](#) to [F16D 48/066](#) are in the process of being reorganised to [F16D 48/00](#), [F16D 48/08](#), [F16D 48/10](#)

- F16D 48/02 . Control by fluid pressure
- F16D 48/0206 .. {in a system with a plurality of fluid-actuated clutches}
- F16D 48/04 .. providing power assistance
  
- F16D 48/06 . Control by electric or electronic means, e.g. of fluid pressure
- F16D 48/062 .. {of a clutch system with a plurality of fluid actuated clutches}
- F16D 48/064 .. {Control of electrically or electromagnetically actuated clutches ([F16D 48/062](#), [F16D 48/068](#) take precedence)}
- F16D 48/066 .. {Control of fluid pressure, e.g. using an accumulator ([F16D 48/062](#), [F16D 48/068](#) take precedence)}
- F16D 48/068 .. {using signals from a manually actuated gearshift linkage}
- F16D 48/08 .. Regulating clutch take-up on starting
- F16D 48/10 .. Preventing unintentional or unsafe engagement

**Brakes** (electrodynamic brake systems for vehicles in general [B60L](#); dynamo-electric brakes [H02K](#))

**F16D 49/00** **Brakes with a braking member co-operating with the periphery of a drum, wheel-rim, or the like** (similar clutches [F16D 13/10](#))

- F16D 49/02 . shaped as a helical band or coil with more than one turn, with or without intensification of the braking force by the tension of the band or contracting member (similar clutches [F16D 13/08](#))
- F16D 49/04 .. mechanically actuated
- F16D 49/06 .. fluid actuated
  
- F16D 49/08 . shaped as an encircling band extending over approximately 360 degrees
- F16D 49/10 .. mechanically actuated (self-tightening [F16D 49/20](#))
- F16D 49/12 .. fluid actuated
  
- F16D 49/14 . shaped as a fluid-filled flexible member actuated by variation of the fluid pressure
  
- F16D 49/16 . Brakes with two brake-blocks (self-tightening [F16D 49/20](#))
  
- F16D 49/18 . Brakes with three or more brake-blocks (self-tightening [F16D 49/20](#))
  
- F16D 49/20 . Self-tightening brakes (with helical or coil with more than one turn [F16D 49/02](#))
- F16D 49/22 .. with an auxiliary friction member initiating or increasing the action of the brake

**F16D 51/00** **Brakes with outwardly-movable braking members co-operating with the inner surface of a drum or the like** (similar clutches [F16D 13/14](#))

- F16D 51/02 . shaped as one or more circumferential band (similar clutches [F16D 13/12](#))
- F16D 51/04 .. mechanically actuated
- F16D 51/06 .. fluid actuated

- F16D 51/08 . . . shaped as an expansible fluid-filled flexible member
- F16D 51/10 . . . shaped as exclusively radially-movable brake-shoes
- F16D 51/12 . . . . . mechanically actuated
- F16D 51/14 . . . . . fluid actuated
- F16D 51/16 . . . shaped as brake-shoes pivoted on a fixed or nearly-fixed axis
- F16D 51/18 . . . . . with two brake-shoes
- F16D 51/20 . . . . . extending in opposite directions from their pivots
- F16D 51/22 . . . . . . . . . . mechanically actuated
- F16D 51/24 . . . . . . . . . . fluid actuated
- F16D 51/26 . . . . . both extending in the same direction from their pivots
- F16D 51/28 . . . . . . . . . . mechanically actuated
- F16D 51/30 . . . . . . . . . . fluid actuated
- F16D 51/32 . . . . . with three or more brake shoes
- F16D 51/34 . . . . . extending in opposite directions from their pivots
- F16D 51/36 . . . . . . . . . . mechanically actuated
- F16D 51/38 . . . . . . . . . . fluid actuated
- F16D 51/40 . . . . . all extending in the same direction from their pivots
- F16D 51/42 . . . . . . . . . . mechanically actuated
- F16D 51/44 . . . . . . . . . . fluid actuated
- F16D 51/46 . . . . . Self-tightening brakes with pivoted brake shoes, {i.e. the braked member increases the braking action}
- F16D 51/48 . . . . . with two linked or directly-interacting brake shoes
- F16D 51/50 . . . . . . . . . . mechanically actuated
- F16D 51/52 . . . . . . . . . . fluid actuated
- F16D 51/54 . . . . . with three or more brake-shoes, at least two of them being linked or directly interacting
- F16D 51/56 . . . . . . . . . . mechanically actuated
- F16D 51/58 . . . . . . . . . . fluid actuated
- F16D 51/60 . . . . . with wedging action of a brake-shoe, e.g. the shoe entering as a wedge between the brake-drum and a stationary part
- F16D 51/62 . . . . . . . . . . mechanically actuated
- F16D 51/64 . . . . . . . . . . fluid actuated
- F16D 51/66 . . . . . an actuated brake-shoe being carried along and thereby engaging a member for actuating another brake-shoe
- F16D 51/68 . . . . . . . . . . mechanically actuated
- F16D 51/70 . . . . . . . . . . fluid actuated
- F16D 53/00** . . . . . **Brakes with braking members co-operating with both the periphery and the inner surface of a drum, wheel-rim, or the like (similar clutches [F16D 13/20](#))**

- F16D 55/00**      **Brakes with substantially-radial braking surfaces pressed together in axial direction, e.g. disc brakes (similar clutches [F16D 13/38](#))**
- F16D 55/02      .    with axially-movable discs or pads pressed against axially-located rotating members
  - F16D 55/025    ..    {with two or more rotating discs at least one of them being located axially}
  - F16D 55/04      ..    by moving discs or pads away from one another against radial walls of drums or cylinders
  - F16D 55/06      ...    without self-tightening action
  - F16D 55/08      ....    Mechanically-actuated brakes
  - F16D 55/10      ....    Brakes actuated by a fluid-pressure device arranged in or on the brake
  - F16D 55/12      .....    comprising an expansible fluid-filled flexible member coaxial with the brake
  - F16D 55/14      ...    with self-tightening action, e.g. by means of coating helical surfaces or balls and inclined surfaces
  - F16D 55/15      ....    initiated by means of brake-bands or brake-shoes
  - F16D 55/16      ....    Mechanically-actuated brakes
  - F16D 55/18      ....    Brakes actuated by a fluid-pressure device arranged in or on the brake
  - F16D 55/20      .....    comprising an expansible fluid-filled flexible member coaxial with the brake
  - F16D 55/22      ..    by clamping an axially-located rotating disc between movable braking members, e.g. movable brake discs or brake pads
  - F16D 55/224    ...    with a common actuating member for the braking members
  - F16D 55/2245    .....    {in which the common actuating member acts on two levers carrying the braking members, e.g. tong-type brakes (similar brakes for rail vehicles [B61H 5/00](#))}
  - F16D 55/225    ....    the braking members being brake pads
  - F16D 55/2255    .....    in which the common actuating member is pivoted
  - F16D 55/226    .....    in which the common actuating member is moved axially, {e.g. floating caliper disc brakes}
  - F16D 55/2262    .....    {the axial movement being guided by open sliding surfaces, e.g. grooves}
  - F16D 55/2265    .....    the axial movement being guided by one or more pins {engaging bores in the brake support or the brake housing}
  - F16D 55/22655    .....    {Constructional details of guide pins}
  - F16D 55/227    .....    by two {or more} pins
  - F16D 55/228    ...    with a separate actuating member for each side
  - F16D 55/24      .    with a plurality of axially-movable discs, lamellae, or pads, pressed from one side towards an axially-located member
  - F16D 55/26      ..    without self-tightening action
  - F16D 55/28      ...    Brakes with only one rotating disc
  - F16D 55/30      ....    mechanically actuated
  - F16D 55/31      .....    by means of an intermediate leverage
  - F16D 55/32      ....    actuated by a fluid-pressure device arranged in or on the brake
  - F16D 55/33      .....    by means of an intermediate leverage

- F16D 55/34 . . . . . comprising an expansible fluid-filled flexible member coaxial with the brake
- F16D 55/36 . . . Brakes with a plurality of rotating discs all lying side by side
- F16D 55/38 . . . . . mechanically actuated
- F16D 55/39 . . . . . by means of an intermediate leverage
- F16D 55/40 . . . . . actuated by a fluid-pressure device arranged in or one the brake
- F16D 55/41 . . . . . by means of an intermediate leverage
- F16D 55/42 . . . . . comprising an expansible fluid-filled flexible member coaxial with the brake
- F16D 55/44 . . . with the rotating part consisting of both central plates and ring-shaped plates arranged concentrically around the central plates
- F16D 55/46 . . with self-tightening action
- F16D 55/48 . . . with discs or pads having a small free angular travel relative to their support, which produces the self-tightening action
- F16D 55/50 . . . with auxiliary friction members, which may be of different type, producing the self-tightening action
- F16D 57/00** **Liquid-resistance brakes; { Brakes using the internal friction of fluids or fluid-like media, e.g. powders (for braking drums, barrels or ropes of cranes, lift hoists or winches [B66D 5/026](#)) }**
- F16D 57/002 . { comprising a medium with electrically or magnetically controlled internal friction, e.g. electrorheological fluid, magnetic powder }
- F16D 57/005 . { Details of blades, e.g. shape }
- F16D 57/007 . { with variable brake geometry, e.g. axially movable rotor or stator }
- F16D 57/02 . with blades or like members braked by the fluid
- F16D 57/04 . with blades causing a directed flow, e.g. Föttinger type
- F16D 57/06 . comprising a pump circulating fluid, braking being effected by throttling of the circulation
- F16D 59/00** **Self-acting brakes, e.g. coming into operation at a predetermined speed**
- F16D 59/02 . spring-loaded and adapted to be released by mechanical, fluid, or electromagnetic means
- F16D 61/00** **Brakes with means for making the energy absorbed available for use ([F16D 57/00](#) takes precedence)**
- F16D 63/00** **Brakes not otherwise provided for; Brakes combining more than one of the types of groups [F16D 49/00-F16D 61/00](#)**
- F16D 63/002 . { Brakes with direct electrical or electro-magnetic actuation }

