F16C

SHAFTS; FLEXIBLE SHAFTS; ELEMENTS OR CRANKSHAFT MECHANISMS; ROTARY BODIES OTHER THAN GEARING ELEMENTS; BEARINGS

Definition statement

This place covers:

The elements of Subclass F16C are various general mechanical engineering elements or units which have in common that they all relate to:

- conducting (transmitting) or supporting (guiding) load (force, torque) in combination with
- controlled relative movement.

In general Subclass F16C it encompasses:

- elongated mechanical engineering elements for transmitting rotary or linear or combined movement in combination with actuating or driving;
- mechanical engineering elements to support relatively moving elements (rotating, pivoting or linear movement);
- construction of rotating bodies in view of load due to movement (centrifugal load).

The elongated elements to transmit linear, rotary or combined movement, e.g. push-pull type movement, comprise:

- Flexible shafts conveying rotary movement (torque);
- Shafts (torque), telescopic shafts, crankshafts;
- Cranks, eccentrics;
- Mechanical means for transmitting movement in a flexible sheathing, e.g. Bowden cables;
- Connecting-rods or links pivoted at both ends with similar function.

The supporting elements allowing relative rotary, linear or combined motion comprise:

- Axles (to support a rotating body);
- Crossheads;
- Crankshaft bearings;
- Connecting rod bearings;
- Pivots;
- Rolls, drums, discs;
- Bearings.

Since the individual mechanical engineering elements of Subclass F16C are not a coherent group they will be defined individually in more detail below.

General distribution of subject-matter in Subclass F16C (index):

Flexible Mechanical elements for transmitting movement / force F16C 1/00:

Rotary/Torque	Linear - Push/Pull
Flexible shafts F16C 1/02	Mechanical in a flexible sheathing: F16C 1/10
Shafts, Axles, Cranks, Eccentrics	F16C 3/00
Crossheads	F16C 5/00
Connecting rods	F16C 7/00
Resisting rotary force	F16C 15/00

Support elements allowing relative displacement between parts:

Bearings for crankshafts/connecting rods, F16C 9/00	Pivots F16C 11/00
Bearings for rolls, drums discs F16C 13/02	Rolls, discs F16C 13/00

Bearings

Bearings with sliding or rolling contact:

For rotary parts F16C 17/00 - F16C 27/08	For parts moving only linearly F16C 29/00
Aligning, Positioning	F16C 23/00; F16C 29/001
Wear / Play	F16C 25/00; F16C 29/12
Resilient	F16C 27/00; F16C 29/002

For parts which both rotate and move linearly F16C 31/00

Other bearings (F16C 32/00)

Magnetic	F16C 32/04
Hydrostatic	F16C 32/06; F16C 29/025

Details or accessories of bearings:

Details or parts thereof	F16C 33/00
Lubrication	F16C 33/10; F16C 33/66
Sealing	F16C 33/72; F16C 29/08
Resilient support	F16C 27/00; F16C 29/002
Rigid Mounting; Housings	F16C 35/00; F16C 29/004
Cooling	F16C 37/00
Relieving load	F16C 39/00
Accessories	F16C 41/00
Assembling	F16C 43/00

Bearings are general mechanical engineering elements which support or guide and are adapted to position one part moving with respect to another part of an arrangement, i.e. to allow constrained relative motion between the two parts. One of the parts supports the load imposed thereon by the other part. The bearing is intended to reduce friction between the two relatively moving parts, which are typically larger than the bearing itself.

It is noted that apart from bearings many other objects, such as vehicle wheels, conveyor rollers etc., also meet the above criteria. These objects are classified elsewhere.

Further it is noted here that in general the expression "bearing" is also used for supports between parts which are (quasi) stationary.

Due to the lack of relative movement such bearing are not bearings in the sense of this section of Subclass F16C.

Apart from the bearings per se the section "bearings" also covers:

- the direct surrounding of the bearing, i.e. the interaction of the bearing with the two relatively moving parts;
- the individual parts of the bearing, such as sleeves, rolling elements, races, separators, cages;
- materials suited for these parts;
- methods specific for making the parts, as far as they are not covered by other groups;
- details involving the proper functioning of the bearing such as sealings, lubrication, cooling, damping means, monitoring;
- parts, although not required for the bearing function, which are integrated in the bearing as far as the way they are integrated is of relevance.

Bearings are distinguished and classified in the respective groups and groups according to

- the type of movement they allow;
- principle of operation;
- suitability for load direction.

Movement between the two parts:

- rotary motion (e.g. of a shaft or axle);
- linear motion (e.g. cross head, linear bearing);
- oscillating respectively spherical movement;
- combined movements, e.g. helical.

