

F16H

GEARING

Definition statement

This place covers:

Gearings for conveying rotary motion

- Toothed gearings
- Friction gearings, e.g. gearings using endless flexible members
- Fluid gearings
- Change speed or reversing gearings
- Differential gearings
- Using intermittently-driving members
- Gearings not limited to rotary motion
- Mechanical gearings using levers, links or cams
- Using intermittently-driving members

Combination of gearings

General details of gearings

Control of gearings

Relationships with other classification places

Subclass [F16H](#) for gearings is a function oriented place. Gearings or transmissions comprising general applicable inventions or intended for different applications are classified in this subclass. Specially adapted gearings for a particular purpose should be classified in the related subclass for the application. Some examples where these gearings will be classified when specially adapted or for a particular purpose could be find in the list of references below.

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Gearings in harvesters or mowers	A01D 69/06
Gearings for toys	A63H 31/00
Toothed-wheel gearing for metal-rolling mills	B21B 35/12
Arrangement of transmissions in vehicles	B60K 17/34
Transmissions for railway locomotives	B61C 9/00
Vehicle steering gears	B62D 3/00
Transmission for cycles	B62M
Transmissions for marine propulsion	B63H 23/00
Marine steering gears	B63H 25/00
Transmission of power for wind motors	F03D 15/00
Gearings associated with fluid-actuated devices	F15B 15/00
Gearing used in indicating or recording apparatus in connection with measuring devices	G01D 5/04

Driving arrangements for tuning resonant circuits	H03J 1/00
Driving mechanisms for apparatus for transmission of coded digital information	H04L 13/04

Informative references

Attention is drawn to the following places, which may be of interest for search:

Arrangement of transmissions in vehicles	B60K
Fluid pressure actuators, Hydraulics or pneumatics in general	F15B
Couplings for transmitting rotation	F16D
Clutches	F16D

Special rules of classification

The use of the available Indexing Codes in this subclass is mandatory and should be assigned for additional information to facilitate searching. However, please note that the classifications in the Indexing Codes of this subclass are only complete after January 2014. Also note that the Indexing Codes under [F16H 2700/00](#) are no longer used for classifying new documents

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Gearing	mechanical, hydraulic, electric, or other means for transmitting mechanical motion or force
Toothed gearing	includes worm gearing and other gearing involving at least one wheel or sector provided with teeth or the equivalent, except gearing with chains or toothed belts, which is treated as friction gearing
Conveying motion	includes transmitting energy, and means that the applied and resultant motions are of the same kind, though they may differ in, e.g. speed, direction or extent
Rotary motion	implies that the motion may continue indefinitely
Oscillating motion	means moving about an axis to an extent which is limited by the construction of the gearing and which may exceed one revolution, the movement being alternately forwards and backwards during continued operation of the gearing
Reciprocating motion	means moving substantially in a straight line, the movement being alternately forwards and backwards during continued operation of the gearing
Reversing or reversal	means that an applied movement in one direction may produce a resultant movement in either of two opposed directions at will
Central gears	includes any gears whose axis is the main axis of the gearing, e.g. sun or ring gear
Creeping	means that when the vehicle has come to a stop, the engine is at idle (i.e., there is no request by the operator for a higher engine speed/torque), but due to the rotation of various transmission components, the vehicle starts to move, and the vehicle operator has some control over movement with a brake
Inching	means that the vehicle operator has some control, besides using a brake, over moving the vehicle by small degrees

F16H 1/00

Toothed gearings for conveying rotary motion (specific for conveying rotary motion with variable gear ratio or for reversing rotary motion [F16H 3/00](#))

Definition statement

This place covers:

Transmission layout for gearing with fixed ratio and using gears with teeth

References

Limiting references

This place does not cover:

Toothed gearing for conveying rotary motion with variable gear ratio of for reversing rotary motion	F16H 3/00
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Gears associated with electric machines	H02K 7/116
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F16H 1/006

{the driving and driven axes being designed to assume variable positions relative to one another during operation}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Angle drives for power tools	B23Q 5/045
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F16H 1/14

comprising conical gears only

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Angle drives for power tools	B23Q 5/045
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F16H 1/16**comprising worm and worm-wheel****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Taking up backlash for transmissions with crossing shafts	F16H 55/24
Support of worm gear shafts	F16H 2057/0213
Worm gears associated with electric machines	H02K 7/1166

F16H 1/32**in which the central axis of the gearing lies inside the periphery of an orbital gear****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Wave gearings with flexsplines	F16H 49/001
Cycloidal or planetary mechanisms for adjustable back-rest in which the central axis of the gearing lies inside the periphery of an orbital gear, e.g. one gear without sun gear	B60N 2/2252

F16H 3/00**Toothed gearings for conveying rotary motion with variable gear ratio or for reversing rotary motion (speed-changing or reversing mechanisms [F16H 59/00](#) - [F16H 63/00](#))****Definition statement***This place covers:*

Using only gears with teeth.

F16H 3/426**{the teeth being arranged on a generally flat, e.g. disc-type surface}****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

With eccentric arranged lever arms for driving a disc	F16H 21/14
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F16H 7/00

Gearings for conveying rotary motion by endless flexible members (specific for conveying rotary motion with variable gear ratio or for reversing rotary motion [F16H 9/00](#); {Belts, V-belts, ropes, cables, and chains [F16G](#), chain-wheels [F16H 55/30](#); pulleys [F16H 55/36](#)})

Definition statement

This place covers:

Belts drives, chain drives, rope drives with a fixed ratio, and tensioning mechanisms and guiding means used in such systems and ways or tools to mount the belt or chain or rope on the pulley or sprocket.

References

Limiting references

This place does not cover:

Gearings for conveying rotary motion by endless flexible members with variable gear ratio or for reversing rotary motion	F16H 9/00
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Pulleys per se	F16H 55/36
Chains or belts per se	F16G

F16H 9/00

Gearings for conveying rotary motion with variable gear ratio, or for reversing rotary motion, by endless flexible members (control of change-speed or reversing-gearings conveying rotary motion [F16H 59/00](#) - [F16H 63/00](#))

Definition statement

This place covers:

Only transmission layout of belt or chain or rope drives for conveying rotary motion with variable gear ratio or for reversing rotary motion.

References

Limiting references

This place does not cover:

Combinations of gearing conveying rotary motion by endless members and toothed gearing	F16H 37/00
Pulleys per se	F16H 55/52
Control of change-speed or reversing-gearings conveying rotary motion	F16H 59/00 - F16H 63/00
Actuators for shifting	F16H 63/06

Informative references

Attention is drawn to the following places, which may be of interest for search:

Gearings for conveying rotary motion by endless flexible members with fixed gear ratio	F16H 7/00
Chains or belts per se	F16G

F16H 9/12

engaging a pulley built-up out of relatively axially-adjustable parts in which the belt engages the opposite flanges of the pulley directly without interposed belt-supporting members

Definition statement

This place covers:

Transmission layout of transmission where a belt is axially squeezed between two sheaves of at least on one pulley.

F16H 13/00

Gearings for conveying rotary motion by friction between rotary members (specific for conveying rotary motion with variable gear ratio or for reversing rotary motion [F16H 15/00](#); {friction discs [F16H 55/32](#)})

Definition statement

This place covers:

Transmission layout of transmissions where rotary motion is transferred with a fixed ratio by the friction of the surfaces of members where the surfaces are pressed to each other; systems to keep the cylindrical members in contact such that rotary motion can be transferred.

References**Limiting references**

This place does not cover:

Friction gearings for conveying rotary motion with variable gear ratio or for reversing rotary motion	F16H 15/00
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F16H 15/00

Gearings for conveying rotary motion with variable gear ratio, or for reversing rotary motion, by friction between rotary members ({gearings for reversal only [F16H 3/14](#), [F16H 3/60](#)}; control of change-speed or reversing-gearings conveying rotary motion [F16H 59/00](#) - [F16H 63/00](#))

Definition statement

This place covers:

Transmission layout of transmissions where rotary motion is transferred with a variable ratio by the friction of the surfaces of members where the surfaces are pressed to each other.

References

Limiting references

This place does not cover:

Friction gearings for conveying rotary motion with fixed gear ratio	F16H 13/00
Control of change-speed or reversing-gearings conveying rotary motion	F16H 59/00 - F16H 63/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Combination of friction gearing and toothed gearing	F16H 37/00
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F16H 15/04

Gearings providing a continuous range of gear ratios

Definition statement

This place covers:

Only transmission layout of conveying rotary motion with a continuously variable ratio by friction between rotary members that are not using flexible endless members and where the rotary members are not in planetary motion, examples of this group are toroidal transmission or friction ring transmissions.

F16H 19/00

Gearings comprising essentially only toothed gears or friction members and not capable of conveying indefinitely-continuing rotary motion (with intermittently-driving members [F16H 27/00](#) - [F16H 31/00](#); rope or like tackle for lifting or haulage [B66D 3/00](#))

Definition statement

This place covers:

Gearings for converting limited rotary movement, e.g. oscillation, into an other rotary movement or a limited rotary movement into reciprocating movement or vice versa in particular by using flexible means, or rack and pinion mechanisms.

Gearings for converting reciprocating movement into another reciprocating movement by flexible means.

References

Limiting references

This place does not cover:

Step-by-step mechanisms without freewheel members, e.g. Geneva driven	F16H 27/00
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Gearings for conveying rotary motion with intermittently-driving members, e.g. with freewheel action	F16H 29/00
Other gearings with freewheeling members or other intermittently driving members	F16H 31/00
Rope or like tackle for lifting or haulage	B66D 3/00

F16H 21/00**Gearings comprising primarily only links or levers, with or without slides****Definition statement**

This place covers:

Crank gearings.

Guiding mechanisms, e.g. for straight line guidance, using links or levers.

Gearings for conveying or interconverting oscillating or reciprocating motions by links or levers, e.g. toggle mechanisms.

Gearings with movement in three dimension comprising primarily links and levers.

References**Application-oriented references**

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Guiding mechanisms for drawing machines	B43L
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Rope or like tackle for lifting or haulage	B66D 3/00
Crankshafts or eccentric shafts	F16C 3/04
Adjustable cranks or eccentrics	F16C 3/28
Adjustable connecting rods	F16C 7/06

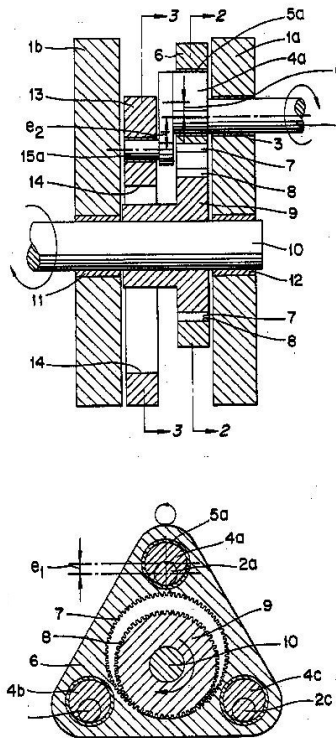
F16H 21/14

by means of cranks, eccentrics, or like members fixed to one rotary member and guided along tracks on the other

Definition statement

This place covers:

Illustrative example of subject matter classified in this group.



F16H 23/00

Wobble-plate gearings; Oblique-crank gearings {(conveying rotary motion with toothed nutating gears [F16H 1/321](#))}

Definition statement

This place covers:

Gearings using rotating wobble plates or discs for converting rotary movement into a reciprocating movement of a gear member.

References

Limiting references

This place does not cover:

Gearings with toothed wobble members for conveying rotary motion, e.g. reduction gears with high ratio	F16H 1/321
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F16H 25/00

Gearings comprising primarily only cams, cam-followers and screw-and-nut mechanisms

Definition statement

This place covers:

- Gearings using essential cams to convey rotary motion.
- Screw and nut mechanisms.
- Other gearings using essential cams for interconverting rotary and reciprocating motions

References

Limiting references

This place does not cover:

Gearings using crankshafts or eccentrics	F16H 21/36
Wobble plate gearings	F16H 23/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Rope or like tackle for lifting or haulage	B66D 3/00
Adjustable connecting rods	F16C 7/06
Adjustable cams	F16C53/04
Cam followers	F16C53/06

F16H 25/20

Screw mechanisms (with automatic reversal [F16H 25/12](#))

References

Limiting references

This place does not cover:

Gearings with helical grooves and automatic reversal for interconverting rotary motion and reciprocating motion	F16H 25/122
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F16H 25/22

**with balls, rollers, or similar members between the co-operating parts;
Elements essential to the use of such members**

Special rules of classification

This group and subgroup [F16H 25/2204](#) are only given if the subject-matter of the cooperating parts, e.g. the circulating balls are of particular interest representing the invention information. If the ball screw device is just an additional feature invention classification is given in group [F16H 25/20](#).

F16H 25/24

Elements essential to such mechanisms, e.g. screws, nuts ([F16H 25/22](#) takes precedence)

Definition statement

This place covers:

- Screw shafts.
- Nuts or their support.
- Safety nuts.
- Seals, wipers or scrapers for screw-nut devices.
- Brakes for locking the screw device in their position.
- Means for facilitating manufacturing or assembly.