- F16D 63/004 . {comprising a rotor engaged both axially and radially by braking members, e.g. combined drum and disc brakes}
- F16D 63/006 . {Positive locking brakes}
- F16D 63/008 . {Brakes acting on a linearly moving member}
- F16D 65/00** **Parts or details** (similar members for clutches [F16D 13/58](#))
- F16D 65/0006 . {Noise or vibration control}
- F16D 65/0012 .. {Active vibration dampers}
- F16D 65/0018 .. {Dynamic vibration dampers, e.g. mass-spring systems}
- F16D 65/0025 . {Rust- or corrosion-preventing means}
- F16D 65/0031 . { Devices for retaining friction material debris, e.g. dust collectors or filters}
- F16D 65/0037 . {Devices for conditioning friction surfaces, e.g. cleaning or abrasive elements}
- F16D 65/0043 . {Brake maintenance and assembly, tools therefor}
- F16D 65/005 . { Components of axially engaging brakes not otherwise provided for}
- F16D 65/0056 .. { Brake supports}
- F16D 65/0062 ... { integral with vehicle suspension, e.g. with the steering knuckle}
- F16D 65/0068 .. { Brake calipers}
- F16D 65/0075 ... { assembled from a plurality of parts}
- F16D 65/0081 .. { Brake covers}
- F16D 65/0087 .. { Brake housing guide members, e.g. caliper pins; Accessories therefor, e.g. dust boots}
- F16D 65/0093 .. { Brake housing guide members, e.g. caliper pins; Accessories therefor, e.g. dust boots}
- F16D 65/02 . Braking members; Mounting thereof ([friction linings or attachment thereof F16D 69/00](#))
- F16D 65/028 .. { Rollers}
- F16D 65/04 .. Bands, shoes or pads; Pivots or supporting members therefor
- F16D 65/06 ... for externally-engaging brakes
- F16D 65/062 .... { engaging the tread of a railway wheel}
- F16D 65/065 .... { Brake bands}
- F16D 65/067 ..... { with means for mounting, e.g. end connection members}
- F16D 65/08 ... for internally-engaging brakes
- F16D 65/09 .... Pivots or supporting members therefor
- F16D 65/091 ..... {for axially holding the segments}
- F16D 65/092 ... for axially-engaging brakes, e.g. disc brakes
- F16D 65/095 .... Pivots or supporting members therefor
- F16D 65/097 ..... Resilient means interposed between pads and supporting members {or other brake parts}

F16D 65/0971	.....	{transmitting brake actuation force, e.g. elements interposed between brake piston and pad}
F16D 65/0972	.....	{transmitting brake reaction force, e.g. elements interposed between torque support plate and pad}
F16D 65/0973	.....	{not subjected to brake forces}
F16D 65/0974	.....	{acting on or in the vicinity of the pad rim in a direction substantially transverse to the brake disc axis}
F16D 65/0975	.....	{Springs made from wire}
F16D 65/0976	.....	{acting on one pad only}
F16D 65/0977	.....	{Springs made from sheet metal}
F16D 65/0978	.....	{acting on one pad only}
F16D 65/0979	.....	{acting on the rear side of the pad or an element affixed thereto, e.g. spring clips securing the pad to the brake piston or caliper}
F16D 65/10	..	Drums for externally- or internally-engaging brakes
F16D 65/12	..	Discs; Drums for disc brakes
F16D 65/121	...	{consisting of at least three circumferentially arranged segments}
F16D 65/122	...	{adapted for mounting of friction pads}
F16D 65/123	...	{comprising an annular disc secured to a hub member; Discs characterised by means for mounting}
F16D 65/124	....	{adapted for mounting on the wheel of a railway vehicle}
F16D 65/125	...	{characterised by the material used for the disc body}
F16D 65/126	....	{the material being of low mechanical strength, e.g. carbon, beryllium; Torque transmitting members therefor}
F16D 65/127	...	{characterised by properties of the disc surface; Discs lined with friction material}
F16D 65/128	...	{characterised by means for cooling}
F16D 65/14	.	Actuating mechanisms for brakes; Means for initiating operation at a predetermined position ( <a href="#">brake control systems</a> , parts thereof <a href="#">B60T</a> )

**NOTE**

[F16D 65/16](#) to **F16D 65/36** are no longer used for classification, documents in these groups are being transferred to groups **F16D 65/14B** to **F16D 65/14P**

F16D 65/16	..	arranged in or on the brake
F16D 65/18	...	adapted for drawing members together, { e.g. for disc brakes}
F16D 65/183	....	{ with force-transmitting members arranged side by side acting on a spot type force-applying member}
F16D 65/186	....	{ with full-face force-applying member, e.g. annular}
F16D 65/22	...	adapted for pressing members apart, { e.g. for drum brakes}
F16D 65/28	..	arranged apart from the brake
F16D 65/38	.	Slack adjusters
F16D 65/40	..	mechanical
F16D 65/42	...	non-automatic
F16D 65/44	....	by means of direct linear adjustment

F16D 65/46	....	with screw-thread and nut
F16D 65/48	....	with eccentric or helical body
F16D 65/50	....	for angular adjustment of two concentric parts of the brake control system
F16D 65/52	...	self-acting in one direction for adjusting excessive play
F16D 65/54	....	by means of direct linear adjustment
F16D 65/543	.....	{comprising a plastically-deformable member}
F16D 65/546	.....	{for mounting within the confines of a drum brake}
F16D 65/56	....	with screw-thread and nut
F16D 65/561	.....	{for mounting within the confines of a drum brake}
F16D 65/562	.....	{arranged between service brake actuator and braking member, and subjected to service brake force}
F16D 65/563	.....	{arranged adjacent to service brake actuator, e.g. on parking brake lever, and not subjected to service brake force}
F16D 65/565	.....	{arranged diametrically opposite to service brake actuator, and subjected to service brake force}
F16D 65/566	.....	{having a temperature-sensitive element preventing adjustment when brake is hot}
F16D 65/567	.....	{for mounting on a disc brake}
F16D 65/568	.....	{for synchronous adjustment of actuators arranged in parallel}
F16D 65/58	....	with eccentric or helical body
F16D 65/60	....	for angular adjustment of two concentric parts of the brake control systems
F16D 65/62	...	self-acting in both directions for adjusting excessive and insufficient play
F16D 65/64	....	by means of direct linear adjustment
F16D 65/66	....	with screw-thread and nut
F16D 65/68	....	with eccentric or helical body
F16D 65/70	....	for angular adjustment of two concentric parts of the brake control system
F16D 65/72	..	hydraulic
F16D 65/74	...	self-acting in one direction
F16D 65/76	...	self-acting in both directions
F16D 65/78	.	Features relating to cooling
F16D 65/80	..	for externally-engaging brakes
F16D 65/807	...	with open cooling system, e.g. cooled by air
F16D 65/813	...	with closed cooling system
F16D 65/82	..	for internally-engaging brakes
F16D 65/827	...	with open cooling system, e.g. cooled by air
F16D 65/833	...	with closed cooling system
F16D 65/84	..	for disc brakes {(discs characterised by means for cooling <a href="#">F16D 65/128</a> )}
F16D 65/847	...	with open cooling system, e.g. cooled by air
F16D 65/853	...	with closed cooling system
<b>F16D 66/00</b>		<b>Arrangements for monitoring working conditions, e.g. wear, temperature</b>

- F16D 66/02 . Apparatus for indicating wear
- F16D 66/021 .. {using electrical detection or indication means}
- F16D 66/022 ... {indicating that a lining is worn to minimum allowable thickness}
- F16D 66/023 .... {directly sensing the position of braking members}
- F16D 66/024 ..... {Sensors mounted on braking members adapted to contact the brake disc or drum, e.g. wire loops severed on contact}
- F16D 66/025 .... {sensing the position of parts of the brake system other than the braking members, e.g. limit switches mounted on master cylinders}
- F16D 66/026 ... {indicating different degrees of lining wear}
- F16D 66/027 .... {Sensors therefor}
- F16D 66/028 ... {with non-electrical sensors or signal transmission, e.g. magnetic, optical}

**F16D 67/00**

**Combinations of couplings and brakes; Combinations of clutches and brakes**  
 (combinations of couplings and clutches [F16D 47/02](#); conjoint control of brake systems and driveline clutches in vehicles [B60W 10/02](#), [B60W 10/18](#))

- F16D 67/02 . Clutch-brake combinations
- F16D 67/04 .. fluid actuated
- F16D 67/06 .. electromagnetically actuated

**F16D 69/00**

**Friction linings; Attachment thereof; Selection of coating friction substances or surfaces** (clutching elements [F16D 13/60](#); braking members [F16D 65/02](#))