Principle of operation, i.e. the means to reduce friction.

Sliding contact, e.g. plain bearings (bushings, journal bearings, sleeve bearings) including:

- dry operated sliding bearings relying on material selected to reduce friction (rubbing contact, solid lubricants);
- lubricated sliding bearings with lubricant separating parts;
- more particular bearings with pressurised fluid (gas or liquid) in the gap between the parts, i.e. making use of low viscosity:
- pressurised by hydrodynamic effect (wedges, pressure generating grooves);
- hydrostatically pressurised by external means;
- rolling contact, e.g. with rolling elements such as balls or rollers rolling between the parts or rocking motion;
- fields such as electromagnetic field, magnetic bearings.

Loads:

- radial load;
- axial load;
- combined radial and axial load;
- lateral loads (linear bearings).

Combination of principles can be used within a bearing or bearing arrangement, e.g. to support different load directions or to take account of various operating conditions, e.g. speed.

Relationships with other classification places

Subclass F16C is a general function-orientated place.

The elements defined in F16C (shafts, connecting rods, pivots, rolls, bearings) are typical examples of function-oriented elements which are used in a wide variety of applications throughout all sections of the IPC.

Subclass F16C as part of Class F16 relates to "Engineering Elements or units". This limits the elements classified in F16C.

Further the elements in F16C are also strongly correlated to:

- the materials or the half-products (Section C, Chemistry; Metallurgy) from which they are made, respectively
- the processes used in their manufacture (Section B, Performing Operations).

Further it is noted that there is a strong correlation with the neighbouring Subclasses in Class F16 relating to other mechanical engineering elements.

Accordingly:

- First it has to be established whether the relevant technical information relates to an engineering element or unit as defined in F16C.
- Further, whether the relevant technical information is or could (also) be relevant for another Subclass.
- Forwarding the document to one or more other technical fields, when the relevant technical information could be relevant for that field.

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:

Bearings for rotary parts (groups F16C 17/00 - F16C 27/00)

Bearings of rotating parts specially adapted for agricultural purposes	A01B 71/04
Bearings for threshing machines	A01F 12/58
Tomographs	A61B 6/03
Mounting or supporting mixing devices	B01F 35/40
Adaptation of roll bearings for rolling mills	B21B 31/07
Movable or adjustable work or tool supports with a mechanism with rotating pairs only	B23Q 1/50
Swash plate in percussive tool	B25D 11/062
Portable power tools	B25F 5/00
Vehicle wheel hubs with ball or roller bearings	B60B 27/00
Arrangement of bearings of torque transmitting axles in axle units	B60B 35/18
MacPherson strut	B60G 15/068
Arrangements of mountings for shafting of transmissions in vehicles	B60K 17/24
Bearings for connecting-rods for driving wheels of railway locomotives	B61C 17/10
Axle boxes with bearings of rail vehicles	B61F 15/00
Bearings specially adapted for steering heads	B62K 21/06
Bearings for mounting spindles in spinning arrangements for imparting permanent twist	D01H 7/12
Bearings of bridges	E01D 19/04
Turntables in dredgers for soil-shifting	E02F 9/121
Bearings specially adapted for roller shutters or for roller blinds	E06B 9/174, E06B 9/50
Bearing, sealing, lubricating of drives used in bore holes (in earth drilling)	E21B 4/003

Details of bearings or lubricating of roller bits (drill bits in earth drilling)	E21B 10/22
Arrangement of bearings in rotary-piston machines or engines	F01C 21/02
Arrangement of bearings in non-positive displacement Machines or engines (turbines)	F01D 25/16
Turbochargers (gas turbines)	F02C 6/12
Arrangement of bearings in gas-turbine plants	F02C 7/06
Bearings in wind motors	F03D 80/70
Bearings in pumps (non-positive displacement),	F04D 29/04
Shaft support structure in gearing	F16H 57/022
Refrigeration machines	F25B 9/00
Bearings for gyroscopes	G01C 19/16
Bearings or suspensions for moving parts of measuring arrangements	G01D 11/02
Arrangements of bearings in weighing apparatus	G01G 21/02
Arrangements of bearings in instruments for measuring electric variables	G01R 1/10
Arrangements of bearings for apparatus for measuring time integral of electric power or current	G01R 11/12
Bearings in horology	G04B 31/00
Bearings for HDD (storage discs)	G11B 19/2009
Mounting arrangements for bearing-shields or end plates in electro-dynamic machines	H02K 5/15
Means for supporting bearings or for fitting them in the bearing-shield in electro-dynamic machines	H02K 5/16
Structural association with bearings of dynamo-electric machines	H02K 7/08