Special rules of classification

In this group, classification of additional information as follows is mandatory:

Intermediate screw supports for reducing unsupported length of screw shaft	F16H 2025/2436
Supports for compensating misalignment or offset between screw and nut	F16H 2025/2445
Brakes using a wrap spring, i.e. a helical wind up spring for braking or locking	F16H 2025/2463
Special features for facilitating the manufacturing of spindles, nuts, or sleeves of screw devices	F16H 2025/2481
Special materials or coatings for screws or nuts	F16H 2025/249

F16H 27/00

Step-by-step mechanisms without freewheel members, e.g. Geneva driven (rotary gearings with cyclically-varying velocity ratio [F16H 35/02](#); impulse couplings [F16D 5/00](#); clockwork escapements [G04B 15/00](#))

Definition statement

This place covers:

- Step-by-step mechanisms using mechanisms with driving pins in driven slots, e.g. Geneva drives.
- Step-by-step mechanisms using gears with interrupted toothings.
- Step-by-step mechanisms using an reciprocating or oscillating transmission member.

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Clockwork escapements	G04B 15/00
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Rotary gears with cyclically-varying velocity ratio	F16H 35/02
Impulse couplings	F16D 5/00

F16H 29/00

Gearings for conveying rotary motion with intermittently-driving members, e.g. with freewheel action (freewheels [F16D 41/00](#) {; Gearings for converting oscillating or reciprocating movement with freewheeling members or other intermittently-driving members into a rotary movement [F16H 31/00](#)})

Definition statement

This place covers:

Gearings for conveying continuous rotary motion into a rotary output motion by using intermittently-driving members or with freewheel action

- with stationary intermittently-driving members, i.e. not rotating with either of the shafts
- with rotating intermittently-driving members

References**Limiting references**

This place does not cover:

Gearings for converting oscillating, i.e. non continuous rotary input, or reciprocating movement with freewheeling members or other intermittently-driving members into a rotary movement	F16H 31/00
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Adjustable cranks or eccentrics	F16C 3/28
Freewheels or freewheel clutches	F16D 41/00

F16H 31/00

Other gearings with freewheeling members or other intermittently driving members ([F16H 21/00](#), [F16H 23/00](#), [F16H 25/00](#) take precedence; gearings involving the use of automatic changing-mechanisms, e.g. cyclically-actuated reversal gearings, see the appropriate groups)

Definition statement

This place covers:

Gearings for converting oscillating, i.e. non continuous rotary input, or reciprocating movement with freewheeling members or other intermittently-driving members into an other movement, e.g. a step by step movement.

References

Limiting references

This place does not cover:

Gearings using freewheel members for changing ratio	F16H 3/00
Gearings comprising primarily only links or levers	F16H 21/00
Wobble plate or oblique crank gearings	F16H 23/00
Gearings comprising primarily only cams, cam-followers and screw-and-nut mechanisms	F16H 25/00
Gearings for conveying rotary motion with intermittently-driving members or freewheel action	F16H 29/00

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Wrenches of the ratchet type	B25B 13/46
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Step-by-step mechanisms without freewheel member	F16H 27/00
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F16H 33/00

Gearings based on repeated accumulation and delivery of energy

Definition statement

This place covers:

- Gearings using mechanical accumulators, e.g. weights, springs or intermittently-connected flywheels.
- Gearings for conveying rotary motion using essentially spring action for achieving variable ratio.
- Gearings for conveying rotary motion using essentially inertia for achieving variable ratio, e.g. by orbital gears with regulating masses or gyroscopic action.
- Gearings for converting, based essentially on inertia, of rotary motion into reciprocating or oscillating motion and vice versa.

References

Limiting references

This place does not cover:

Gravity or inertia motors	F03G 3/00
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Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Apparatus for generating mechanical vibrations involving rotary unbalanced masse	B06B 1/16
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F16H 35/00**Gearings or mechanisms with other special functional features****Definition statement**

This place covers:

Groups for functional features not otherwise provided for in this subclass

- For variation of rotational phase relationship
- For conveying rotary motion with cyclically varying velocity ratio
- Means for supporting gears allowing relative movement between supports thereof
- For adjustment of members on moving parts from a stationary place
- Arrangements or devices for absorbing overload or preventing damage by overload
- Mechanisms with only two stable positions, e.g. acting at definite angular positions
- Mechanisms for movements or movement relations conforming to mathematical formulae
- Turning devices for rotatable members, e.g. shafts

F16H 35/008

{for variation of rotational phase relationship, e.g. angular relationship between input and output shaft (couplings [F16D 3/10](#))}

References**Limiting references**

This place does not cover:

Couplings with means for varying the angular relationship	F16D 3/10
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Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Changing the angular relationship between crankshaft and camshaft	F01L 1/344
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F16H 35/02

for conveying rotary motion with cyclically varying velocity ratio (speed-changing mechanisms operating cyclically, see the appropriate groups)

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Gearings converting continuous rotation into a step-by-step rotary movement without freewheeling members

	F16H 27/04
Eccentric mounted gears in gearings	F16H 2035/001
Pulleys or toothed members of non-circular shape, e.g. elliptic gears	F16H 2035/003

F16H 35/06

Gearings designed to allow relative movement between supports thereof without ill effects ([F16H 1/26](#), [F16H 1/48](#) take precedence {; mounting or supporting gearboxes [F16H 57/025](#)})

References

Limiting references

This place does not cover:

Special means compensating for misalignment of axes	F16H 1/26
Special means compensating for misalignment of axes for gears having orbital motion	F16H 1/48
Support of transmission casing, e.g. torque arms, or attachment to other devices	F16H 57/025

F16H 35/10

Arrangements or devices for absorbing overload or preventing damage by overload (for screw mechanisms [F16H 25/2021](#)); couplings for transmitting rotation [F16D](#))

References

Limiting references

This place does not cover:

Arrangements or devices for absorbing overload or preventing damage by overload for screw mechanisms	F16H 25/2021
Slip couplings, e.g. slipping on overload	F16D 7/00
Couplings with safety member for disconnecting	F16D 9/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Monitoring wear or stress of transmission elements, e.g. for triggering maintenance	F16H 57/01
Monitoring of overload conditions	F16H 2057/016
Detection of mechanical transmission failures	F16H 2057/018
Arrangements of torque limiters in wrenches or screwdrivers	B23C23/14

F16H 35/16

Mechanisms for movements or movement relations conforming to mathematical formulae (devices in which computing operations are performed mechanically [G06G 3/00](#))

References**Application-oriented references**

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Devices in which computing operations are performed mechanically	G06G 3/00
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F16H 35/18

Turning devices for rotatable members, e.g. shafts (starting devices for internal-combustion engines [F02N](#))

References**Limiting references**

This place does not cover:

Starting devices for internal-combustion engines	F02N
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F16H 37/00

Combinations of mechanical gearings, not hereinbefore provided for (applications of "underdrives" or "overdrives" in motor vehicles, combinations with differential gearings in motor vehicles [B60K](#))

Definition statement

This place covers:

- Combination of toothed and friction gearings.
- Combination of toothed or friction gearings not provided in groups [F16H 1/00](#) - [F16H 35/00](#).
- Gearings comprising essential combinations with other gearing mechanism where not only an additional gearing element like lever, link or cam is added to the basic gearing.

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Combination of gearings with a plurality of driving or driven shafts comprising differential gearing for four wheel drive	B60K 17/34
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F16H 37/021

{toothed gearing combined with continuous variable friction gearing}

Definition statement

This place covers:

Combination of toothed and continuous variable friction gearings where the two gearings are arranged in series. The toothed gearing is arranged before or after the CVT (no power split).

F16H 37/027

{toothed gearing combined with a gear using endless flexible members for reversing rotary motion only}

Definition statement

This place covers:

The idle gear for reversing is replaced by a gear with an endless flexible member, e.g. a chain transmission to establish the reverse ratio. In general no CVTs.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Arrangement of reverse gear in transmissions with continuously meshing gears	F16H 2003/0822
Gearings for reversal only	F16H 3/14 , F16H 3/18 , F16H 3/60

F16H 37/06

with a plurality of driving or driven shafts; with arrangements for dividing torque between two or more intermediate shafts

Definition statement

This place covers:

Combination of gearings with a plurality of driving or driven shafts.

References

Limiting references

This place does not cover:

Toothed gears for conveying rotary motion with constant gear ratio having a plurality of driving or driven shafts; with arrangements for dividing torque between two or more intermediate shafts	F16H 1/22
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F16H 37/08

with differential gearing

Definition statement

This place covers:

- Combination of gears with differentials for dividing or summarising torque between two or more torque paths.
- Combination of CVTs with differentials for splitting torque.

References

Limiting references

This place does not cover:

Toothed gears for conveying rotary motion with constant gear ratio having a plurality of driving or driven shafts; with arrangements for dividing torque between two or more intermediate shafts	F16H 1/22
Combination of gears with a plurality of driving or driven shafts comprising differential gearing for four wheel drive	B60K 17/346

F16H 37/12

Gears comprising primarily toothed or friction gearing, links or levers, and cams, or members of at least two of these types ([F16H 21/14](#), [F16H 21/28](#), [F16H 21/30](#) take precedence; toothed or friction gearing or cam gearing with only an additional lever or link, see the appropriate group for the main gearing)

Definition statement

This place covers:

Gears comprising essential combinations with other gearing mechanism where not only an additional gearing element like lever, link or cam is added to the basic gearing.

References

Limiting references

This place does not cover:

Mechanisms for conveying rotary motion by means of cranks, eccentrics, or like members fixed to one rotary member and guided along tracks on the other	F16H 21/14
Crank gears with one connecting rod combined with cams or additional guides	F16H 21/28

Crank gearings with one connecting rod combined with members having rolling contact, e.g. gears	F16H 21/30
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Screw mechanisms with both nut and screw being driven	F16H 25/2018
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F16H 39/00

Rotary fluid gearing using pumps and motors of the volumetric type, i.e. passing a predetermined volume of fluid per revolution (application to motor vehicles [B60K](#)) ; application to lifting or pushing equipment [B66F](#); control of exclusively fluid gearing [F16H 61/38](#))

Definition statement

This place covers:

Systems wherein the pressure of a gas or a liquid is increased in a pump and this pressure is used to drive a piston pump and piston motor.

References

Limiting references

This place does not cover:

Control of fluid gearing	F16H 61/38
Control of hydrostatic fluid gearing	F16H 61/40
Details of fluid pumps of motors	F04B , F04C

Informative references

Attention is drawn to the following places, which may be of interest for search:

Pneumatic hammers	B25D 9/00
Application to lifting or pushing equipment	B66F

F16H 41/00

Rotary fluid gearing of the hydrokinetic type (control of exclusively fluid gearing [F16H 61/38](#))

Definition statement

This place covers:

Constructions of hydrodynamic torque converters: systems wherein the kinetic energy of a fluid is increased in a pump and this kinetic energy is used to drive a turbine.

References

Limiting references

This place does not cover:

Lock-up clutches of torque converters	F16H 45/02
Fluid gearing combined with mechanical gearing	F16H 47/00
Control of torque converter lock-up clutches	F16H 61/14
Control of hydrodynamic fluid gearings	F16H 61/48
Hydrodynamic couplings	F16D 33/00

F16H 43/00

Other fluid gearing, e.g. with oscillating input or output {(generating mechanical vibrations of infrasonic or sonic frequency [B06B](#); percussive tools [B25D 9/00](#); mine roof supports for step by step movement [E21D 23/00](#); reciprocating-piston machines without rotary main shaft [F01B 11/08](#); fluid pressure actuators [F15B](#))}

Definition statement

This place covers:

Systems wherein the pressure or the kinetic energy of the fluid is not substantially constant during one cycle because the pump or the motor has for example only one cylinder.

References

Limiting references

This place does not cover:

Details of fluid pumps or motors	F04B , F04C
Fluid-actuated devices for displacing a member from one position to an other	F15B 15/00

F16H 45/00

Combinations of fluid gearings for conveying rotary motion with couplings or clutches ([F16H 41/22](#), {[F16H 47/085](#)} take precedence; conjoint control of driveline clutches and change-speed gearing in vehicles [B60W 10/02](#), [B60W 10/10](#) {and [B60W 30/18](#)})

Definition statement

This place covers:

The combination of a fluid gearing such as a hydrodynamic torque converter for example with claw couplings or friction clutches for example to lock up the torque converter or to uncouple the torque converter from the engine or the transmission

References

Limiting references

This place does not cover:

Control of torque converter lock-up clutches	F16H 61/14
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Rotary fluid gearing of the hydrokinetic type, for example for details not related to the lock-up of the torque converter	F16H 41/00
Fluid couplings or clutches with pumping sets of the volumetric type	F16D 31/00
Rotary fluid couplings or clutches of the hydrokinetic type	F16D 33/00
Dampers	F16F

F16H 47/00

Combinations of mechanical gearing with fluid clutches or fluid gearing (conjoint control of driveline clutches and change-speed gearing in vehicles [B60W 10/02](#) and [B60W 10/10](#))

Definition statement

This place covers:

- Characterising layout of combination of mechanical gearing such as planetary gearing with fluid gearing such as a hydrodynamic torque converter.
- Control means for the combination of mechanical gearing with fluid clutches.