- F16D 69/02 . Compositions of linings; { Methods of manufacturing}

**NOTE**

Indexing codes [F16D 69/021](#) to **R16D 69/02H** are used for indexing aspects relating to compositions or manufacturing of friction linings

- F16D 69/021 .. {containing asbestos}
- F16D 69/022 ... {in the form of fibres}
- F16D 69/023 .. {Composite materials containing carbon and carbon fibres or fibres made of carbonizable material}
- F16D 69/025 .. {Compositions based on an organic binder}
- F16D 69/026 ... {containing fibres}
- F16D 69/027 .. {Compositions based on metals or inorganic oxides}
- F16D 69/028 ... {containing fibres}
- F16D 69/04 . Attachment of linings
- F16D 69/0408 .. {specially adapted for plane linings}
- F16D 69/0416 .. {specially adapted for curved linings}

**F16D 71/00**

**Mechanisms for bringing members to rest in a predetermined position** (combined with or controlling clutches [F16D 43/26](#); means for initiating operation of brakes at a predetermined position [F16D 65/14](#); means for securing members after operation)

[F16B 1/02](#))

- F16D 71/02 . comprising auxiliary means for producing the final movement
- F16D 71/04 . providing for selection between a plurality of positions ([F16D 71/02](#) takes precedence)

**F16D 2001/00**      **Couplings for rigidly connecting two coaxial shafts or other movable machine elements** (attachment of wheels to axles for railway carriages [B60B](#); for attachment of cranks to their shafts [F16C 3/10](#))

- F16D 2001/06 . for attachment of a member on a shaft or on a shaft-end ([attachment of marine propellers on shafts B63H 23/34](#))
- F16D 2001/062 .. characterised by adaptors where hub bores being larger than the shaft
- F16D 2001/08 .. with clamping hub; with hub and longitudinal key
- F16D 2001/09 ... with radial clamping due to axial loading of at least one pair of conical surfaces [{\(tapered keys F16D 1/0882\)}](#)
- F16D 2001/0903 .... the clamped shaft being hollow
- F16D 2001/0906 .... using a hydraulic fluid to clamp or disconnect, not provided for in [F16D 1/091](#)
- F16D 2001/093 .... using one of more elastic segmented conical rings forming at least one of the conical surfaces, the rings being expanded or contracted to effect clamping([F16D 1/091T](#) akes precedence)
- F16D 2001/094 ..... using one or more pairs of elastic or segmented rings with mutually mating conical surfaces, one of the mating rings being contracted and the other being expanded
- F16D 2001/0945 ..... using multiple pairs of elastic or segmented rings to effect clamping
- F16D 2001/095 ..... with clamping effected by ring contraction only([for connecting two abutting shafts F16D 1/02](#));
- F16D 2001/0955 ..... the clamping is effected by hub contraction, i.e. a compression of the hub instead of the ring
- F16D 2001/10 . Quick-acting couplings in which the parts are connected by simply bringing them together axially
- F16D 2001/102 .. the torque is transmitted via polygon shaped connections
- F16D 2001/103 .. the torque is transmitted via splined connections

**F16D 2003/00**      **Yielding couplings, i.e. with means permitting movement between the connected parts during the drive** (couplings disconnectable simply by axial movement [F16D 1/10](#); slip couplings [F16D 7/00](#))

- F16D 2003/16 . Universal joints in which flexibility is produced by means of pivots or sliding or rolling connecting parts
- F16D 2003/20 .. one coupling part entering a sleeve of the other coupling part and connected thereto by sliding or rolling members ([F16D 3/18](#), [F16D 3/24](#) take precedence)

**NOTE**

"coupling parts" means the driving member and the driven member of the coupling to be mounted on and rotate as a unit with the shafts or their equivalents between which the coupling is placed. An intermediate member interconnecting these parts is regarded as such an equivalent.

F16D 2003/202	...	{ one coupling part having radially projecting pins, e.g. tripod joints}
F16D 2003/2023	....	with linear rolling bearings between raceway and trunnion mounted shoes
F16D 2003/2026	....	with trunnion rings, i.e. with tripod joints having rollers supported by a ring on the trunnion
F16D 2003/22	...	the rolling members being balls, rollers, or the like, guided in grooves or sockets in both coupling parts
F16D 2003/223	....	the rolling members being guided in grooves in both coupling parts

### **WARNING**

Groups [F16D 3/2233](#) and [F16D 3/2237](#) are not yet complete pending a reorganisation; see also [this group](#)

F16D 2003/22303	.....	Details of ball cages
F16D 2003/22306	.....	having counter tracks, i.e. ball track surfaces which diverge in opposite directions
F16D 2003/22309	.....	Details of grooves
F16D 2003/22313	.....	Details of the inner part of the core or means for attachment of the core on the shaft
F16D 2003/22316	.....	Means for fastening or attaching the bellows or gaiters
F16D 2003/2232	.....	Elements arranged in the hollow space between the end of the inner shaft and the outer joint member
F16D 2003/22323	.....	Attachments to the shaft of the inner joint member whereby the attachments are distanced from the core
F16D 2003/22326	.....	Attachments to the outer joint member, i.e. attachments to the exterior of the outer joint member or to the shaft of the outer joint member
F16D 2003/50	.	with the coupling parts connected by one or more intermediate members ( <a href="#">F16D 3/16</a> takes precedence)
F16D 2003/72	..	with axially-spaced attachments to the coupling parts ( <a href="#">F16D 3/56</a> takes precedence)
F16D 2003/74	...	the intermediate member or members being made of rubber or other {rubber-like} flexible material
F16D 2003/745	....	Tyre type coupling i.e. bellows with only one fold
F16D 2003/84	.	Shrouds, e.g. casings, covers; Sealing means specially adapted therefor
F16D 2003/843	..	{enclosed covers}
F16D 2003/845	...	{allowing relative movement of joint parts due to the flexing of the cover}
F16D 2003/846	....	Venting arrangements for flexible seals e.g. ventilation holes
F16D 2011/00		<b>Clutches in which the members have interengaging parts</b> ( <a href="#">arrangements for synchronisation F16D 23/02</a> )

- F16D 2011/002 . using an external and axially slidable sleeve for coupling the teeth of both coupling components together
- F16D 2011/004 . using an internal or intermediate axially slidable sleeve, coupling both components together, whereby the intermediate sleeve is arranged internally at least with respect to one of the components.
- F16D 2011/006 . Locking or detent means, i.e. means to keep the clutch in engaged condition
- F16D 2011/008 . characterised by the form of the teeth forming the inter-engaging parts; Details of shape or structure of these teeth
  
- F16D 2013/00**      **Friction clutches** (arrangements for synchronisation [F16D 23/02](#))
  
- F16D 2013/22 . with axially-movable clutching members (similar brakes [F16D 55/00](#))
- F16D 2013/38 . . with flat clutching surfaces, e.g. discs
- F16D 2013/52 . . . . Clutches with multiple lamellae {Clutches in which three or more axially moveable members are fixed alternately to the shafts to be coupled and are pressed from one side towards an axially-located member ([F16D 13/385](#) takes precedence)}
- F16D 2013/54 . . . . with means for increasing the effective force between the actuating sleeve or equivalent member and the pressure member
- F16D 2013/56 . . . . . in which the clutching pressure is produced by springs only
- F16D 2013/565 . . . . . with means for releasing the clutch pressure in case of back torque
  
- F16D 2013/58 . Details {(tools for assembling or disassembling clutches [B25B 27/0064](#))}
- F16D 2013/581 . . Securing means for transportation or shipping.
- F16D 2013/586 . . the cover housing is formed by diaphragm springs
- F16D 2013/588 . . . the diaphragm springs are arranged outside the cover housing
- F16D 2013/60 . . Clutching elements ([friction lining or attachment thereof F16D 69/00](#))
- F16D 2013/64 . . . Clutch-plates; Clutch-lamellae ([brake-plates, brake-lamellae F16D 65/12](#))
- F16D 2013/642 . . . . with resilient attachment of frictions rings or linings to their supporting discs or plates for allowing limited axial displacement of these rings or linings
- F16D 2013/70 . . Pressure members, e.g. pressure plates, for clutch-plates or lamellae; Guiding arrangements for pressure members {(clutch flywheels comprising two or more masses with a rotational damper [F16F 15/12K](#))}
- F16D 2013/703 . . . the pressure plate on the flywheel side is combined with a damper
- F16D 2013/706 . . . the axially movable pressure plate is supported by leaf springs
  
- F16D 2021/00**      **Systems comprising a plurality of actuated clutches** (for synchronisation [F16D 23/04](#))
  
- F16D 2021/02 . for interconnecting three or more shafts or other transmission members in different ways ([in endless-track vehicles B62D](#))
- F16D 2021/06 . . at least two driving shafts or two driven shafts being concentric
- F16D 2021/0607 . . . Double clutch with torque input plate in-between the two clutches, i.e. having a central input plate
- F16D 2021/0615 . . . . the central input plate is supported by bearings in-between the two clutches