Informative references

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

Materials or half products used in F16C

Layered products essentially comprising metal	B32B 15/00
Shaped ceramic products	C04B 35/00
Organic macromolecular compounds (plastics, resins)	C08L
Lubricating compositions	C10M
Alloys in general	C22C

Methods used in making parts in F16C

Manufacture by compacting/sintering metallic powder;	B22F 3/00
Composite articles of metallic powder (at least partly)	B22F 7/00
Build-up welding of surfaces	B23K 9/044
Build-up welding using laser beam	B23K 26/34
Connecting metal parts;	B23P 11/00
Grinding and polishing	B24

Injection moulding plastics;	B29C 45/00
Composites with reinforcements	B29C 70/00
Coating metallic material; Coating with metallic material	C23C
Electroplating	C25D 7/00

Parts or elements used in F16C

Rivets	F16B 19/00
Circlips	F16B 21/10
Screws	F16B 35/00
Springs	F16F 1/00
Suppression of vibration in rotating systems	F16F 15/00
Sealings between relatively-moving surfaces	F16J 15/16
Lubricating	F16N

Special rules of classification

Relation with IPC classification rules

Reference is made to the paper copy of Volume 5 of the Eighth Edition (2006) of the International Patent Classification "Guide to the IPC" respectively the version of 2009 available as PDF-file on the site of the WIPO.

Chapters VIII to XI (paragraphs 75. to 155.) of this publication deal with the general classification rules of the IPC.

Predominant IPC classification rules in F16C:

The IPC-guide refers to "invention information" (cf. paragraphs 77. and 78.). This definition is not followed, since "the addition to the prior art" of most documents at the time of publication is not clear. In Subclass F16C the criteria for classification derive from the following rules (cf. paragraphs 102. and 133. of the IPC-Guide):

- Establishing relevant technical information from the document classified;
- Classifying this information in a way allowing efficient retrieval.

They apply to the classification of new documents as well as documents reclassified during reorganisation.

Warning: A large number of documents from the back file do not comply with the present criteria.

For efficient retrieval:

Most documents should preferably have two or more classification symbols (EC, Indexing Code not necessarily all in F16C):

- one symbol to describe the general configuration (preamble type information, field of use), particular of the example(s) given and;
- one or more further symbols are used to identify the special technical features described in the document.

In exceptional cases one symbol could be sufficient, e.g. in small groups specifying both types of information or when the general configuration is defined too broad. In this context reference is made to Chapter IX of the IPC-guide.

The technical information is to be classified as specific as possible, i.e. as close as possible to the embodiments described.

For large documents, e.g. WO-publications based on multiple priorities, multiple symbols would be required particularly in view of non-unitary technical content.

However, when too many examples are given a more general classification symbol could be expedient.

Apart from the configuration of the subject to be classified per se, particular attention should be paid to the following topics:

- the materials used,
- the methods and processes used in making,
- the half products and parts used, and
- the field of application.

These topics could, apart from classification in an appropriate F16C group, also be made retrievable by a symbol in the corresponding Subclass when the technical content is considered relevant enough therefore. References to other Subclasses and groups are given below as relationships to other subject matter areas, limiting references relevant for classification and informative references.

Further since a major part of documents to be classified have no search report the corresponding sections of the IPC-guide are particularly relevant, i.e. IPC-guide paragraphs 124. to 130. combined with the observations in paragraphs 131. to 134.

Glossary of terms

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

rotary engineering element	any engineering element, other than a rotating element used in gearing, clutches, couplings or brakes, which rotates so far as its features are affected only by the fact that it rotates.
bearing	a component of a machine or mechanism that is positioned between two relatively movable elements of the machine or mechanism and that has a surface formed for sliding or rolling contact with these elements when they move relative to each other for the sole function of reducing the friction that would otherwise result from their relative movement.
connecting-rod or link pivoted at both ends	a reciprocating or oscillating elongated member of a machine or mechanism that is intended to be pivotally connected to and positioned between two relatively movable elements of the machine or mechanism for the purpose of transmitting force or conveying motion between the elements when it reciprocates or oscillates.
axle	an elongated element to support a rotating part, e.g. a wheel or roll. loads are bending moments and radial load. It may be stationary or rotating with the part fixed thereto.
shaft	an elongated element, normally a rod of circular cross-section, that rotates about its longitudinal axis to transmit torque, e.g. by conveying motion from a gear wheel supported by it to another part of a machine or mechanism.
crankshaft	a shaft with one or more cranks for turning reciprocating or oscillating motion into rotary motion.
flexible shaft	an elongated element, that is bendable along its length and rotates about its longitudinal axis to transmit torque or convey rotary motion.