References

Limiting references

This place does not cover:

Control of torque converter lock-up clutches	F16H 61/14
Conjoint control of clutch and gearing for propulsion of vehicles	B60W 30/18

Informative references

Attention is drawn to the following places, which may be of interest for search:

Electromagnetic actuated clutch-brake combinations	F16D 67/06
--	----------------------------

Special rules of classification

Contrary to references in the IPC the control means for shifting of combinations of mechanical and fluid gearing are also included in this group and subgroups (no reorganisation had been performed in group [F16H 47/00](#) related to subjects of [F16H 61/00](#))

F16H 48/00

Differential gearings (cooling or lubricating of differential gearing [F16H 57/04](#))

References**Limiting references**

This place does not cover:

Cooling or lubricating of differential gearings	F16H 57/04
---	----------------------------

Informative references

Attention is drawn to the following places, which may be of interest for search:

Arrangement or mounting of differential gearing in vehicles	B60K 17/16
Arrangement or mounting of a transfer gear in vehicles for driving both front and rear wheels having a transfer gear	B60K 17/34
Arrangement or mounting of control devices for differential gearing of vehicle	B60K 23/04

Special rules of classification

When classifying in this group, in the absence of an indication to the contrary, classification is made in all appropriate places.

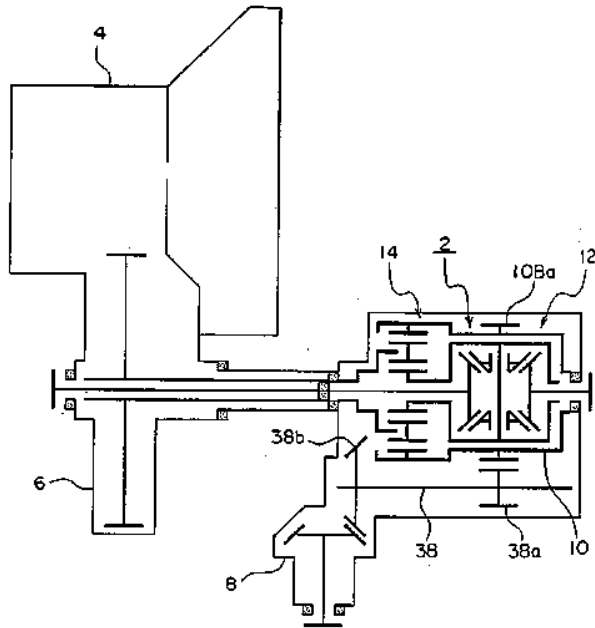
F16H 48/05

Multiple interconnected differential sets

Definition statement

This place covers:

Combinations of several interconnected differential sets, for example a combination of a right-and-left differential with a center differential (such a relationship as between "center differential unit 14" and "front differential unit 12" in the figure below: EP 1527933 A2)



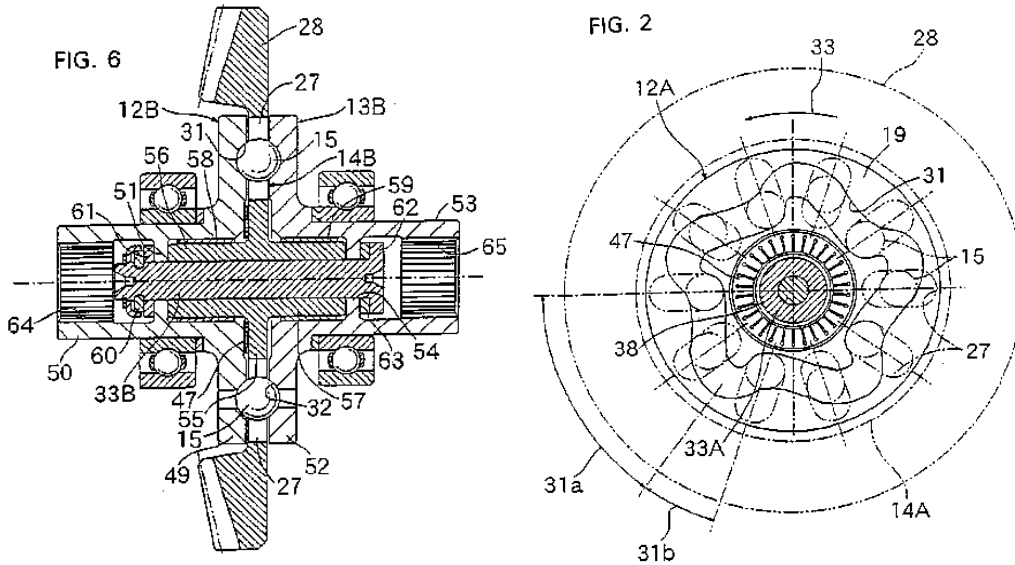
F16H 48/14

with cams

Definition statement

This place covers:

Differentials having cams, for example, in between the two output members as seen in the figure below (EP 1167824 A2: "Output rotary members 12B, 13B" are output members and "cam groove 31 and balls 15" comprise the cam mechanism).



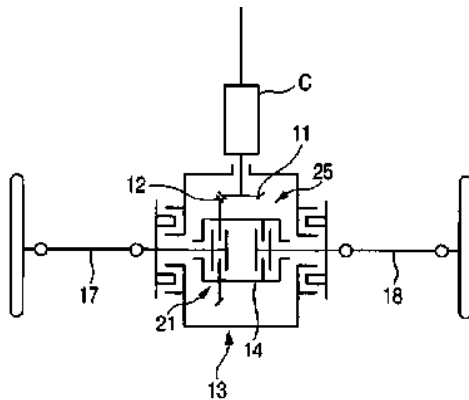
F16H 48/19

consisting of two linked clutches

Definition statement

This place covers:

Those differentials that divide one input into two outputs without using planet gears but by using two linked clutches (see "clutches 21, 25" in the figure below: US 2003/0051935 A1).



F16H 48/22

using friction clutches or brakes

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Clutches	F16D
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F16H 48/24

using positive clutches or brakes

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Clutches	F16D
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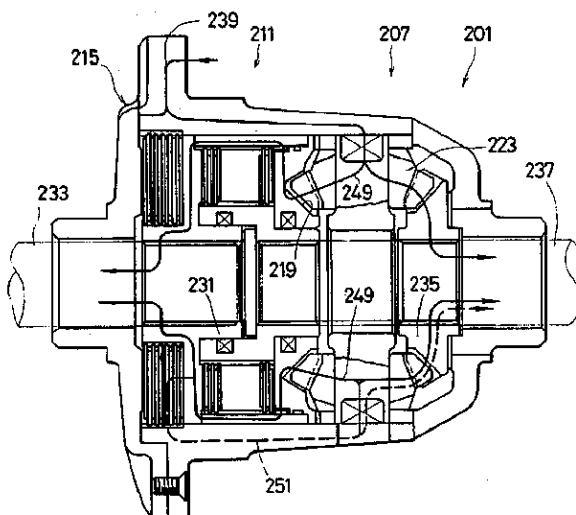
F16H 48/26

using fluid action, e.g. viscous clutches

Definition statement

This place covers:

Differentials, the differential action of which is suppressed by utilizing the function of fluid viscosity, etc. such as, for example, viscous clutches (see the figure below: US5458547A)



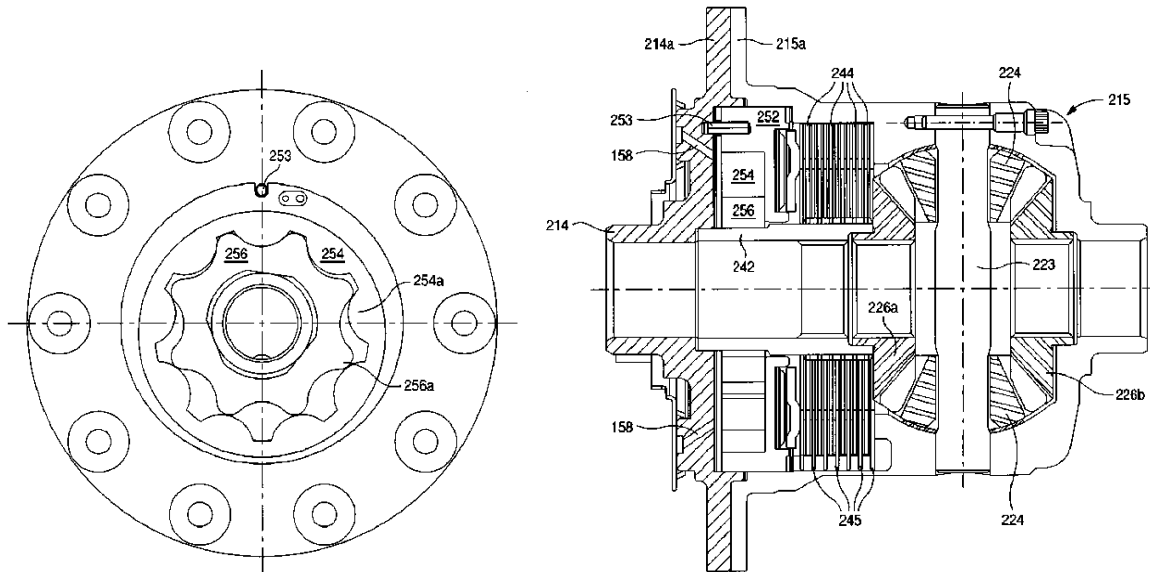
F16H 48/27

using internally-actuatable fluid pressure, e.g. internal pump types

Definition statement

This place covers:

Differentials, the differential action of which is suppressed by fluid pressure that is generated, for example, by internal pumps actuated by the difference of rotation numbers between two outputs (see the figures below: US6238315B1)



F16H 48/28

using self-locking gears or self-braking gears

Definition statement

This place covers:

Differentials, the differential action of which is suppressed in response to a difference in torque that is generated between two outputs.

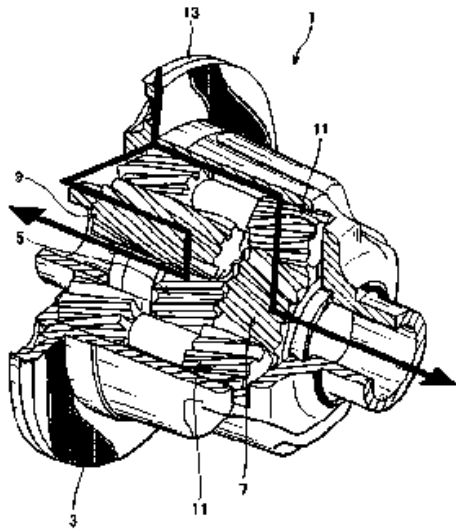
F16H 48/285

with self-braking intermeshing gears having parallel axes and having worms or helical teeth

Definition statement

This place covers:

Differentials, the differential action of which is suppressed by, for example, meshing reaction forces of helical gears that are arranged in parallel axes, by way of the said helical gears being pushed against the casing of the differentials (see the figure below: EP2050985A2)



F16H 48/29

with self-braking intermeshing gears having perpendicular arranged axes and having worms or helical teeth

Definition statement

This place covers:

Differentials, the differential action of which is suppressed by, for example, meshing reaction forces of helical gears or worms that are arranged in orthogonal axes, by way of the said helical gears or

worms being pushed against the casing of the differentials (see the figure below: US5098356A)

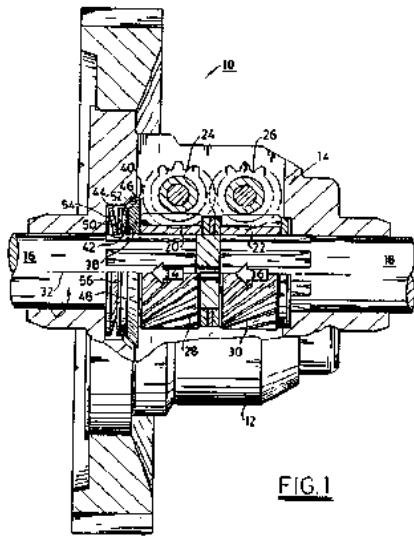


FIG. 1

F16H 48/295

using multiple means for force boosting

Definition statement

This place covers:

Differentials, in which the engaging power of a pilot clutch is amplified by using a cam, for example, and thereby, to have a main clutch engaged (see "pilot clutch 33," "cam mechanism 35" and "main clutch 39" in the figure below: US 6436002 B1)

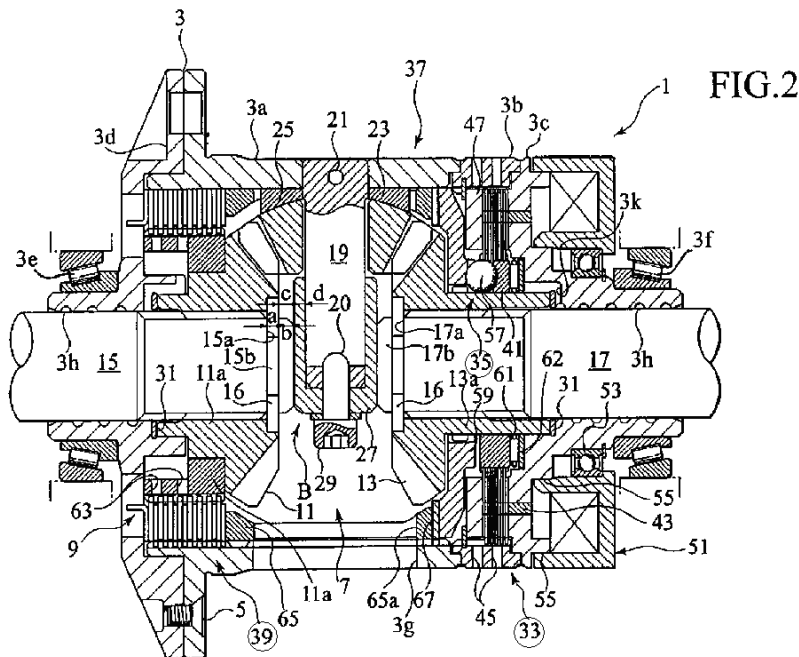


FIG. 2

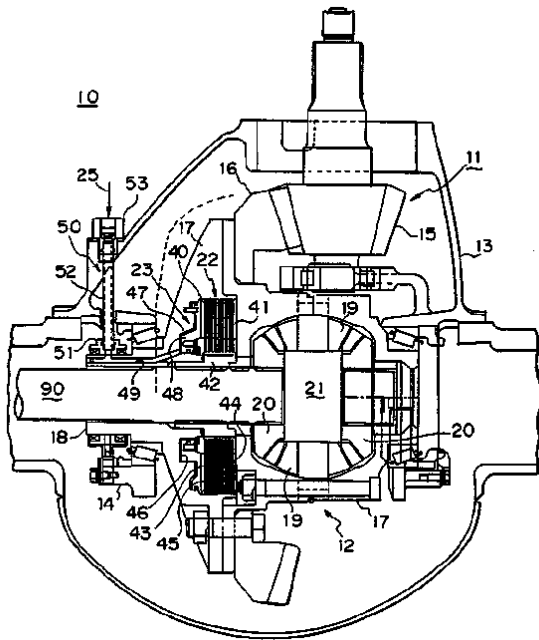
F16H 48/32

using fluid pressure actuators

Definition statement

This place covers:

Differentials, the differential action of which is suppressed by, for example, fluidic actuators that are controllable from outside of the differential (see the figure below: EP0456560A2)



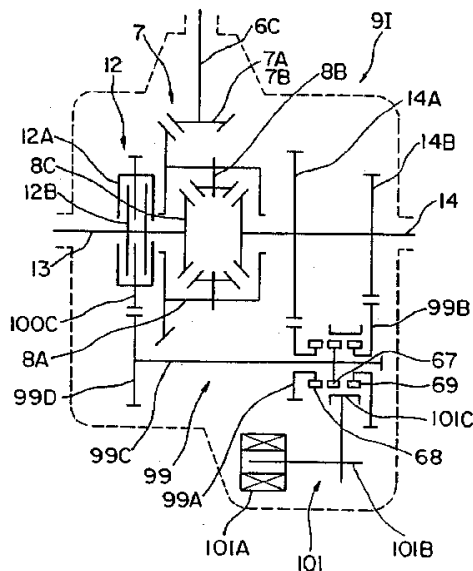
F16H 48/36

characterised by intentionally generating speed difference between outputs

Definition statement

This place covers:

Those differentials that are intentionally made to have different rotation numbers between two outputs for the purpose of improving the turning performance or controlling the yaw motion of vehicles (see the figure below: US5456641A)



F16H 48/38

Constructional details (the outer casing comprising the differential and supporting input and output shafts [F16H 57/037](#))

Definition statement

This place covers:

Those differentials that are characterised by such component parts as gear wheels, casings, washers, shafts, bearings or carriers

References

Limiting references

This place does not cover:

The outer casing comprising the differential and supporting input and output shafts	F16H 57/037
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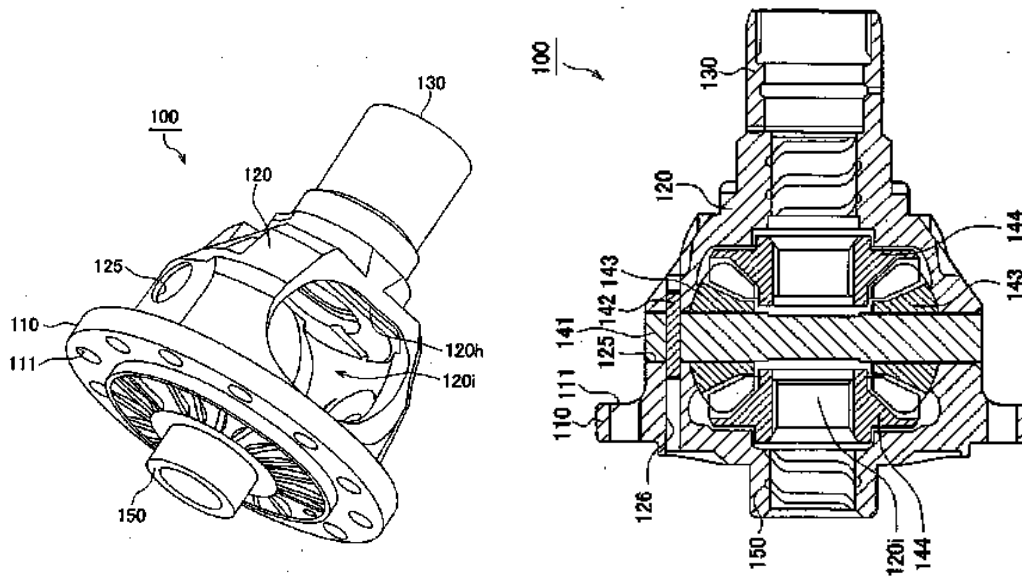
F16H 48/40

characterised by features of the rotating cases

Definition statement

This place covers:

Casings that accommodate the differential mechanism internally and are rotated by the power from the input shaft (see number 120 in the sample figures below: US 2008/0229878 A1)



F16H 49/00

Other gearings

Definition statement

This place covers:

Gearings or mechanisms not otherwise provided for:

- Wave gearings using flexible deformable members, e.g. Harmonic drive transmissions
- Magnetic gearings having in addition engaging gear elements, e.g. teeth
- Gearings using guided balls to transmit motion

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Harmonic drives for manipulators or robots	B25J 9/1025
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Worm gears with balls between the cooperating gear parts	F16H 1/163
Gearings where the central axis of the gearing lies inside the periphery of an orbital gear	F16H 1/32

Gearings for conveying rotary motion with intermediate members guided along tracks on both rotary members	F16H 25/06
Rotating torque transmitting elements of the permanent-magnet type	H02K 49/102

F16H 51/00

Levers of gearing mechanisms ({connecting rods or links pivoted at both ends [F16C 7/00](#); gear levers [F16H 59/00](#)}; manipulating levers [G05G](#))

Definition statement

This place covers:

Levers for gearing mechanisms.

References

Limiting references

This place does not cover:

Gear levers for transmission control	F16H 59/02
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Transmissions with cams	F16H 25/00
Control levers per se	G05G

Special rules of classification

This group is merely used because the particular levers are normally classified with the mechanism they are used for

F16H 53/00

Cams; Non-rotary cams; Cam followers, e.g. rollers

Definition statement

This place covers:

Cams, camshafts or cam followers

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Gearings comprising primarily only cams or cam-followers	F16H 25/00
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F16H 53/025

{characterised by their construction, e.g. assembling or manufacturing features (grinding of camshafts [B24B 19/12](#))}

Definition statement

This place covers:

- Constructional features of camshafts.
- Assembling or manufacturing of camshafts.

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Camshafts for valve gears	F01L 1/047
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Making crankshafts by working or processing metal tubes, rods or profiles without essentially removing material	B21D 53/845
Grinding of camshafts	B24B 19/12

F16H 55/00

Elements with teeth or friction surfaces for conveying motion; Worms; Pulleys; Sheaves (pulley-blocks [B66D 3/04](#))

Definition statement

This place covers:

- Different kind of gear elements for conveying rotary motion with and without teeth, e.g. gears, racks, worms, pulleys or chain wheels.
- Constructional features of these elements.
- Profiles of teeth for gearings.

References

Limiting references

This place does not cover:

Screw and nut gearings	F16H 25/20
Details of fluid gearing	F16H 39/00 - F16H 43/00

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Pulley blocks for lifting or hauling appliances	B66D 3/04
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F16H 55/06

Use of materials; Use of treatments of toothed members or worms to affect their intrinsic material properties {(coatings for lubrication [F16H 57/041](#); producing gear wheels from plastics or substances in a plastic state [B29D 15/00](#); heat treatment [C21D 9/32](#); electrolytic surface treatment [C25D](#); heating by electromagnetic field [H05B 6/00](#)}}

Definition statement

This place covers:

- Use of materials for toothed gear members.
- Toothed gear members characterised by their material properties achieved by particular treatments.
- Gear features related to production by moulding, e.g. injection moulding.

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Coatings for lubrication	F16H 57/041
Producing gear wheels from plastics or substances in a plastic state	B29D 15/00
Heat treatment	C21D 9/32
Electrolytic surface treatment	C25D

Informative references

Attention is drawn to the following places, which may be of interest for search:

Heating by electromagnetic field	H05B 6/00
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F16H 55/10

Constructively simple tooth shapes, e.g. shaped as pins, as balls {(gearwork for clocks and watches [G04B 13/00](#)}}

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Worm gear transmissions with balls between the cooperating gear elements	F16H 1/163
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Gearworks for clocks and watches	G05B 13/00
----------------------------------	----------------------------

F16H 55/14

Construction providing resilience or vibration-damping ([F16H 55/06](#) takes precedence; resilient coupling of wheel or wheel-rim with shaft [F16D 3/50](#), [F16D 3/80](#))

References

Limiting references

This place does not cover:

Toothed gear wheels using particular materials for providing resilience or vibration damping	F16H 55/06
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Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Resilient coupling of wheel or wheel rim with the shaft	F16D 3/50 , F16D 3/80
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Devices for varying tension of belts, ropes or chains with vibration damping means	F16H 7/0829
Vibration-damping or noise reducing means specially adapted for gearings	F16H 57/0006
Reducing vibrations or noise of the gearbox casing	F16H 57/028
Suppression of vibrations or noise of gear selectors or gear levers	F16H 59/0208
Control of hydrostatic fluid gearing preventing or reducing vibrations or noise	F16H61/418

F16H 55/17

Toothed wheels ({with simple tooth shapes [F16H 55/10](#)} ; worm wheels [F16H 55/22](#); chain wheels [F16H 55/30](#))

Definition statement

This place covers:

- Toothed wheels.
- Toothed belt pulleys.

References

Limiting references

This place does not cover:

Wheels having constructively simple tooth shapes, e.g. pins or balls	F16H 55/10
Worm wheels	F16H 55/22
Chain wheels or sprockets	F16H 55/30

F16H 55/18

Special devices for taking up backlash {(in tuner actuating devices [H03J](#), [H03J 1/06](#); in gear-train of clocks or watches [G04B 35/00](#))}

Definition statement

This place covers:

- Means for taking up backlash when related to the toothed wheels. If backlash is taken up by modification of the shaft support, e.g. distance of axes between engaging members it should be classified in [F16H 57/12](#).
- For bevel gears.

References

Limiting references

This place does not cover:

Means for taking up backlash at worm wheels	F16H 55/24
Means for taking up backlash at racks	F16H 55/28

Informative references

Attention is drawn to the following places, which may be of interest for search:

Arrangements for adjusting or for taking-up backlash for planetary gearings conveying rotary motion	F16H 1/2863
Arrangements for adjusting or for taking-up backlash not provided for elsewhere	F16H 57/12

F16H 55/22

for transmissions with crossing shafts, especially worms, worm-gears (bevel gears, crown wheels, helical gears [F16H 55/17](#))

Definition statement

This place covers:

- Worm gears or worm wheels.
- Special features of worm gears.

References

Limiting references

This place does not cover:

Bevel gears, crown wheels or helical gears	F16H 55/17
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Profiles of gears with perpendicular non-intersecting shaft arrangement	F16H 55/082 , F16H 55/0853
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F16H 55/24

Special devices for taking up backlash

Definition statement

This place covers:

Worm gears or worm wheels with means for taking up backlash.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Transmission with arrangements for dividing torque between two or more worm wheels	F16H 1/225
Backlash reducing means for bevel gears, crown wheels or helical gears	F16H 55/18
Means for taking up backlash at racks	F16H 55/28
Support of worm gear shafts	F16H 2057/0213
Arrangements for adjusting or for taking-up backlash not provided for elsewhere	F16H 57/12

F16H 55/52

Pulleys or friction discs of adjustable construction

Definition statement

This place covers:

- Pulleys or friction discs where diameter for the pulley or chains can be modified.
- Pulleys with centrifugal masses for automatically changing the active diameter dependent on speed.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Control of continuous variable gearing using endless flexible means	F16H 61/662
Final output mechanisms, e.g. means or actuating devices to adjust the friction discs	F16H 63/06

F16H 57/00

General details of gearing (of screw-and-nut gearing [F16H 25/00](#); of fluid gearing [F16H 39/00](#) - [F16H 43/00](#))

Definition statement

This place covers:

- Monitoring wear or stress of transmission elements.
- Shaft assemblies specially adapted for gearings.
- Gearboxes, Mounting gearing in gearboxes.

- Lubrication or cooling of gearings.
- General details of gears having orbital motion, e.g. planet carriers.
- Arrangement for adjusting or taking-up backlash not otherwise provided for.

References

Limiting references

This place does not cover:

Details of screw-and-nut gearings	F16H 25/20
Fluid gearing	F16H 39/00 - F16H 43/00

F16H 57/04

Features relating to lubrication or cooling {or heating} ({in hydrokinetic gearing [F16H 41/30](#); } control of lubrication or cooling in hydrostatic gearing [F16H 61/4165](#))

Definition statement

This place covers:

Lubrication or cooling of gearings

References

Limiting references

This place does not cover:

Lubrication or cooling in hydrokinetic gearing	F16H 41/30
Control of lubrication or cooling in hydrostatic gearing	F16H 61/4165

Informative references

Attention is drawn to the following places, which may be of interest for search:

Lubrication systems in vehicles	B60R 17/02
Vehicle endless-track units with lubrication means	B62D 55/092
Lubrication in general	F16N

Special rules of classification

Multiple aspects of classification are given in the subgroups of [F16H 57/04](#), i.e.