F16D 2021/0623	....	the central input plate having a damper in-between the two clutches
F16D 2021/063	...	Electric arrangements for clutch control
F16D 2021/0638	...	Electrically actuated multiple lamellae clutches
F16D 2021/0646	...	Electrically actuated clutch with two clutch plates
F16D 2021/0653	...	Hydraulic arrangements for clutch control
F16D 2021/0661	...	Hydraulically actuated multiple lamellae clutches
F16D 2021/0669	...	Hydraulically actuated clutches with two clutch plates
F16D 2021/0676	...	Mechanically actuated multiple lamellae clutches
F16D 2021/0684	...	Mechanically actuated clutches with two clutch plates
F16D 2021/0692	...	with two clutches arranged axially without radial overlap

### **F16D 2023/00      Details of mechanically-actuated clutches not specific for one distinct type**

F16D 2023/02	.	Arrangements for synchronisation, also for power-operated clutches ( <a href="#">shape or mounting of interengaging parts of clutch members to facilitate engagement F16D 11/08</a> )
F16D 2023/04	..	with an additional friction clutch ( <a href="#">synchro rings per se F16D 23/025</a> )
F16D 2023/06	...	and a blocking mechanism preventing the engagement of the main clutch prior to synchronisation
F16D 2023/0618	....	Details of blocking mechanism comprising a helical spring loaded element, e.g. ball
F16D 2023/0625	....	Details of members being coupled, e.g. gears
F16D 2023/0631	....	Sliding sleeves; Details thereof
F16D 2023/0637	....	Details relating to the hub member on which the sliding is arranged
F16D 2023/0643	....	Synchro friction clutches with flat plates, discs or lamellae
F16D 2023/065	....	Means to provide additional axial force for self-energising, e.g. by using torque from the friction clutch
F16D 2023/0656	....	Details of the tooth structure; Arrangements of teeth
F16D 2023/0662	.....	Details relating to special geometry of arrangements of teeth
F16D 2023/0668	.....	Details relating to tooth end or tip geometry
F16D 2023/0675	.....	Details relating to special undercut geometry
F16D 2023/0681	....	Double cone synchromesh clutches
F16D 2023/0687	....	Clutches with electrical actuation
F16D 2023/0693	....	Clutches with hydraulic actuation
F16D 2023/12	.	Mechanical clutch-actuating mechanisms arranged outside the clutch as such ( <a href="#">specific for combined clutches F16D 21/00</a> ; <a href="#">mechanisms specific for synchronisation F16D 23/02</a> )
F16D 2023/123	..	Clutch actuation by cams, ramps or ball-screw mechanisms
F16D 2023/126	..	Actuation by rocker lever; Rocker levers therefor
F16D 2023/14	..	Clutch-actuating sleeves { <a href="#">or bearings</a> }; Actuating members directly connected to clutch-actuating sleeves{ <a href="#">or bearings</a> }
F16D 2023/141	...	characterised by using a fork; Details of forks

- F16D 2025/00**      **Fluid-actuated clutches**
- F16D 2025/08      . with fluid-actuated member not rotating with a clutching member ([F16D 25/02](#) takes precedence){[F16D 25/048](#) takes precedence}
- F16D 2025/081    .. Hydraulic devices that initiate movement of pistons in slave cylinders for actuating clutches, i.e. master cylinders
- F16D 2027/00**      **Magnetically-~~or electrically-~~actuated clutches; Control or electric circuits therefor**  
(clutches with magnetisable particles [F16D 37/02](#); {with electro-rheological fluids [F16D 37/008](#)})
- F16D 2027/001    . Means for electric connection of the coils of the electromagnetic clutches
- F16D 2027/002    . Electric or electronic circuits relating to actuation of electromagnetic clutches.
- F16D 2027/005    . Details relating to the internal construction of coils or to clutches having more than one coil in the same housing
- F16D 2027/007    . Bias of an armature of an electromagnetic clutch by flexing of substantially flat springs, e.g. leaf springs
- F16D 2027/008    . Details relating to the magnetic circuit, or to the shape of the clutch parts to achieve a certain magnetic path
- F16D 2037/00**      **Clutches in which the drive is transmitted through a medium consisting of small particles, e.g. centrifugally speed-responsive**
- F16D 2037/001    . Electric arrangements for clutch control
- F16D 2037/002    . characterised by a single substantially axial gap in which the fluid or medium consisting of small particles is arranged
- F16D 2037/004    . characterised by multiple substantially axial gaps in which the fluid or medium consisting of small particles is arranged
- F16D 2037/005    . characterised by a single substantially radial gap in which the fluid or medium consisting of small particles is arranged
- F16D 2037/007    . characterised by multiple substantially radial gaps in which the fluid or medium consisting of small particles is arranged
- F16D 2041/00**      **Freewheels or freewheel clutches** (cycle brakes controlled by back-peddalling [B62L 5/00](#); {one-way linear clutches [F16B 7/16](#)})
- F16D 2041/06      . with intermediate wedging coupling members between an inner and an outer surface ([F16D 41/02](#), [F16D 41/24](#) take precedence)
- F16D 2041/0601    .. with a sliding bearing or spacer
- F16D 2041/0603    .. Sprag details
- F16D 2041/0605    .. Spring details

- F16D 2041/0606 .. the intermediate coupling members having parts wedging by movement other than pivoting or rolling but combined with pivoting or rolling parts, e.g. shoes on pivot bars or on rollers
- F16D 2041/0608 .. Races with a regular polygon shape
- F16D 2041/064 .. the intermediate members wedging by rolling and having a circular cross-section, e.g. balls ([F16D 41/061](#) takes precedence)
- F16D 2041/0643 ... the intermediate coupling members being of more than one size
- F16D 2041/0646 ... the intermediate coupling members moving between recesses in an inner race and recesses in an outer race
- F16D 2041/066 ... all members having the same size and only one of the two surfaces being cylindrical
- F16D 2041/0665 ..... characterised by there being no cage other than the inner and outer race for distributing the intermediate members

**F16D 2043/00** **Automatic clutches** (varying the relationship between two coaxial shafts [F16D 3/10](#); freewheels, freewheel clutches [F16D 41/00](#))

- F16D 2043/02 . actuated entirely mechanically
- F16D 2043/04 .. controlled by angular speed ([F16D 43/24](#) takes precedence; clutches in which the drive is transmitted through a medium consisting of small particles [F16D 37/00](#))
- F16D 2043/14 ... with centrifugal masses actuating the clutching members directly in a direction which has at least a radial component; with centrifugal masses themselves being the clutching members
- F16D 2043/145 ..... the centrifugal masses being pivoting

**F16D 2048/00** **External control of clutches**

**WARNING**

Groups [F16D 48/00](#), [F16D 48/06](#), [F16D 48/08](#), [F16D 48/10](#), introduced in September 1998, are not complete. Documents from the groups [F16D 48/062](#) to [F16D 48/066](#) are in the process of being reorganised to [F16D 48/00](#), [F16D 48/08](#), [F16D 48/10](#)

- F16D 2048/02 . Control by fluid pressure
- F16D 2048/0203 .. with an accumulator; Details thereof
- F16D 2048/0209 .. characterised by fluid valves having control pistons, e.g. spools
- F16D 2048/0212 .. Details of pistons for master or slave cylinders especially adapted for fluid control (for other details of pistons in master or slave cylinders [F16D 2025/081](#) or [F16D 25/082](#))
- F16D 2048/0215 .. for damping of pulsations within the fluid system
- F16D 2048/0218 .. Reservoirs for clutch control systems; Details thereof
- F16D 2048/0221 .. Valves for clutch control systems; Details thereof
- F16D 2048/0224 .. Details of conduits, connectors or the adaptors therefor specially adapted for clutch control
- F16D 2048/0227 .. Source of pressure producing the clutch engagement or disengagement action within a circuit; Means for initiating command action in power assisted devices (for details of the source or means per se [F16D 25/088](#), [F16D 29/005](#))

- F16D 2048/023 . . . by pedal actuation ([for pedals per se G01G 1/30](#))
- F16D 2048/0233 . . . by rotary pump actuation
- F16D 2048/0236 . . . . with multiple independent pumps, e.g. one per clutch, or for supplying fluid to different systems
- F16D 2048/0239 . . . . . One fluid source supplying fluid at high pressure and one fluid source supplying fluid at low pressure
- F16D 2048/0242 . . . . . Two or more rotating pumps driven together by the same power source, e.g. connected by a shaft, or a single pump having two or more fluid outputs
- F16D 2048/0245 . . . . Electrically driven rotary pumps
- F16D 2048/0248 . . . . . Reversible rotary pumps, i.e. pumps that can be rotated in the two directions.
- F16D 2048/0251 . . . . Electric motor driving a piston, e.g. for actuating the master cylinder ([for details of the actuator per se F16D 29/00](#))
- F16D 2048/0254 . . . Double actuation, i.e. two actuation means can produce independently an engagement or disengagement of the clutch
- F16D 2048/0257 . . Hydraulic circuit layouts, i.e. details of hydraulic circuit elements or the arrangement thereof
- F16D 2048/026 . . . The controlling actuation is directly performed by the pressure source, i.e. there is no intermediate valve for controlling flow or pressure
- F16D 2048/0263 . . . Passive valves between pressure source and actuating cylinder, e.g. check valves or throttle valves
- F16D 2048/0266 . . . Actively controlled valves between pressure source and actuation cylinder
- F16D 2048/0269 . . . Single valve for switching between fluid supply to actuation cylinder or draining to the sump
- F16D 2048/0272 . . . Two valves, where one valve is supplying fluid to the cylinder and the other valve is for draining fluid to the sump
- F16D 2048/0275 . . . Two valves arranged in parallel, e.g. one for coarse and the other for fine control during supplying or draining fluid from the actuation cylinder
- F16D 2048/0278 . . . Two valves in series arrangement for controlling supply to actuation cylinder
- F16D 2048/0281 . . . Complex circuits with more than two valves in series or special arrangements thereof not provided for in previous groups
- F16D 2048/0284 . . . characterised by valve arrangements supplying fluid to a two chamber- cylinder
- F16D 2048/0287 . . . Hydraulic circuits combining clutch actuation and other hydraulic systems
- F16D 2048/029 . . . . Hydraulic circuits combining clutch actuation with clutch lubrication or cooling
- F16D 2048/0293 . . . . Hydraulic circuits combining clutch and transmission actuation
- F16D 2048/0296 . . . Hydraulic circuits controlled exclusively by hydraulic pressure, i.e. with no electrically controlled valves
- F16D 2048/04 . . providing power assistance
- F16D 2048/045 . . . Vacuum boosters therefor
  
- F16D 2051/00** **Brakes with outwardly-movable braking members co-operating with the inner surface of a drum or the like** ([similar clutches F16D 13/14](#))
  
- F16D 2051/001 . Parts or details of drum brakes
- F16D 2051/003 . . Brake supports
- F16D 2051/005 . . Protective covers

- F16D 2051/006 .. Braking members arranged axially spaced, e.g. side by side
- F16D 2051/008 .. Brakes with only one substantially rigid braking member

**F16D 2055/00**      **Brakes with substantially-radial braking surfaces pressed together in axial direction, e.g. disc brakes** ([similar clutches F16D 13/38](#))

- F16D 2055/0004 . Parts or details of disc brakes
  - F16D 2055/0008 .. Brake supports
    - F16D 2055/0012 ... integral with vehicle suspension
  - F16D 2055/0016 .. Brake calipers
    - F16D 2055/002 ... assembled from a plurality of parts
      - F16D 2055/0025 ... comprising a flat frame member
      - F16D 2055/0029 ... Retraction devices
    - F16D 2055/0033 .. Fully-enclosing housings
    - F16D 2055/0037 .. Protective covers
    - F16D 2055/0041 .. Resilient elements interposed directly between the actuating member and the brake support, e.g. anti-rattle springs
  - F16D 2055/0045 .. Braking members arranged non-symmetrically with respect to the brake disc
  - F16D 2055/005 .. Brakes straddling an annular brake disc radially internally
  - F16D 2055/0054 .. Brakes located in the radial gap between two coplanarly arranged annular brake discs
    - F16D 2055/0058 .. Fully lined, i.e. braking surface extending over the entire disc circumference
    - F16D 2055/0062 .. Partly lined, i.e. braking surface extending over only a part of the disc circumference
  - F16D 2055/0066 .. Brakes having more than one actuator on the same side of the disc
  - F16D 2055/007 .. Pins holding the braking members
- F16D 2055/0075 . Constructional features of axially engaged brakes
  - F16D 2055/0079 .. with braking members arranged non-symmetrically with respect to the rotor
  - F16D 2055/0083 .. with brake actuator located radially inside of an annular rotor
  - F16D 2055/0087 .. with brake actuator located between two coplanar annular rotors
  - F16D 2055/0091 .. Plural actuators arranged side by side on the same side of the rotor
  - F16D 2055/0095 .. Plural rotors with different properties, e.g. to influence working conditions like wear or temperature

**F16D 2065/00**      **Parts or details** ([similar members for clutches F16D 13/58](#))

- F16D 2065/02 . Braking members; Mounting thereof ([friction linings or attachment thereof F16D 69/00](#))
  - F16D 2065/022 .. Rollers
    - F16D 2065/024 .. the braking surface being inclined with respect to the rotor's axis of rotation at an angle other than 90 degrees, e.g. comprising a conical rotor
    - F16D 2065/026 .. characterised by a particular outline shape of the braking member, e.g. footprint of friction lining
  - F16D 2065/13 .. Parts or details of discs or drums
    - F16D 2065/1304 ... Structure

F16D 2065/1308	....	one-part
F16D 2065/1312	....	circumferentially segmented
F16D 2065/1316	....	radially segmented
F16D 2065/132	....	layered
F16D 2065/1324	....	carrying friction elements
F16D 2065/1328	....	internal cavities, e.g. cooling channels
F16D 2065/1332	....	external ribs, e.g. for cooling or reinforcement
F16D 2065/1336	....	integral part of vehicle wheel
F16D 2065/134	...	Connection
F16D 2065/1344	....	permanent, e.g. by casting
F16D 2065/1348	....	resilient
F16D 2065/1352	....	articulated
F16D 2065/1356	....	interlocking
F16D 2065/136	.....	with relative movement radially
F16D 2065/1364	.....	with relative movement axially
F16D 2065/1368	.....	with relative movement both radially and axially
F16D 2065/1372	....	outer circumference
F16D 2065/1376	....	inner circumference
F16D 2065/138	....	to wheel
F16D 2065/1384	....	to wheel hub
F16D 2065/1388	....	to shaft or axle
F16D 2065/1392	....	Connection elements
F16D 2065/1396	.....	Ancillary resilient elements, e.g. anti-rattle or retraction springs
F16D 2065/38	.	Slack adjusters
F16D 2065/383	..	for adjusting the spring force in spring-applied brakes
F16D 2065/386	..	driven electrically
F16D 2065/78	.	Features relating to cooling
F16D 2065/781	..	involving phase change of material
F16D 2065/782	..	the brake-actuating fluid being used as a coolant
F16D 2065/783	..	cooling control or adjustment
F16D 2065/784	..	the coolant not being in direct contact with the braking surface
F16D 2065/785	..	Heat insulation or reflection
F16D 2065/786	..	Fluid spray devices
F16D 2065/787	..	Pumps
F16D 2065/788	..	Internal cooling channels
F16D 2065/789	..	External cooling ribs
F16D 2066/00		<b>Arrangements for monitoring working conditions, e.g. wear, temperature</b>
F16D 2066/001	.	Temperature

- F16D 2066/003 . Position, angle or speed
- F16D 2066/005 . Force, torque, stress or strain
- F16D 2066/006 . without direct measurement of the quantity monitored, e.g. wear or temperature calculated from force and duration of braking
- F16D 2066/008 . of clutches
  
- F16D 2069/00** **Friction linings; Attachment thereof; Selection of coating friction substances or surfaces** ([clutching elements F16D 13/60](#); [braking members F16D 65/02](#))
  
- F16D 2069/001 . Material of friction lining and support element of same or similar composition
- F16D 2069/002 . Combination of different friction materials
- F16D 2069/003 . Selection of coating friction materials
- F16D 2069/004 . Profiled friction surfaces, e.g. grooves, dimples
- F16D 2069/005 . having a layered structure
- F16D 2069/006 . . comprising a heat-insulating layer
- F16D 2069/007 . . comprising a resilient layer
- F16D 2069/008 . . Layers of fibrous materials
- F16D 2069/009 . Linings attached to both sides of a central support element, e.g. a carrier plate
- F16D 2069/04 . Attachment of linings
- F16D 2069/0425 . . Attachment methods or devices
- F16D 2069/0433 . . . Connecting elements not integral with the braking member, e.g. bolts, rivets
- F16D 2069/0441 . . . Mechanical interlocking, e.g. roughened lining carrier, mating profiles on friction material and lining carrier
- F16D 2069/045 . . . Bonding
- F16D 2069/0458 . . . . metallurgic, e.g. welding, brazing, sintering
- F16D 2069/0466 . . . . chemical, e.g. using adhesives, vulcanising
- F16D 2069/0475 . . . . . comprising thermal treatment
- F16D 2069/0483 . . . Lining or lining carrier material shaped in situ
- F16D 2069/0491 . . . Tools, machines, processes
  
- F16D 2121/00** **Type of actuator operation force**
  
- F16D 2121/005 . unspecified force for releasing a normally applied brake
- F16D 2121/02 . Fluid pressure
- F16D 2121/04 . . acting on a piston-type actuator, e.g. for liquid pressure

**WARNING**[F16D 121/02](#)

F16D 2121/06 . . . for releasing a normally applied brake

**WARNING**[F16D 121/12](#)

F16D 2121/08 . . acting on a membrane-type actuator, e.g. for gas pressure

**WARNING**[F16D 121/02](#)

F16D 2121/10 . . . for releasing a normally applied brake

**WARNING**[F16D 121/12](#)

F16D 2121/12 . . for releasing a normally applied brake, the type of actuator being irrelevant or not provided for in groups [F16D 121/04-F16D 121/10](#)

F16D 2121/14 . Mechanical

F16D 2121/16 . . for releasing a normally applied brake

F16D 2121/18 . Electric or magnetic

F16D 2121/20 . . using electromagnets

F16D 2121/22 . . . for releasing a normally applied brake

F16D 2121/24 . . using motors

F16D 2121/26 . . . for releasing a normally applied brake

F16D 2121/28 . . using electrostrictive or magnetostrictive elements, e.g. piezoelectric elements