- if a disclosed subject-matter is considered as "invention information" than an appropriate ECLA-group shall be given to each single aspect of such subject-matter.
- if a disclosed subject-matter is considered as "additional information" than an appropriate Indexing Code-group shall be given to each single aspect of such subject-matter.
- if there is no particular application place for the type of gearing in the subgroups of [F16H 57/048](#), at least an Indexing Code outside [F16H 57/048](#) should be given, e.g. in case of wobble plate gears [F16H 23/00](#).

Documents published before January 2009 are not fully reclassified into the subgroups of this scheme. Therefore documents in group [F16H 57/04](#) may disclose aspects which should be classified in one of the subgroups.

Documents published before January 2009 disclosing multiple aspects of different subgroups might be classified in only one of these groups.

F16H 57/0401

{using different fluids, e.g. a traction fluid for traction gearing and a lubricant for bearings or reduction gears}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Sealings between different partitions of a gear case or reservoir	F16H 57/0454
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F16H 57/0402

{Cleaning of lubricants, e.g. filters or magnets}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Venting trapped air for hydraulic systems	F16H 2061/004
Venting of hydraulic transmissions	F16H 61/4174
Filtration, Filtering material	B01D
Degasification of liquids	B01D 19/00
Deaeration of lubricants	F16N 39/002

F16H 57/0404

{Lubricant filters}

Definition statement

This place covers:

Filter devices.

Magnets for collecting metallic debris.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Oilsumps with filter	F01M 2011/0029
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F16H 57/0406**{Absorption elements for lubricants, e.g. oil felts}****Definition statement***This place covers:*

- Feeding lubricant by a felt or other foamed material. The felt often forms a reservoir for life time lubrication.
- Feed by capillary action, e.g. using a wick.

References**Informative references***Attention is drawn to the following places, which may be of interest for search:*

Grease depots	F16H 57/0463
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F16H 57/0408**{Exchange or filling of transmission lubricant (filling or draining lubricant of or from machines or engines [F01M 11/04](#); servicing, maintaining, repairing, or refitting of vehicles [B60S 5/00](#))}****Definition statement***This place covers:*

- Draining of transmission fluids.
- Filling of transmission fluids.
- Exchange of transmission fluids, e.g. fluids for automatic transmissions.
- Cleaning or flushing of transmissions.

References**Informative references***Attention is drawn to the following places, which may be of interest for search:*

Flushing in hydrostatic fluid gearing	F16H 61/4104
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F16H 57/041**{Coatings or solid lubricants, e.g. antiseize layers or pastes}****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Use of materials for toothed members	F16H 55/06
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F16H 57/0412**{Cooling or heating; Control of temperature}****Definition statement***This place covers:*

Cooling of transmission, their elements (e.g. gears, casings) or cooling of the lubricant.

References**Limiting references***This place does not cover:*

Lubrication or cooling in hydrokinetic gearing	F16H 41/30
Control of lubrication or cooling in hydrostatic gearing	F16H 61/4165

Informative references*Attention is drawn to the following places, which may be of interest for search:*

Engine cooling	F01P 7/14
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F16H 57/0415**{Air cooling or ventilation; Heat exchangers; Thermal insulations}****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Heat exchangers per se	F28D
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F16H 57/0416**{Air cooling or ventilation}****Definition statement***This place covers:*

The term "air cooling or ventilation" shall include transmission elements and/or lubricants cooled by heat exchange with ambient air, e.g. ventilated air cooling of CVT belts, guidance of lubricant through air cooled tubes or air cooled parts of the casing, cooling fins inside or outside the casing.

F16H 57/0417**{Heat exchangers adapted or integrated in the gearing}****Definition statement***This place covers:*

The term "heat exchangers" shall include lubricant cooled or heated by heat exchange with another fluid, e.g. with water, oil or exhaust gas.

F16H 57/0434

{relating to lubrication supply, e.g. pumps (arrangement of pumps [F16H 57/0441](#)); Pressure control (grooves with pumping effect for supplying lubricant [F16H 57/0428](#); generation and variation of line pressure for transmission control [F16H 61/0021](#))}

Definition statement

This place covers:

All kind of lubrication pumps or special means to produce flow of lubrication. Further lubrication control units or valves to supply the transmission with lubricant.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Generation or control of line pressure	F16H 61/0021
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F16H 57/0436

{Pumps}

References

Limiting references

This place does not cover:

Arrangement of lubrication pumps	F16H 57/0441
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Supply of control fluid; Pumps or accumulators therefore	F16H 61/0025
Lubricating pumps per se	F16N 13/00

F16H 57/0445

{for supply of different gearbox casings or sections}

Definition statement

This place covers:

The term "gearbox section" means a section containing gearing elements like gear, belts, chains or clutches. A section comprising only shaft support bearings is not considered as a different gearbox section.

References

Limiting references

This place does not cover:

Arrangement of lubrication pumps	F16H 57/0441
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Control of lubricant levels	F16H 57/0447
Section walls to divide a gear sump	F16H 57/0453

F16H 57/0447

{Control of lubricant levels, e.g. lubricant level control dependent on temperature}

Relationships with other classification places

This classification should not be allocated to documents which merely disclose a splash lubrication. The lubricant level of any splash lubrication sump depends on the rotational speed of the splashing element, but, if a document does not explicitly disclose the problem of "level control", classification should be given only in group [F16H 57/0457](#) for "splash lubrication".

[F16H 57/0447](#) shall also not be allocated to documents dealing with "providing a correct fill level". These are classified in [F16H 57/0408](#) "exchange or filling of transmission lubricant". However, "sensors or indicators for controlling the fluid level should be classified in [F16H 57/0449](#)."

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Splash lubrication	F16H 57/0457
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F16H 57/045

{Lubricant storage reservoirs, e.g. reservoirs in addition to a gear sump for collecting lubricant in the upper part of a gear case}

Relationships with other classification places

Group [F16H 57/045](#) "lubricant storage reservoir" is essentially given for "additional reservoirs". It shall not be given for the mere existence of a gear sump. However, documents dealing with "oil pans" shall be given [F16H 57/0452](#) and dealing with "section walls to divide gear sump" shall be given [F16H 57/0453](#).

The term "gearbox sections" in [F16H 57/0445](#) "supply of different gearbox sections" shall mean sections which contain gearing elements, e.g. gears, belts, chains or clutches. For bearing lubrication [F16H 57/0471](#) should be given.

F16H 57/0457

{Splash lubrication (characterised by the problem reducing losses, e.g. splash losses [F16H 57/0409](#))}

Definition statement

This place covers:

Splash lubrication, e.g. by gearing elements plunging into an oil bath

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Characterised by the problem to increase efficiency, e.g. by reducing splash losses	F16H 57/0409
Control of lubricant levels	F16H 57/0447

F16H 57/0463

{Grease lubrication; Drop-feed lubrication}

Definition statement

This place covers:

- Grease lubrication.
- Grease depots.
- Drip lubrications.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Arrangements for supplying grease from a stationary reservoir or equivalent	F16N 11/00
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F16H 57/0468

{Shift rods or shift forks}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Lubrication guiding means on or inside shift rods or shift forks	F16H 57/0432
Gear shift yokes	F16H 63/32

F16H 57/0475

{Engine and gearing, i.e. joint lubrication or cooling or heating thereof (electric machines and gearing [F16H 57/0476](#))}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Gearboxes associated or combined with the crankcase of the engine	F16H 2057/0203
Joint lubrication or cooling of electric machines and gearing	F16H 57/0476

F16H 57/0476

{Electric machines and gearing, i.e. joint lubrication or cooling or heating thereof}

Special rules of classification

In case of controlled cooling or heating classification should also be given in group [F16H 57/0413](#)

F16H 57/048

{Type of gearings to be lubricated, cooled or heated}

Special rules of classification

According the multiple classification rule in this main group an invention-classification should be given for the type of the gearing. If there is no particular place in subgroups of [F16H 57/048](#) at least an additional classification should be given for the type of the gearing, e.g. for wobble plate gearings [F16H 23/00](#).

F16H 59/00

Control inputs to {control units of} change-speed-, or reversing-gearings for conveying rotary motion

Definition statement

This place covers:

- Selector apparatus, e.g. gear shift or range levers.
- Control inputs being a function of different parameters, e.g. torque, speed or transmission status.
- Other control inputs related to ambient or vehicle parameters, e.g. road condition, load, steering, clutch or engine.

References

Limiting references

This place does not cover:

Final output mechanisms in the gearbox, e.g. selector or shifting means in the gearbox	F16H 63/00
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Input parameters for vehicles	B60W 2510/00 - B60W 2560/00
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Special rules of classification

The input values represent in most cases only additional information. Only if the measuring device or the method for measuring of the value forms an essential part of the invention it is classified as 'Invention information'.

In groups [F16H 59/00-F16H 63/00](#), clutches positioned within a gearbox are considered as comprising part of the gearings.

When classifying in groups [F16H 59/00-F16H 63/00](#), control inputs or types of gearing which are considered to represent information of interest for search, may also be classified. Such non-obligatory classification should be given as "additional information", e.g. selected from subgroup [F16H 61/66](#) relating to the type of gearing controlled or from group [F16H 59/00](#) relating to control inputs.

Former IPC notes 5 and 6 are not applied in this scheme

Additional classification should be also given in the codes of [F16H](#).

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Mechanism	means a kinematic chain consisting either of a single element or alternatively of a series of elements, the position of each point on the kinematic chain being derivable from the position of any other point on the chain, and therefore, for a given position of a point on one of the elements forming the kinematic chain there is only one position for each of the other points on the element or series of elements forming the kinematic chain
Final output mechanism	means the mechanism which includes the final output element
Final output element	means the final element which is moved to establish a gear ratio, i.e. which achieves the linking or coupling between two power transmission means, e.g. reverse idler gear, gear cluster, coupling sleeve, apply piston of a hydraulic clutch
Actuating mechanism	means the mechanism, the movement of which causes the movement of another mechanism by being in mutual contact
Final actuating mechanism	means the mechanism actuating the final output mechanism, i.e. this mechanism actuates the final output mechanism which includes the final output element, like coupling sleeve or shift fork

F16H 61/00

Control functions within {control units of} change-speed- or reversing-gearings for conveying rotary motion {; Control of exclusively fluid gearing, friction gearing, gearings with endless flexible members or other particular types of gearing}

Definition statement

This place covers:

Subject matter which is not fully covered by other subgroups of this main group (see appropriate codes):

- Venting trapped air from hydraulic control systems
- Cleaning of hydraulic elements, e.g. remove orifice clogging
- Details of fluid supply channels, e.g. within shafts, for supplying friction devices or transmission actuators with control fluid
- Supply of electric power, e.g. batteries for back-up supply
- Initialising the parameters of the controller
- Power-down of the controller
- Modifying an existing transmission control, e.g. by replacement of parts
- Tuning an existing transmission control for racing
- Measures or means for testing transmission control or parts thereof

- Robots or simulators for testing

F16H 61/0003

{Arrangement or mounting of elements of the control apparatus, e.g. valve assemblies or snapfittings of valves; Arrangements of the control unit on or in the transmission gearbox}

Definition statement

This place covers:

- Arrangements of the control unit on or in the transmission gearbox.
- General features of the control units, e.g. supporting or connection of printed circuits, channel plates for supporting valves.
- Arrangement or mounting of elements of the control apparatus, e.g. valve assemblies or snap-fittings of valves.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Housings for electric apparatus for protecting electronics against vibration or moisture	H05K 5/0056
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F16H 61/0021

{Generation or control of line pressure}

Definition statement

This place covers:

- Supply of control fluid, e.g. fluid pumps or accumulators for generating line pressure.
- Additional auxiliary pumps for supply of hydraulic fluid when engine has stopped.
- Single pumps driven by different sources of power.
- Control circuits for controlling line pressure.
- Lubrication or cooling of transmission taken from the hydraulic control supply.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Layout of control circuits for shifting gears with friction clutches or brakes	F16H 61/0206 , F16H 61/0267
Layout of control circuits for moving shift actuators	F16H 61/2807 , F16H 61/30
Control for optimising pump efficiency in CVTs	F16H 2061/66286

F16H 61/0059

{Braking of gear output shaft using simultaneous engagement of friction devices applied for different gear ratios}

Definition statement

This place covers:

Gearings where braking is achieved by simultaneous engagement of different gear ratios, in fact gear locking which can be smooth when one friction coupling or brake is involved. Sometimes also used instead of a parking lock.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Engine braking	F16H 61/21
Parking lock mechanisms in the transmission	F16H 63/3416
Signals to parking lock or parking brake being part of the transmission; Control circuits therefore	F16H 63/48

F16H 61/02

characterised by the signals used {(for shift actuators [F16H 61/28](#), for continuously variable gearings [F16H 61/66](#))}

Definition statement

This place covers:

Methods for generating shift signals

- Estimating or calculating of optimal gears or ranges therefor
- Generating or modifying shift maps
- Selecting a particular map or ratio depending on particular conditions or situations

Control circuits classified according their essential kind of signals

Circuits where gearshift control is essential controlled by electric means or circuits are classified in [F16H 61/0202](#). This group includes electro hydraulic circuits using different solenoids.

Circuits where gearshift control is essentially controlled by fluid signals are classified in [F16H 61/0262](#). A control with a single solenoid for a sub function, e.g. kick down, is not considered as an electro hydraulic control in the sense of [F16H 61/0202](#).