F16D 2121/30 . . . for releasing a normally applied brake

F16D 2121/32 . . using shape memory [or other thermo-mechanical] elements

F16D 2121/34 . . . for releasing a normally applied brake

**F16D 2123/00 Multiple operation forces**

**WARNING**[F16D 2121/00](#)

**F16D 2125/00 Components of actuators**

- F16D 2125/02 . Fluid-pressure mechanisms
- F16D 2125/023 .. Pumps
- F16D 2125/026 .. Pressure-to-pressure converters, e.g. hydropneumatic
- F16D 2125/04 .. Cylinders
- F16D 2125/06 .. Pistons
- F16D 2125/08 .. Seals, e.g. piston seals
- F16D 2125/10 .. Plural pistons interacting by fluid pressure, e.g. hydraulic force amplifiers using different sized pistons
- F16D 2125/12 .. Membrane or diaphragm types
- F16D 2125/14 .. Fluid-filled flexible members, e.g. enclosed air bladders
- F16D 2125/16 .. Devices for bleeding or filling
  
- F16D 2125/18 . Mechanical mechanisms
- F16D 2125/20 .. converting rotation to linear movement or vice-versa
- F16D 2125/22 ... acting transversely to the axis of rotation
- F16D 2125/24 .... Rack-and-pinion
- F16D 2125/26 .... Cranks
- F16D 2125/28 .... Cams; Levers with cams
- F16D 2125/30 ..... acting on two or more cam followers, e.g. S-cams
- F16D 2125/32 ..... acting on one cam follower
- F16D 2125/34 ... acting in the direction of the axis of rotation
- F16D 2125/36 .... Helical cams, Ball-rotating ramps
- F16D 2125/38 ..... with plural cam or ball-ramp mechanisms arranged concentrically with the brake rotor axis
- F16D 2125/40 .... Screw-and-nut
- F16D 2125/405 ..... with differential thread
- F16D 2125/42 .... Rack-and-worm gears
- F16D 2125/44 .. transmitting rotation
- F16D 2125/46 ... Rotating members in mutual engagement
- F16D 2125/48 .... with parallel stationary axes, e.g. spur gears
- F16D 2125/50 .... with parallel non-stationary axes, e.g. planetary gearing
- F16D 2125/52 .... with non-parallel stationary axes, e.g. worm or bevel gears
- F16D 2125/54 .... with non-parallel non-stationary axes
- F16D 2125/56 ... Shafts for transmitting torque directly
- F16D 2125/565 .... flexible
- F16D 2125/58 .. transmitting linear movement
- F16D 2125/582 ... Flexible element, e.g. spring, other than the main force generating element
- F16D 2125/585 ..... arranged in parallel with a force-applying member
- F16D 2125/587 ... Articulation e.g. ball-socket
- F16D 2125/60 ... Cables or chains, e.g. Bowden cables
- F16D 2125/62 ..... Fixing arrangements therefor, e.g. cable end attachments
- F16D 2125/64 ... Levers

- F16D 2125/645 . . . . with variable leverage, e.g. movable fulcrum
- F16D 2125/66 . . . Wedges
- F16D 2125/68 . . . Lever-link mechanisms, e.g. toggles with change of force ratio
- F16D 2125/70 . . . Rods

### **F16D 2127/00 Auxiliary mechanisms**

- F16D 2127/001 . for automatic or self-acting brake operation
- F16D 2127/002 . . speed-responsive
- F16D 2127/004 . . direction-responsive
- F16D 2127/005 . . force- or torque-responsive
  
- F16D 2127/007 . for non-linear operation
  
- F16D 2127/008 . Trigger mechanisms
  
- F16D 2127/02 . Release mechanisms
- F16D 2127/04 . . for manual operation
  
- F16D 2127/06 . Locking mechanisms, e.g. acting on actuators, on release mechanisms or on force transmission mechanisms
  
- F16D 2127/08 . Self-amplifying or de-amplifying mechanisms
- F16D 2127/085 . . having additional fluid pressure elements
- F16D 2127/10 . . having wedging elements
- F16D 2127/12 . . having additional frictional elements

### **F16D 2129/00 Type of operation source for auxiliary mechanisms**

- F16D 2129/02 . Fluid-pressure
  
- F16D 2129/04 . Mechanical
- F16D 2129/043 . . Weights
- F16D 2129/046 . . Flywheels
  
- F16D 2129/06 . Electric or magnetic
- F16D 2129/065 . . Permanent magnets
- F16D 2129/08 . . Electromagnets
- F16D 2129/10 . . Motors
- F16D 2129/12 . . Electrostrictive or magnetostrictive elements, e.g. piezoelectric
  
- F16D 2129/14 . Shape memory [or other thermo-mechanical] elements

### **F16D 2131/00 Overall arrangement of the actuators or their elements, e.g. modular construction**

- F16D 2131/02 . of the actuator controllers

**F16D 2200/00**      **Materials; Production methods therefor**

- F16D 2200/0004      .    metallic
- F16D 2200/0008      ..    Ferro
- F16D 2200/0013      ...    Cast iron
- F16D 2200/0017      ...    corrosion-resistant
- F16D 2200/0021      ...    Steel
- F16D 2200/0026      ..    Non-ferro
- F16D 2200/003      ...    Light metals, e.g. aluminium
  
- F16D 2200/0034      .    non-metallic
- F16D 2200/0039      ..    Ceramics
- F16D 2200/0043      ...    Ceramic base, e.g. metal oxides or ceramic binder
- F16D 2200/0047      ...    Ceramic composite, e.g. C/C composite infiltrated with Si or B, or ceramic matrix infiltrated with metal
- F16D 2200/0052      ..    Carbon
- F16D 2200/0056      ..    Elastomers
  
- F16D 2200/006      .    containing fibres or particles
- F16D 2200/0065      ..    Inorganic, e.g. non-asbestos mineral fibres
- F16D 2200/0069      ..    being characterised by their size
- F16D 2200/0073      ..    having lubricating properties
  
- F16D 2200/0078      .    laminated
  
- F16D 2200/0082      .    Production methods therefor
- F16D 2200/0086      ..    Moulding materials together by application of heat and pressure
- F16D 2200/0091      ..    Impregnating a mat of fibres with a binder
- F16D 2200/0095      ..    Mixing an aqueous slurry of fibres with a binder, e.g. papermaking process

**F16D 2250/00**      **Manufacturing; Assembly**

- F16D 2250/0007      .    Casting
- F16D 2250/0015      ..    around inserts
  
- F16D 2250/0023      .    Shaping by pressure
  
- F16D 2250/003      .    Chip removing
  
- F16D 2250/0038      .    Surface treatment
- F16D 2250/0046      ..    Coating
- F16D 2250/0053      ..    Hardening
  
- F16D 2250/0061      .    Joining

- F16D 2250/0069 .. Adhesive bonding
- F16D 2250/0076 .. Welding, brazing
- F16D 2250/0084 . Assembly or disassembly
- F16D 2250/0092 . Tools or machines for producing linings

### **F16D 2300/00 Special features for couplings or clutches**

- F16D 2300/02 . Overheat protection, i.e. means for protection against overheating
- F16D 2300/021 .. Cooling features not provided for in group [F16D 13/72](#) or [F16D 25/123](#), e.g. heat transfer details
  - F16D 2300/0212 ... Air cooling
  - F16D 2300/0214 ... Oil or fluid cooling
- F16D 2300/06 . Lubrication details not provided for in group [F16D 13/74](#)
- F16D 2300/08 . Details or arrangements of sealings not provided for in groups [F16D 3/84](#), [F16D 25/08](#)
- F16D 2300/10 . Surface characteristics; Details related to material surfaces
- F16D 2300/12 . Mounting or assembling
- F16D 2300/14 . Clutches which are normally open, i.e. not engaged in released state
- F16D 2300/18 . Sensor; Details or arrangements thereof
- F16D 2300/22 . Vibration damping
- F16D 2300/24 . Concentric actuation rods, e.g. actuation rods extending concentrically through a shaft
- F16D 2300/26 . Cover or bell housings; Details or arrangements thereof

### **F16D 2500/00 External control of clutches by electric or electronic means**

- F16D 2500/10 . System to be controlled
- F16D 2500/102 .. Actuator
  - F16D 2500/1021 ... Electrical type
    - F16D 2500/1022 .... Electromagnet
    - F16D 2500/1023 .... Electric motor
      - F16D 2500/1024 ..... combined with hydraulic actuation
      - F16D 2500/1025 ..... with threaded transmission
  - F16D 2500/1026 ... Hydraulic
    - F16D 2500/1027 .... Details about the hydraulic valves
  - F16D 2500/1028 ... Pneumatic
- F16D 2500/104 .. Clutch
  - F16D 2500/10406 ... Clutch position