Circuits where gearshift control is essentially controlled by mechanical forces, e.g. by using centrifugal or gear forces, are classified in [F16H 61/0293](#).

References

Limiting references

This place does not cover:

Control circuits for shift actuators	F16H 61/28
Control for continuous variable gearings	F16H 61/66

Informative references

Attention is drawn to the following places, which may be of interest for search:

Control specially adapted for double clutch transmissions	F16H 61/688
Control specially adapted for change speed gearing in group arrangement	F16H 61/70

F16H 61/04**Smoothing ratio shift****Definition statement**

This place covers:

- Synchronisation before shifting
- Bridging torque interruption
- Subgroup for smoothing ratio shift using electric signals

See codes for particular shift transitions, e.g. swap shift, jump shift, particular gear sequences, preventing gear butting, suppressing engine flare, low or high torque shifts.

Relationships with other classification places

[F16H 61/04](#) and subgroup [F16H 61/0437](#) are the groups for the more general aspects of gear shifting, because there is no proper IPC place for gear shifting per se, i.e. the gear smooth effect is not an essential feature. If there is pressure control between an releasing friction element and an applied friction element the document is classified in [F16H 61/06](#) or in subgroup [F16H 61/061](#) if there is any electronic control involved.

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Signals to clutch outside the gearbox	F16H 63/46
Signals to engine or motor for smoothing gear shift	F16H 63/502

F16H 61/06**by controlling rate of change of fluid pressure****Definition statement**

This place covers:

Control of fluid pressure for off-going or on-coming gear friction devices for shift transition from former ration to new target ratio.

Special rules of classification

If there is electronic control involved the document is classified in subgroup [F16H 61/061](#). See codes for fill parameters and for calibration of pressure levels.

F16H 61/08

Timing control

Definition statement

This place covers:

Timing control during shift transition.

Some timing control is always performed during shifting. Therefore only documents showing special inventive features related to timing control are classified in this group.

Timing of auxiliary gear shifts [F16H 2061/085](#).

F16H 61/12

Detecting malfunction or potential malfunction, e.g. fail safe (in control of hydrostatic gearing [F16H 61/4192](#)); {Circumventing or fixing failures}

Definition statement

This place covers:

- Diagnose or detection of failures.
- Avoiding failures by using redundant parts.
- Adapting to failure by work around with other constrains.
- Fixing failures by repairing failed parts, e.g. loosening a sticking valve
- Keeping current state, resume normal operation.
- Limiting input power.
- Characterised by the parts where malfunction was assumed or detected.

References

Limiting references

This place does not cover:

Fail safe in control of hydrostatic gearing	F16H 61/4192
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Monitoring wear or stress of transmission elements, e.g. for triggering maintenance	F16H 57/01
Detection of mechanical transmission failures	F16H 2057/018
Ensuring safety in case of control system failures, e.g. by diagnosing, circumventing or fixing failures, for control systems of road vehicle drive controls not related to a particular sub-unit	B60W 50/02

F16H 61/16

Inhibiting {or initiating} shift during unfavourable conditions, {e.g. preventing forward reverse shift at high vehicle speed, preventing engine over speed (unintentional control input [F16H 61/18](#))}

Definition statement

This place covers:

- Inhibiting, preventing shifting during unfavourable conditions (see codes).
- Holding gear for delaying shifting under unfavourable conditions, e.g. during cornering.
- Checking feasibility of shift, i.e. determining of shift can be successfully completed and post shift values are in an acceptable range.
- Initiating a shift to prevent an unfavourable condition, e.g. forced shift into neutral in case of transmission failure.
- Preventing or initiating shifts for preventing stall or overspeed of engine.

Relationships with other classification places

In group [F16H 61/16](#) the emphasis is the condition and not an unintentional control input by the driver. A device for preventing unintended movements of shift lever, e.g. the shift from fifth gear into reverse is classified in [F16H 61/18](#). A device where the reverse gear is blocked because the vehicle speed is too high would be classified in [F16H 61/16](#).

References

Limiting references

This place does not cover:

Preventing unintentional control input	F16H 61/18
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Gearshift control characterised by the method for generating shift signals	F16H 61/0213
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F16H 61/18

Preventing unintentional or unsafe shift, {e.g. preventing manual shift from highest gear to reverse gear}

Definition statement

This place covers:

- Means, e.g. catches or locking devices for preventing unintended shift into reverse gear.
- Means preventing unintentional or unsafe shifts.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Lever handles with lock mechanisms	F16H 2059/0282
Locking of the selector apparatus	F16H 61/22

Final output mechanism for reverse gear	F16H 63/302
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F16H 61/20

Preventing gear creeping {; Transmission control during standstill, e.g. hill hold control}

Definition statement

This place covers:

- Active creep control for slow driving.
- Hill hold control, e.g. with torque converter or an friction device slightly engaged to keep vehicle stationary.
- Neutral control, e.g. preparing for drive off.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Vehicle drive off	F16H 2312/02
Preparing to drive off	F16H 2312/022
Holding or hill holding	F16H 2312/04
Creeping	F16H 2312/06
Going to or coming from stand by operation, e.g. for engine start stop operation at traffic lights	F16H 2312/14

F16H 61/22

Locking {of the control input devices} ([F16H 63/34](#) takes precedence {; vehicle fittings for preventing unauthorised use, e.g. ignition keys interlocked with gear box or gear lever [B60R 25/06](#))}

Definition statement

This place covers:

Locking of a control device with exception of final output mechanisms. Input means, e.g. locking of range lever in the 'Park' position.

References

Limiting references

This place does not cover:

Locking of the final output mechanisms	F16H 63/34
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Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Vehicle fittings for preventing unauthorised use operating on the vehicle transmission, e.g. ignition keys interlocked with gear box or gear lever	B60R 25/06
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F16H 61/26

Generation or transmission of movements for final actuating mechanisms

Definition statement

This place covers:

- Actuators for moving final actuating mechanisms.
- Means for transmitting movement for selecting and shifting by cables.
- Linkages for transmitting movement essentially outside the gear box.

Special rules of classification

The generation or transmission of movements comprising essentially the selector apparatus, is classified in group [F16H 59/00](#).

The generation or transmission of movements, when part of the final output mechanisms, is classified in group [F16H 63/00](#).

F16H 61/28

with at least one movement of the final actuating mechanism being caused by a non-mechanical force, e.g. power-assisted

Definition statement

This place covers:

- Fluid actuators.
- Servo actuators for power assisted shifting.
- Electric actuators, e.g. actuators using electric motors or solenoids.
- Control of actuators.

References

Limiting references

This place does not cover:

Methods for generating shift signals	F16H 61/0213
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Inputs being a function of the gearing status	F16H 59/68
Hydraulic actuators forming part of the final actuating mechanism	F16H 63/3023
Electric actuators forming part of the final actuating mechanism	F16H 63/304

F16H 61/30

Hydraulic {or pneumatic} motors {or related fluid control means} therefor

Definition statement

This place covers:

Fluid actuators.

Servo actuators for power assisted shifting.

Control of actuators.

References

Limiting references

This place does not cover:

Methods for generating shift signals	F16H 61/0213
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Inputs being a function of the gearing status	F16H 59/68
Hydraulic actuators forming part of the final actuating mechanism	F16H 63/3023

F16H 61/32

Electric motors {actuators or related electrical control means} therefor

Definition statement

This place covers:

Servo actuators for power assisted shifting.

Actuators for range selection.

Control of actuators.

References

Limiting references

This place does not cover:

Methods for generating shift signals	F16H 61/0213
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Inputs being a function of the gearing status	F16H 59/68
Electric actuators forming part of the final actuating mechanism	F16H 63/304

F16H 61/34

comprising two mechanisms, one for the preselection movement, and one for the shifting movement ([F16H 61/36](#) takes precedence)

References

Limiting references

This place does not cover:

With at least one movement, e.g. for selecting or shifting, being transmitted by a cable	F16H 61/36
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Ratio selector apparatus comprising a final actuating mechanism	F16H 59/041
Final output mechanisms having elements remote from the gearbox	F16H 63/3009

Special rules of classification

The features of this group represent in most cases not an inventive concept. Therefore this group was not systematically allocated to shift linkages with two mechanisms. Group is not complete.

F16H 61/40

hydrostatic (involving modification of the gearing [F16H 39/02](#), [F16H 39/04](#))

Definition statement

This place covers:

- Devices or systems to vary the transmission ratio of hydrostatic gearing or control the hydraulic power transmission between a pump and a motor having no specific entry in the following subgroups.
- Arrangements or mountings of the control apparatus on the hydrostatic gearing.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Hydrostatic gearings comprising integrated control parts (valves) or accessories	F16H 39/02 , F16H 39/04
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F16H 61/4008

Control of circuit pressure

Definition statement

This place covers:

- Devices for controlling pressure not specific for the high or low working pressures.
- Control of differential pressure.

F16H 61/4017

Control of high pressure, e.g. avoiding excess pressure by a relief valve

Definition statement

This place covers:

- Devices for limiting a maximum pressure in the hydrostatic high pressure conduits;
- Check valves, relief valves, regulating valves.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Preventing overload by changing the capacity of a pump or a motor	F16H 61/478
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F16H 61/4026

Control of low pressure

Definition statement

This place covers:

- Devices for regulating or limiting pressure in the hydrostatic low pressure conduits.
- Check valves, relief valves, regulating valves in low pressure conduits.

F16H 61/4035

Control of circuit flow

Definition statement

This place covers:

- Devices for regulating the circuit flow.
- Pulsing stop valves, orifice valves or variable restrictions in the conduits.

F16H 61/4043

Control of a bypass valve

Definition statement

This place covers:

- Devices for connecting high pressure conduits with low pressure conduits.
- Control circuits characterised by features related to the bypass valves.

F16H 61/4052

by using a variable restriction, e.g. an orifice valve

Definition statement

This place covers:

- Devices for varying the bypass flow, e.g. for implementing a starting clutch of the hydrostatic transmission.

- Variable orifice valves.

F16H 61/4061

Control related to directional control valves, e.g. change-over valves, for crossing the feeding conduits (forward reverse switching by using swash plate [F16H 61/438](#))

Definition statement

This place covers:

- Devices for changing the rotational direction of the motor by exchanging the supply conduits.
- Change-over valves, crossing valves for exchanging the conduits.

F16H 61/4069

Valves related to the control of neutral, e.g. shut off valves (zero tilt rotation holding means [F16H 61/439](#))

Definition statement

This place covers:

- Devices for interrupting communication between pump and motor.
- Stop valves, shut-off valves.
- Pump output closing valves or plates.
- Intermediate position of change-over valve.

F16H 61/4078

Fluid exchange between hydrostatic circuits and external sources or consumers

Definition statement

This place covers:

- Devices for connecting the hydrostatic conduits with external sources or consumers, e.g. linear motor actuators of working circuits.
- Switching valves and controls therefore.

F16H 61/4096

with pressure accumulators

Definition statement

This place covers:

- Devices for controlling the charging or discharging of accumulators from the high or low pressure conduits.
- Arrangements of high or low pressure accumulators.
- Check valves, one way valves between hydrostatic circuit and accumulators.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Hybrid vehicles with regenerative braking using fluid accumulators	B60K 6/12
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F16H 61/4104

Flushing, e.g. by using flushing valves or by connection to exhaust

Definition statement

This place covers:

- Devices for connecting the hydrostatic low pressure conduits with the exhaust or sump.
- Flushing valves for leaking the circuit to enable replenishing.

F16H 61/4131

Fluid exchange by aspiration from reservoirs, e.g. sump

Definition statement

This place covers:

- Devices for feeding the hydrostatic circuits without use of a charging pump.
- Aspiration from sump or non pressurized reservoirs.

F16H 61/4139

Replenishing or scavenging pumps, e.g. auxiliary charge pumps

Definition statement

This place covers:

- Pumps and controls for charging the hydrostatic circuit with fluid.
- Auxiliary pumps driven by input shaft feeding the low pressure conduits.

F16H 61/4148

Open loop circuits

Definition statement

This place covers:

- Devices for switching between closed loop and open loop circuits.
- Specific features or arrangements of the open loop circuits.

Special rules of classification

This subgroup is also given as a multiple classification or as additional information.

F16H 61/4157

Control of braking, e.g. preventing pump over-speeding when motor acts as a pump

Definition statement

This place covers:

- Devices for limiting the pump over-speed when the motor functions as pump.
- Control of friction brakes in hydraulic motors.
- Restrictions in circuits, changing pump or motor capacity for braking purposes.

F16H 61/4165

Control of cooling or lubricating

Definition statement

This place covers:

- Devices for controlling the oil or hydraulic fluid temperature, also by heating, e.g. after start when temperature is low.
- Devices for controlling oil levels.
- Controlling the cooling of housings of pumps or motors.
- Details of the lubrication circuits, control of lubricating pressures.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Features relating to lubrication or cooling for general gearings	F16H 57/04
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F16H 61/4174

Control of venting, e.g. removing trapped air

Definition statement

This place covers:

Devices for removing trapped air in hydrostatic circuits, e.g. breathers therefor

F16H 61/4183

Preventing or reducing vibrations or noise, e.g. avoiding cavitations

Definition statement

This place covers:

- Devices for damping the pressure oscillations, e.g. by using restrictions or accumulators.
- Devices for cancelling cavitation, detection of cavitation.

F16H 61/4192

Detecting malfunction or potential malfunction, e.g. fail safe

Definition statement

This place covers:

- Fail-safe devices.
- Detection of minimum oil level in the sump.
- Detection of oil leakages in the circuits.