F16D 2500/10412	....	Transmission line of a vehicle
F16D 2500/10418	....	Accessory clutch, e.g. cooling fan, air conditioning
F16D 2500/10425	....	Differential clutch
F16D 2500/10431	....	4WD Clutch dividing power between the front and the rear axle
F16D 2500/10437	....	Power Take Off clutch
F16D 2500/10443	...	Clutch type
F16D 2500/1045	....	Friction clutch
F16D 2500/10456	....	Synchro clutch
F16D 2500/10462	....	Dog-type clutch
F16D 2500/10468	....	Fluid adhesion clutch
F16D 2500/10475	....	Magnetic field, e.g. electro-rheological, magnetisable particles
F16D 2500/10481	....	Automatic clutch, e.g. centrifugal masses
F16D 2500/10487	....	Fluid coupling
F16D 2500/10493	....	One way clutch
F16D 2500/106	..	Engine
F16D 2500/1062	...	Diesel
F16D 2500/1064	...	Electric
F16D 2500/1066	...	Hybrid
F16D 2500/1068	...	Engine supercharger or turbocharger
F16D 2500/108	..	Gear
F16D 2500/1081	...	Actuation type
F16D 2500/1082	....	Manual transmission
F16D 2500/1083	....	Automated manual transmission
F16D 2500/1085	....	Automatic transmission
F16D 2500/1086	...	Concentric shafts
F16D 2500/1087	...	Planetary gearing
F16D 2500/1088	...	CVT
F16D 2500/11	..	Application
F16D 2500/1102	...	Lawnmower
F16D 2500/1105	...	Marine applications
F16D 2500/1107	...	Vehicles
F16D 2500/111	....	Agricultural
F16D 2500/1112	....	Heavy vehicle
F16D 2500/1115	....	Racing
F16D 2500/1117	....	Motorcycle
F16D 2500/112	..	Details of the arrangement of the system
F16D 2500/30	.	Signal inputs
F16D 2500/302	..	from the actuator
F16D 2500/3021	...	Angle
F16D 2500/3022	...	Current
F16D 2500/3023	...	Force

F16D 2500/3024	...	Pressure
F16D 2500/3025	...	Fluid flow
F16D 2500/3026	...	Stroke
F16D 2500/3027	...	Torque
F16D 2500/3028	...	Voltage
F16D 2500/304	..	from the clutch
F16D 2500/30401	...	On-off signal indicating the engage or disengaged position of the clutch
F16D 2500/30402	...	Clutch friction coefficient
F16D 2500/30403	...	Number of clutch actuations
F16D 2500/30404	...	Clutch temperature
F16D 2500/30405	.....	Estimated clutch temperature
F16D 2500/30406	...	Clutch slip
F16D 2500/30407	.....	Clutch slip change rate
F16D 2500/30408	...	Relative rotational position of the input and output parts, e.g. for facilitating positive clutch engagement
F16D 2500/30409	.....	Signals detecting the transmission of zero torque
F16D 2500/3041	...	from the input shaft
F16D 2500/30412	.....	Torque of the input shaft
F16D 2500/30415	.....	Speed of the input shaft
F16D 2500/30417	.....	Speed change rate of the input shaft
F16D 2500/3042	...	from the output shaft
F16D 2500/30421	.....	Torque of the output shaft
F16D 2500/30423	.....	Signal detecting the transmission of zero torque
F16D 2500/30425	.....	Estimation of the transmitted clutch torque e.g. applying dynamic torque balance equation
F16D 2500/30426	.....	Speed of the output shaft
F16D 2500/30428	.....	Speed change rate of the output shaft
F16D 2500/305	..	from the clutch cooling
F16D 2500/3051	...	Flow amount of cooling fluid
F16D 2500/3053	.....	On/off signal indicating the presence of cooling oil flow
F16D 2500/3055	...	Cooling oil properties
F16D 2500/3056	.....	Cooling oil temperature
F16D 2500/3058	.....	Cooling oil pressure
F16D 2500/306	..	from the engine
F16D 2500/3061	...	Engine inlet air flow rate
F16D 2500/3062	...	Engine braking signal indicating the use of the engine as a brake
F16D 2500/3063	...	Engine fuel flow rate
F16D 2500/3064	...	Temperature of the engine
F16D 2500/3065	...	Torque of the engine
F16D 2500/3066	.....	Torque change rate of the engine
F16D 2500/3067	...	Speed of the engine
F16D 2500/3068	.....	Speed change of rate of the engine

F16D 2500/3069	...	Engine ignition switch
F16D 2500/308	..	from the transmission
F16D 2500/30801	...	Number of shift actuations
F16D 2500/30802	...	Transmission oil properties
F16D 2500/30803	....	Oil temperature
F16D 2500/30805	....	Oil pressure
F16D 2500/30806	...	Engaged transmission ratio
F16D 2500/30807	....	Estimation of the engaged transmission ratio
F16D 2500/30808	....	Detection of transmission in neutral
F16D 2500/3081	...	from the input shaft
F16D 2500/30812	....	Direction of rotation of the input shaft
F16D 2500/30814	....	Torque of the input shaft
F16D 2500/30816	....	Speed of the input shaft
F16D 2500/30818	.....	Speed change rate of the input shaft
F16D 2500/3082	...	from the output shaft
F16D 2500/30822	....	Torque of the output shaft
F16D 2500/30825	....	Speed of the output shaft
F16D 2500/30827	.....	Speed change rate of the output shaft
F16D 2500/31	..	from the vehicle
F16D 2500/3101	...	Detection of a brake actuation by a sensor on the brake ( <a href="#">brake pedal actuation R16D 505/14D2</a> )
F16D 2500/3102	...	Vehicle direction of travel, i.e. forward/reverse
F16D 2500/3104	...	Travelled distance
F16D 2500/3105	...	Operational Time of clutches during vehicle life
F16D 2500/3107	...	Vehicle weight
F16D 2500/3108	...	Vehicle speed
F16D 2500/3109	....	Vehicle acceleration
F16D 2500/3111	....	Standing still, i.e. signal detecting when the vehicle is standing still or below a certain limit speed
F16D 2500/3112	....	Vehicle acceleration change rate
F16D 2500/3114	...	Vehicle wheels
F16D 2500/3115	....	Vehicle wheel speed
F16D 2500/3117	....	Vehicle wheel torque
F16D 2500/3118	....	Slip of vehicle wheels
F16D 2500/312	..	External to the vehicle
F16D 2500/3121	...	Ambient conditions, e.g. air humidity, air temperature, ambient pressure
F16D 2500/3122	....	Ambient temperature
F16D 2500/3124	...	Driving conditions, e.g. climbing hills, cornering, traffic
F16D 2500/3125	...	Driving resistance, i.e. external factors having an influence in the traction force, e.g. road friction, air resistance, road slope
F16D 2500/3127	....	Road slope
F16D 2500/3128	...	Distance from the vehicle to an external element, e.g. to an obstacle, to an other vehicle or a target

F16D 2500/314	..	from the user
F16D 2500/31406	...	input from pedals
F16D 2500/31413	....	Clutch pedal position
F16D 2500/3142	.....	Clutch pedal position rate
F16D 2500/31426	....	Brake pedal position
F16D 2500/31433	.....	Brake pedal position threshold, e.g. switch
F16D 2500/3144	....	Accelerator pedal position
F16D 2500/31446	.....	Accelerator pedal position change rate
F16D 2500/31453	.....	Accelerator pedal position threshold, e.g. switch
F16D 2500/3146	...	input from levers
F16D 2500/31466	....	Gear lever
F16D 2500/31473	....	Parking brake lever
F16D 2500/3148	...	Detection of user presence
F16D 2500/31486	...	Recognition of user style of driving, e.g. sportive, calm, nervous
F16D 2500/31493	...	Switches on the dashboard
F16D 2500/316	..	Other signal inputs not covered by the groups above
F16D 2500/3161	...	Signal providing information about the state of engine accessories
F16D 2500/3163	...	Using the natural frequency of a component as input for the control
F16D 2500/3165	...	Using the moment of inertia of a component as input for the control
F16D 2500/3166	...	Detection of an elapsed period of time
F16D 2500/3168	...	Temperature detection of any component of the control system
F16D 2500/50	.	Problem to be solved by the control system
F16D 2500/501	..	Relating the actuator
F16D 2500/5012	...	Accurate determination of the clutch positions, e.g. treating the signal from the position sensor, or by using two position sensors for determination
F16D 2500/5014	...	Filling the actuator cylinder with fluid
F16D 2500/5016	...	Shifting operation, i.e. volume compensation of the master cylinder due to wear, temperature changes or leaks in the cylinder
F16D 2500/5018	...	Calibration or recalibration of the actuator
F16D 2500/502	..	Relating the clutch
F16D 2500/50203	...	Transition between manual and automatic control of the clutch
F16D 2500/50206	...	Creep control
F16D 2500/50209	....	Activation of the creep control operation
F16D 2500/50212	.....	Accelerator pedal
F16D 2500/50215	.....	Brake pedal
F16D 2500/50218	.....	Clutch pedal
F16D 2500/50221	.....	Manual switch actuated by the user
F16D 2500/50224	...	Drive-off
F16D 2500/50227	...	Control of clutch to control engine
F16D 2500/5023	...	Determination of the clutch wear
F16D 2500/50233	...	Clutch wear adjustment operation
F16D 2500/50236	...	Adaptations of the clutch characteristics e.g. curve clutch capacity torque -