F16H 61/42

involving adjustment of a pump or motor with adjustable output or capacity
{{F16H 61/46 takes precedence}}

Definition statement

This place covers:

- Control the displacement of a pump and a motor having no specific entry in the following subgroups.
- Conjoint actuation of pump and motor.

F16H 61/421

Motor capacity control by electro-hydraulic control means, e.g. using solenoid valves

Definition statement

This place covers:

- Electro-hydraulic valves for regulating the pressure of the hydraulic actuator.
- Linear solenoid valves, pulse width modulated valves.

F16H 61/423

Motor capacity control by fluid pressure control means

Definition statement

This place covers:

- Purely hydraulic valves for regulating the pressure of the hydraulic actuator.
- Hydraulic servo assisted shifting, hydraulic actuators therefor.

F16H 61/425

Motor capacity control by electric actuators

Definition statement

This place covers:

- Electric motors for adjusting displacement.
- Electrically assisted shifting actuation.

F16H 61/427

Motor capacity control by mechanical control means, e.g. by levers or pedals

Definition statement

This place covers:

Mechanical linkages between manually actuated levers or pedals and shifting means

F16H 61/431

Pump capacity control by electro-hydraulic control means, e.g. using solenoid valves

Definition statement

This place covers:

- Electro-hydraulic valves for regulating the pressure of the hydraulic actuator.
- Linear solenoid valves, pulse width modulated valves.

F16H 61/433

Pump capacity control by fluid pressure control means

Definition statement

This place covers:

- Purely hydraulic valves for regulating the pressure of the hydraulic actuator.
- Hydraulic servo assisted shifting, hydraulic actuators therefor.

F16H 61/435

Pump capacity control by electric actuators

Definition statement

This place covers:

- Electric motors for adjusting displacement.
- Electrically assisted shifting actuation.

F16H 61/437

Pump capacity control by mechanical control means, e.g. by levers or pedals

Definition statement

This place covers:

Mechanical linkages between manually actuated levers or pedals and shifting means.

F16H 61/438

Control of forward-reverse switching, e.g. control of the swash plate causing discharge in two directions (using a directional control valve [F16H 61/4061](#))

Definition statement

This place covers:

- Control of a pump discharging in two opposite directions by swinging displacement.
- Control of a motor rotating in opposite directions by swinging displacement.

F16H 61/439

Control of the neutral position, e.g. by zero tilt rotation holding means (using a neutral valve or a shutoff valve [F16H 61/4069](#))

Definition statement

This place covers:

- Devices to hold a pump in a nearly zero discharge position.
- Devices to control a motor in a free-wheel or zero torque position by maintaining a nearly zero displacement.

F16H 61/44

with more than one pump or motor in operation

Definition statement

This place covers:

Control of multiple pumps or motors having no specific entry in the following lower subgroups.

F16H 61/444

by changing the number of pump or motor units in operation

Definition statement

This place covers:

- Devices for switching an additional pump or motor to the hydrostatic circuit.
- Bypass devices for shunting a motor in a series connection of motors.

F16H 61/448

Control circuits for tandem pumps or motors

Definition statement

This place covers:

Circuits comprising pumps or motors mounted on same shaft.

F16H 61/452**Selectively controlling multiple pumps or motors, e.g. switching between series or parallel****Definition statement***This place covers:*

Devices for switching between a series connection and a parallel connection of pumps and motors.

F16H 61/456**Control of the balance of torque or speed between pumps or motors (hydrostatic differentials [F16H 48/18](#))****Definition statement***This place covers:*

Devices for controlling the balance of torques or speeds between several motors or pumps.

F16H 61/46**Automatic regulation in accordance with output requirements****Definition statement***This place covers:*

- Regulation of an output requirement not specified in the following subgroups.
- Regulating methods not specific for a particular output parameter.

F16H 61/462**for achieving a target speed ratio****Definition statement***This place covers:*

- Closed loop or open loop control to set a target speed ratio between input and output.
- Automatic speed ratio change by comparing two input variables for example output speed versus throttle opening.

F16H 61/465**for achieving a target input speed****Definition statement***This place covers:*

- Closed loop or open loop control to set a target input speed or acceleration.
- Limitation of maximum input speed.
- Detection of input speed by using for example input shaft pump flow.

F16H 61/468

for achieving a target input torque

Definition statement

This place covers:

- Closed loop or open loop control to set a target input torque.
- Limitation of maximum input torque.
- Detection of input torque by using for example pump output pressure.

F16H 61/47

for achieving a target output speed

Definition statement

This place covers:

- Closed loop or open loop control to set a target output speed or acceleration.
- Limitation of maximum output speed.
- Detection of output speed by using for example output shaft governors.

F16H 61/472

for achieving a target output torque

Definition statement

This place covers:

- Closed loop or open loop control to set a target output torque.
- Limitation of maximum output torque.
- Detection of output torque by using for example motor input pressure.

F16H 61/475

for achieving a target power, e.g. input power or output power

Definition statement

This place covers:

- Closed loop or open loop control to set a target input or output power.
- Limitation of maximum input or output power.

F16H 61/478

for preventing overload, e.g. high pressure limitation

Definition statement

This place covers:

- Arrangements for preventing transmission breakage.
- Limitation of maximum pressure by regulation of pump capacity.

F16H 61/66

especially adapted for continuously variable gearings ([F16H 61/38](#) takes precedence)

Definition statement

This place covers:

Only control of mechanical continuously variable gearings, e.g. for gearings using endless flexible members or friction gearings.

References

Limiting references

This place does not cover:

Control of exclusively fluid gearing	F16H 61/38
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F16H 61/662

with endless flexible means

Definition statement

This place covers:

Control only of continuously variable gearings using endless flexible members

Relationships with other classification places

The indented subgroups [F16H 61/66227](#), [F16H 61/66231](#) and [F16H 61/6625](#) are divided according parameters, but groups [F16H 61/66254](#), [F16H 61/66272](#) and [F16H 2061/66295](#) should take precedence.

[F16H 61/66227](#) - transmission ratio control is exclusively depending on speed and torque.

[F16H 61/66231](#) - transmission ratio control is exclusively depending on speed.

[F16H 61/6625](#) - transmission ratio control is exclusively depending on torque.

References

Limiting references

This place does not cover:

Layout of CVT gearings using endless flexible members	F16H 9/00
Actuators, e.g. for adjusting pulleys	F16H 63/06

F16H 61/66227

{controlling shifting exclusively as a function of speed and torque}

Definition statement

This place covers:

Transmission ratio control is exclusively depending on speed and torque parameters, i.e. the combinations of what is covered in groups [F16H 61/66231](#) and [F16H 61/6625](#), see the examples given there (controlling of shifting = control of transmission ratio).

F16H 61/66231

{controlling shifting exclusively as a function of speed}

Definition statement

This place covers:

Transmission ratio control is exclusively depending on speed, see the examples in the subgroups (controlling of shifting = control of transmission ratio).

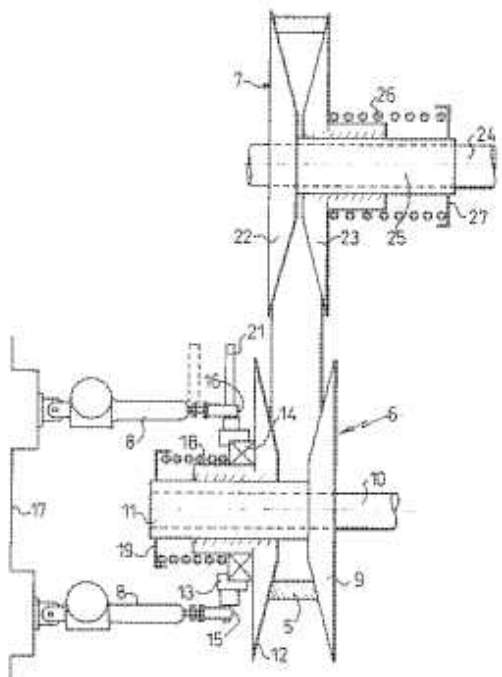
F16H 61/66236

{using electrical or electronical sensing or control means}

Definition statement

This place covers:

Illustrative example of subject matter classified in this group: FR2683288 - Please mind the higher group title: shifting exclusively as a function of speed (controlling of shifting = control of transmission ratio).



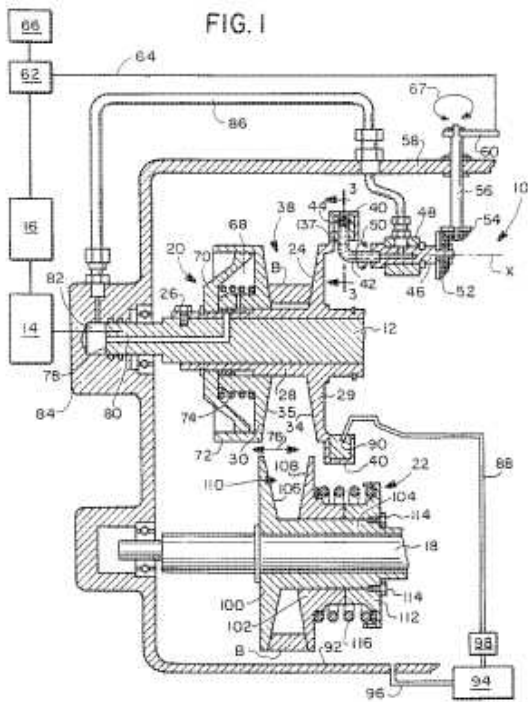
F16H 61/6624

{using only hydraulic and mechanical sensing or control means}

Definition statement

This place covers:

Illustrative example of subject matter classified in this group: EP0489999 - Please mind the higher group title: shifting exclusively as a function of speed (controlling of shifting = control of transmission ratio).



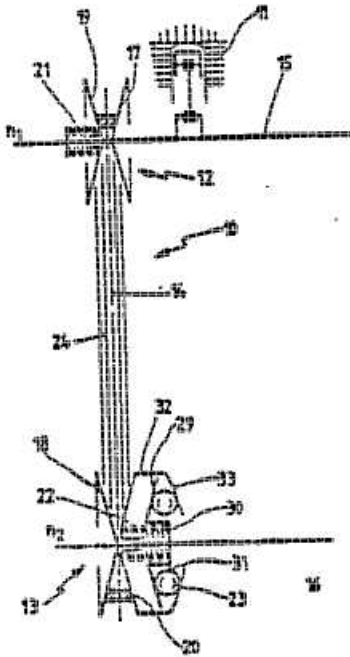
F16H 61/66245

{using purely mechanical sensing or control means}

Definition statement

This place covers:

Illustrative example of subject matter classified in this group: DE3118165 - Please mind the higher group title: shifting exclusively as a function of speed (controlling of shifting = control of transmission ratio)



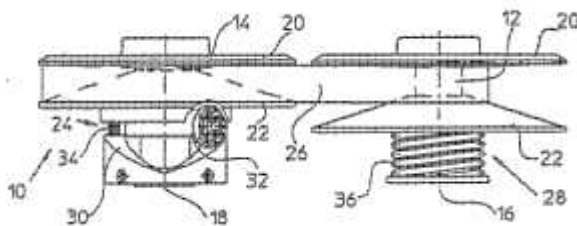
F16H 61/6625

{controlling shifting exclusively as a function of torque}

Definition statement

This place covers:

Illustrative example of subject matter classified in this group: DE19633274



Relationships with other classification places

Please do not confuse this group with group for torque sensors: the presence of a torque sensor does not necessarily imply the exclusive control (i.e. also shift-control) as a function of torque. Most

torque sensors serve to give a signal for clamping force control, therefore torque sensors or use thereof is mostly classified in [F16H 61/66272](#). For mechanical shift actuators see group [F16H 63/067](#). Controlling of shifting = control of transmission ratio.

Special rules of classification

This group contains the exclusive control as a function of torque. If other input parameters are used, the subject matter should not be classified here.

F16H 61/66254

{controlling of shifting being influenced by a signal derived from the engine and the main coupling}

Definition statement

This place covers:

Control of shifting, see the examples in the subgroups.

Control of transmission ratio based NOT exclusively on one input parameter; if based on speed see [F16H 61/66231](#), exclusively on torque see [F16H 61/6625](#), or a combination of exclusively speed and torque see [F16H 61/66227](#).

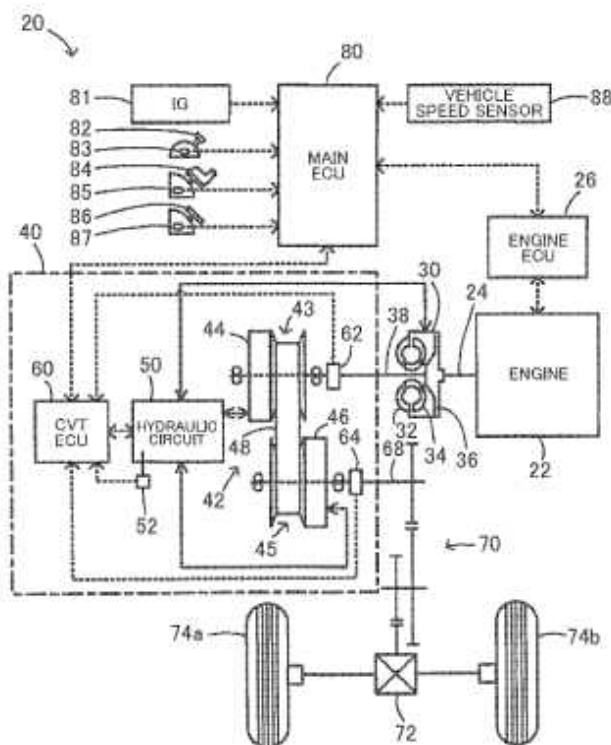
F16H 61/66259

{using electrical or electronical sensing or control means}

Definition statement

This place covers:

Illustrative example of subject matter classified in this group: US2008312030 - controlling of shifting = control of transmission ratio.



F16H 61/66263

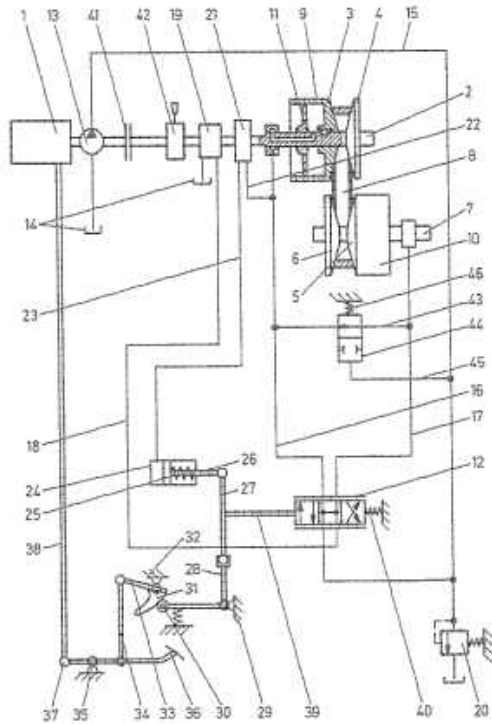
{using only hydraulic and mechanical sensing or control means}

Definition statement

This place covers:

Illustrative example of subject matter classified in this group:

US5378200 - controlling of shifting = control of transmission ratio

**F16H 61/66268**

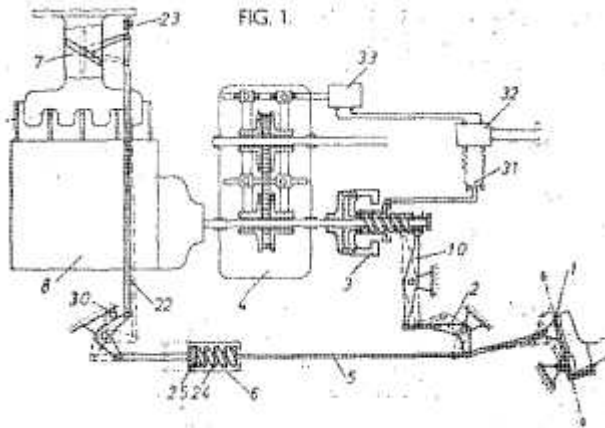
{using purely mechanical sensing or control means}

Definition statement

This place covers:

Illustrative example of subject matter classified in this group:

GB1096469 - controlling of shifting = control of transmission ratio.



F16H 61/66272

{characterised by means for controlling the torque transmitting capability of the gearing}

Definition statement

This place covers:

Control of pinch or clamping force/Klemmkraft (by means of e.g. "secondary" pressure control, or torque sensor).

Control of SLIP (since inversely related to pinch force). But no momentary change of ratio.

Also includes the control concerning compensation of centrifugal pressure (i.e. the "extra" secondary pressure that results from the centrifugal effect on the (oil in the) actuator (cylinder) exerting the clamping force: NB constructions to achieve this can be found in [F16H 55/56](#) also).

F16H 2061/66295

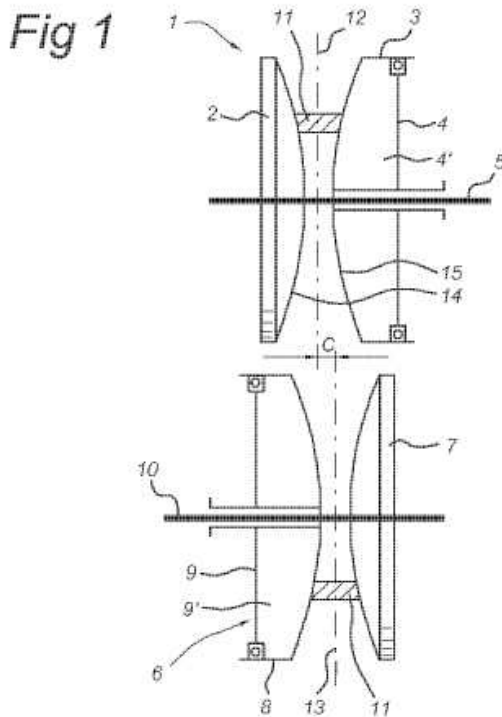
{characterised by means for controlling the geometrical interrelationship of pulleys and the endless flexible member, e.g. belt alignment or position of the resulting axial pulley force in the plane perpendicular to the pulley axis}

Definition statement

This place covers:

Geometrical relationships; Illustrative example:

WO2010074563



Special rules of classification

For specific pulley/disk geometrical properties, see also [F16H 55/56](#);

For geometrical relationships between pulley sets, see [F16H 9/16](#), [F16H 9/18](#)

F16H 61/664

Friction gearings

Definition statement

This place covers:

Only control of friction gearing

Relationships with other classification places

The indented subgroups [F16H 61/6645](#), [F16H 61/6646](#) and [F16H 61/6647](#) are divided according parameters, but groups [F16H 61/6648](#) and [F16H 61/6649](#) should take precedence.

[F16H 61/6645](#) - transmission ratio control is exclusively depending on speed and torque.

[F16H 61/6646](#) - transmission ratio control is exclusively depending on speed.

[F16H 61/6647](#) - transmission ratio control is exclusively depending on torque.

References

Limiting references

This place does not cover:

Layout of continuous variable friction gearing	F16H 15/00
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Layout of continuous variable friction gearing with torque splitting	F16H 37/08
Actuators	F16H 63/06

F16H 61/6645

{controlling shifting exclusively as a function of speed and torque}

Definition statement

This place covers:

Transmission ratio control exclusively depending on speed and torque, see combinations of what is classified in [F16H 61/6646](#) and [F16H 61/6647](#), see the examples given there; controlling of shifting = control of transmission ratio.

F16H 61/6646

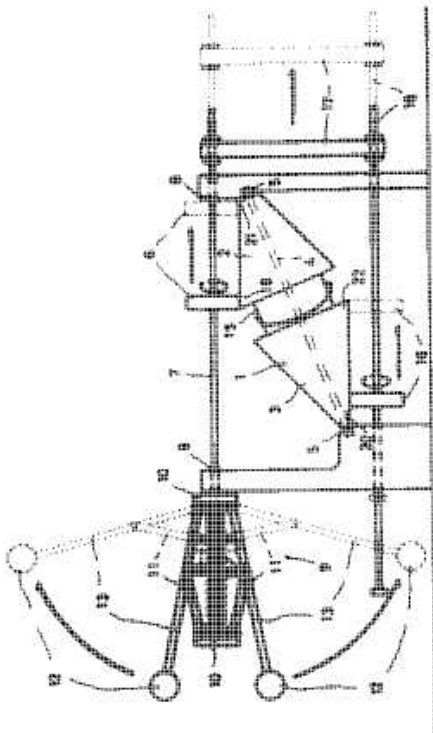
{controlling shifting exclusively as a function of speed}

Definition statement

This place covers:

Illustrative example of subject matter classified in this group:

JP58124855 - controlling of shifting = control of transmission ratio



F16H 61/6647

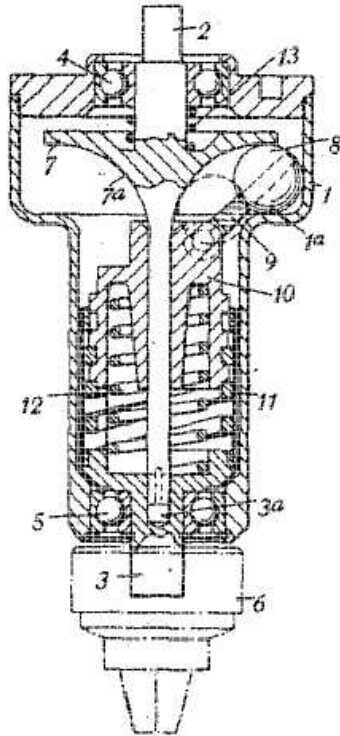
{controlling shifting exclusively as a function of torque}

Definition statement

This place covers:

Illustrative example of subject matter classified in this group:

GB924485 - controlling of shifting = control of transmission ratio

**F16H 61/6648**

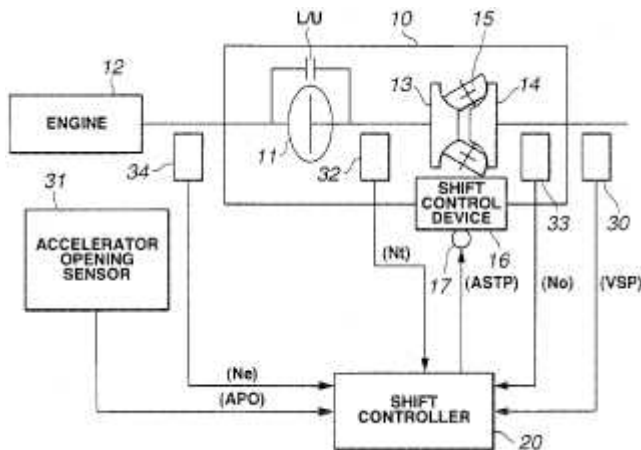
{controlling of shifting being influenced by a signal derived from the engine and the main coupling}

Definition statement

This place covers:

Control of transmission ratio not based on one of: exclusively on speed (see [F16H 61/6646](#)), exclusively torque (see [F16H 61/6647](#)), or a combination of exclusively speed and torque (see [F16H 61/6645](#)). "

Illustrative example: US2003135315



F16H 61/6649

{characterised by the means for controlling the torque transmitting capability of the gearing}

Definition statement

This place covers:

- Control of pinch or clamping force/klemmkraft by means of e.g. "secondary" pressure control or torque sensor.
- Control of slip (since inversely related to pinch force).
- Also includes the control of compensation of centrifugal pressure, i.e. the "extra" secondary pressure that results from the centrifugal effect on the oil in the actuator (cylinder) exerting the clamping force.

F16H 61/68

especially adapted for stepped gearings

Special rules of classification

The classification of groups [F16H 61/58](#) - [F16H 61/686](#) was based on a former IPC indexing scheme and is therefore not complete. Since 2010 the classification is given when the control is specially adapted to a particular type of gearing. Only group symbols [F16H 61/688](#) (double clutch transmissions) and [F16H 61/70](#) (change speed gearings in group arrangements) where systematically given for transmissions controls.

F16H 61/70

especially adapted for change-speed gearing in group arrangement, i.e. with separate change-speed gear trains arranged in series, e.g. range or overdrive-type gearing arrangements

Definition statement

This place covers:

Control of transmissions with different gear trains in series, e.g. a main gear combined with an auxiliary range gear

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Timing of auxiliary gear shifts	F16H 2061/085
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F16H 63/00

Control outputs {from the control unit} to change-speed- or reversing-gearings for conveying rotary motion {or to other devices than the final output mechanism}

Definition statement

This place covers:

- Final output mechanisms, which includes the final output element, the element which establish a gear ratio, e.g. a coupling sleeve.
- Actuating means for the final output mechanisms, the so called "final actuating mechanism".
- Constructional feature of the final output mechanisms.
- Interlocking devices between output mechanisms.
- Ratio indicator devices.
- Parking lock mechanisms.
- Signals to a clutch outside the gearbox.
- Signals to an engine or motor, e.g. motor control for smoothing gear shift.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Mechanism	means a kinematic chain consisting either of a single element or alternatively of a series of elements, the position of each point on the kinematic chain being derivable from the position of any other point on the chain, and therefore, for a given position of a point on one of the elements forming the kinematic chain there is only one position for each of the other points on the element or series of elements forming the kinematic chain
Final output mechanism	means the mechanism which includes the final output element
Final output element	means the final element which is moved to establish a gear ratio, i.e. which achieves the linking or coupling between two power transmission means, e.g. reverse idler gear, gear cluster, coupling sleeve, apply piston of a hydraulic clutch
Actuating mechanism	means the mechanism, the movement of which causes the movement of another mechanism by being in mutual contact
Final actuating mechanism	means the mechanism actuating the final output mechanism, i.e. this mechanism actuates the final output mechanism which includes the final output element, like coupling sleeve or shift fork

F16H 63/06

the final output mechanism having an indefinite number of positions

Definition statement

This place covers:

- Final output mechanisms for continuous variable transmissions (CVTs).
- Actuators therefor.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Pulleys or friction discs of adjustable construction	F16H 55/52
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F16H 63/32

Gear shift yokes, {e.g. shift forks}

Definition statement

This place covers:

- Shift forks and their connection to shift rod or shaft.
- Slide shoes to move the clutch sleeve.

F16H 63/34

Locking or disabling mechanisms

Definition statement

This place covers:

- Locking mechanisms forming part of the final actuating mechanism.
- Locking mechanisms for the parking lock.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Locking of the control input devices, e.g. range selector	F16H 61/22
Control of parking brakes being part of the transmission	F16H 63/48

F16H 63/38

Detents {(spring-loaded ball units for holding levers in a limited number of positions [G05G 5/065](#))}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Providing feel, e.g. to enable selection	F16H 61/24
Spring-loaded ball units for holding levers in a limited number of positions	G05G 5/065