		clutch actuator displacement
F16D 2500/50239	...	Soft clutch engagement
F16D 2500/50242	...	Cleaning of clutches, e.g. controlling the engine or the clutch to provoke vibrations eliminating particles from the clutch friction surfaces
F16D 2500/50245	...	Calibration or recalibration of the clutch touch-point
F16D 2500/50248	....	During assembly
F16D 2500/50251	....	During operation
F16D 2500/50254	.....	Brake actuated
F16D 2500/50257	.....	During a creep operation
F16D 2500/5026	.....	Gear engaged
F16D 2500/50263	.....	During standing still
F16D 2500/50266	....	Way of detection
F16D 2500/50269	.....	Engine speed
F16D 2500/50272	.....	Gearing speed
F16D 2500/50275	.....	Estimation of the displacement of the clutch touch-point due to the modification of relevant parameters, e.g. temperature, wear
F16D 2500/50278	.....	Stalling
F16D 2500/50281	.....	Transmitted torque
F16D 2500/50284	...	Control of secondary clutch in the driveline, i.e. not including clutches in automatic transmission, e.g. in the vicinity of rear axle or on parallel drive shaft
F16D 2500/50287	...	Torque control
F16D 2500/5029	....	Reducing drag torque
F16D 2500/50293	...	Reduction of vibrations
F16D 2500/50296	...	Limit clutch wear
F16D 2500/503	..	relating to the accumulator
F16D 2500/5035	...	Filling level of an accumulator providing fluid for the engagement of the clutch
F16D 2500/504	..	Relating the engine
F16D 2500/5041	...	Control of engine accessories, e.g. air conditioning, pumps, auxiliary drive
F16D 2500/5043	...	Engine fuel consumption
F16D 2500/5045	...	Control of engine at idle, i.e. controlling engine idle conditions, e.g. idling speed
F16D 2500/5046	...	Preventing engine over-speed, e.g. by actuation of the main clutch
F16D 2500/5048	...	Stall prevention
F16D 2500/506	..	Relating the transmission
F16D 2500/50607	...	Facilitating engagement of a dog clutches, e.g. preventing of gear butting
F16D 2500/50615	...	Facilitating disengagement of a dog clutch, e.g. by applying a pretension on the disengaging elements
F16D 2500/50623	...	Preventing transmission load change
F16D 2500/5063	...	Shaft dither, i.e. applying a pulsating torque to a (transmission) shaft to create a buzz or dither, e.g. to prevent tooth butting or gear locking
F16D 2500/50638	...	Shaft speed synchronising e.g. using engine, clutch outside transmission
F16D 2500/50646	...	Control of the main clutch to prevent or release a tooth-to-tooth condition in the transmission
F16D 2500/50653	...	Gearing shifting without the interruption of drive
F16D 2500/50661	...	Limit transmission input torque

F16D 2500/50669	...	Neutral control, i.e. preventing creep or drag torque being transmitted in a transmission with a torque converter when the vehicle is stationary
F16D 2500/50676	...	Optimising drive-train operating point, e.g. selecting gear ratio giving maximum fuel economy, best performance
F16D 2500/50684	...	Torque resume after shifting
F16D 2500/50692	...	Simulate the characteristics of a torque converter
F16D 2500/507	..	Relating the vehicle
F16D 2500/5075	...	Prevention or regulation of vehicle's wheel slip
F16D 2500/508	..	Relating driving conditions
F16D 2500/50808	...	Cold starting
F16D 2500/50816	...	Control during a braking operation, e.g. during ABS control
F16D 2500/50825	...	Hill climbing or descending
F16D 2500/50833	...	Control during a stability control operation (ESP)
F16D 2500/50841	...	Hill hold
F16D 2500/5085	...	Coasting
F16D 2500/50858	...	Selecting a Mode of operation
F16D 2500/50866	...	Parking, i.e. control of drive units during parking
F16D 2500/50875	...	Driving in reverse
F16D 2500/50883	...	Stop-and-go, i.e. repeated stopping and starting, e.g. in traffic jams
F16D 2500/50891	...	Towing or towed
F16D 2500/51	..	Relating safety
F16D 2500/5102	...	Detecting abnormal operation, e.g. unwanted slip or excessive temperature
F16D 2500/5104	...	Preventing failures
F16D 2500/5106	....	Overheat protection
F16D 2500/5108	...	Failure diagnosis
F16D 2500/511	....	Leak detection
F16D 2500/5112	....	Using signals from redundant sensors
F16D 2500/5114	...	Failsafe
F16D 2500/5116	...	Manufacture, testing, calibrating, i.e. test or calibration of components during or soon after assembly, e.g. at the end of the production line ( <b>R16D 510/02P1</b> takes precedence)
F16D 2500/5118	...	Maintenance
F16D 2500/512	..	Relating to the driver
F16D 2500/5122	...	Improve passengers comfort
F16D 2500/5124	...	Driver error, i.e. preventing effects of unintended or incorrect driver inputs
F16D 2500/5126	...	Improving response to driver inputs
F16D 2500/5128	...	Driver workload reduction
F16D 2500/52	..	General
F16D 2500/525	...	Improve response of control system
F16D 2500/70	.	Details about the implementation of the control system
F16D 2500/702	..	Look-up tables
F16D 2500/70205	...	Clutch actuator

F16D 2500/70211	....	Force
F16D 2500/70217	....	Pressure
F16D 2500/70223	....	Current
F16D 2500/70229	....	Voltage
F16D 2500/70235	....	Displacement
F16D 2500/70241	....	Angle
F16D 2500/70247	...	Engine
F16D 2500/70252	...	Clutch torque
F16D 2500/70258	....	Throttle
F16D 2500/70264	....	Stroke
F16D 2500/7027	....	Engine speed
F16D 2500/70276	....	Slip
F16D 2500/70282	....	Time
F16D 2500/70288	....	Clutch pedal position
F16D 2500/70294	...	Valve look-up tables
F16D 2500/704	..	Output parameters from the control unit; Target parameters to be controlled
F16D 2500/70402	...	Actuator parameters
F16D 2500/70404	....	Force
F16D 2500/70406	....	Pressure
F16D 2500/70408	....	Torque
F16D 2500/7041	....	Position
F16D 2500/70412	.....	Clutch position change rate
F16D 2500/70414	.....	Quick displacement to clutch touch point
F16D 2500/70416	....	Angle
F16D 2500/70418	....	Current
F16D 2500/7042	....	Voltage
F16D 2500/70422	...	Clutch parameters
F16D 2500/70424	....	Outputting a clutch engaged-disengaged signal
F16D 2500/70426	....	Clutch slip
F16D 2500/70428	.....	Clutch slip change rate
F16D 2500/7043	....	Clutch temperature
F16D 2500/70432	....	From the input shaft
F16D 2500/70434	.....	Input shaft torque
F16D 2500/70436	.....	Input shaft speed
F16D 2500/70438	....	From the output shaft
F16D 2500/7044	.....	Output shaft torque
F16D 2500/70442	.....	Output shaft speed
F16D 2500/70444	.....	Output shaft speed rate
F16D 2500/70446	...	Clutch cooling parameters
F16D 2500/70448	....	for regulating the amount of fluid flow
F16D 2500/7045	.....	On/off switching of the cooling fluid flow
F16D 2500/70452	...	Engine parameters

F16D 2500/70454	....	Engine speed
F16D 2500/70456	.....	Engine speed change rate
F16D 2500/70458	....	Engine torque
F16D 2500/7046	.....	Engine torque change rate
F16D 2500/70462	....	Opening of the throttle valve
F16D 2500/70464	...	Transmission parameters
F16D 2500/70466	....	Input shaft
F16D 2500/70468	.....	Input shaft torque
F16D 2500/7047	.....	Input shaft torque change rate
F16D 2500/70472	.....	Input shaft speed
F16D 2500/70474	.....	Input shaft speed change rate
F16D 2500/70476	....	Output shaft
F16D 2500/70478	.....	Output shaft power
F16D 2500/7048	.....	Output shaft torque
F16D 2500/70482	.....	Output shaft torque change rate
F16D 2500/70484	.....	Output shaft speed
F16D 2500/70486	.....	Output shaft speed change rate
F16D 2500/70488	....	Selection of the gear ratio
F16D 2500/7049	...	Brake parameters
F16D 2500/70492	...	Vehicle parameters
F16D 2500/70494	....	Vehicle speed
F16D 2500/70496	.....	Vehicle acceleration
F16D 2500/70498	.....	Vehicle acceleration change rate
F16D 2500/706	..	Strategy of control
F16D 2500/70605	...	Adaptive correction; Modifying control system parameters, e.g. gains, constants, look-up tables
F16D 2500/7061	...	Feed-back
F16D 2500/70615	....	PI control
F16D 2500/70621	....	PD control
F16D 2500/70626	....	PID control
F16D 2500/70631	...	Feed-forward
F16D 2500/70636	...	Fuzzy logic
F16D 2500/70642	...	Inverse model
F16D 2500/70647	...	Neuronal network
F16D 2500/70652	...	Open loop
F16D 2500/70657	...	Predictor methods
F16D 2500/70663	...	State analysis; Analysing potential states of the machine and developing control strategies at each state
F16D 2500/70668	...	Signal filtering
F16D 2500/70673	...	Statistical calculations
F16D 2500/70678	....	using histogrammes
F16D 2500/70684	....	using regressions

F16D 2500/70689	....	using maximum or minimum values
F16D 2500/70694	....	with plausibility checks
F16D 2500/708	..	Mathematical model
F16D 2500/7082	...	of the clutch
F16D 2500/7085	...	of the driver
F16D 2500/7087	...	of the vehicle
F16D 2500/71	..	Actions
F16D 2500/7101	...	Driver alarm
F16D 2500/7102	....	by provoking vibrations of a vehicle part
F16D 2500/7103	....	Acoustic alarms
F16D 2500/7104	....	Visual alarms
F16D 2500/7105	...	Inhibit control automatically
F16D 2500/7106	...	Gearshift to neutral
F16D 2500/7107	...	Others
F16D 2500/7108	....	Engine torque calculation
F16D 2500/7109	....	Pulsed signal; Generating or processing pulsed signals; PWM, width modulation, frequency or amplitude modulation