Bowden cable	a control cable consisting of an elongated member enclosed within a housing bendable along its length and shiftable along its longitudinal axis relative to its housing to transmit motion or force.
roll, drum, disc	an element of a machine or mechanism in the form of a roller that has a generally curved surface that contacts work or (linear) moving part and revolves about its axis when the work shifts relative to it.

Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- "sliding bearing", "sliding contact bearing", "slide bearing", "plain bearing", "gliding bearing", "friction bearing", "hydrodynamic bearing" and "fluid dynamic bearing"
- "rolling bearing", "antifriction bearing", "roller bearing", "rolling bearing", "rolling contact bearing", "ball bearing", "needle bearing" and "rolling element bearing"
- "linear bearing" and "linear motion guide"
- "connecting-rod", "conrod", "con rod" and "piston rod"
- "Bowden cable" and "control cable"

F16C 1/00

Flexible shafts (flexible shafts in dental machines for boring or cutting A61C 1/18); Mechanical means for transmitting movement in a flexible sheathing

Definition statement

This place covers:

There are two distinct groups of elements which, apart from being elongated and flexible, have a different function:

- Flexible shafts conveying rotary motion, respectively
- Flexible means to transmit push-pull movement.

The shaft itself or the transmitting means themselves provide flexibility.

It is noted that:

- flexible shafts are functionally related to shafts (cf. F16C 3/00) which also convey rotary motion, i.e. are used as drive shaft, whereas
- "Bowden mechanisms" are functionally related to connecting rods (cf. F16C 9/00) which are also built to transmit push-pull movements, i.e. they are typically used for control-movements.

The two groups of elements are thus related to different fields (see limiting and informative references below).

F16C 1/02

for conveying rotary movements

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:

Control cables for flexible medical endoscopes	A61B 1/005

Flexible shafts (in surgery instruments)	A61B 17/1631
Endoscopic instruments	A61B 17/320016
Flexible shaft in dental machines	A61C 1/18
Control cables for flexible technical endoscopes	G02B 23/24

F16C 1/10

Means for transmitting linear movement in a flexible sheathing, e.g. "Bowden-mechanisms" (guiding-sheathings F16C 1/26)

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:

Control cables for change-speed gearing control	B60K 20/02
Adjusting rear mirror by cables	B60R 1/068
Control cables for actuating brakes	B60T 7/08
Transmitting braking action using cables	B60T 11/046
Control cables for brake-actuating mechanisms specially adapted for cycles	B62L 3/02
Control cables for gearing speed-change mechanisms specially adapted for cycles	B62M 25/02
Operation of locks by Bowden cable	E05B 53/005
Movement transmitted by a cable in actuating mechanism of change speed or reversing-gearings	F16H 61/36
Control devices or systems insofar as characterised by mechanical features only	G05G

Synonyms and Keywords

Bowden cable	Control cable

F16C 1/20

Construction of flexible members moved to and fro in the sheathing

References

Informative references

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

Constructional features of ropes and cables	D07B 1/00
Means for fastening cables or ropes to one another or to other objects	F16G 11/00

F16C 1/26

Construction of guiding-sheathings or guiding-tubes

References

Informative references

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

Supports for pipes and tubes	F16L 3/00
Tubes and pipes passing through walls	F16L 5/00

F16C 3/00

Shafts (flexible shafts F16C 1/00; marine propeller shafts, paddle wheel shafts B63H 23/34); Axles; Cranks; Eccentrics

References

Limiting references

This place does not cover:

Flexible shafts	F16C 1/02
Camshafts	F16H 53/02

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:

Axle units; Parts thereof; Arrangements for lubrification of axles	B60B 35/00
Arrangement or mounting of transmissions in vehicles characterised by arrangement, location, or type of drive shafting, e.g. cardan shaft	B60K 17/22
Propeller shafts or paddle-wheel shafts for ships	B63H 23/34

Informative references

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

Forged or pressed shafts	B21K 1/06
Balancing shafts	F16F 15/322

F16C 3/03

telescopic (axially displaceable couplings F16D 3/06)

References

Informative references

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

Axially displaceable couplings	F16D 3/06

F16C 3/04

Crankshafts, eccentric-shafts; Cranks, eccentrics

References

Limiting references

This place does not cover:

Crank gearings	F16H 21/18
Crank gearings with adjustment of throw	F16H 21/20

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:

Using cranks in rotary pistons	F01C 17/063

F16C 3/20

Shape of crankshafts or eccentric-shafts having regard to balancing

References

Informative references

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

Compensation of inertia forces of crankshafts	F16F 15/26

F16C 3/26

Elastic crank-webs; Resiliently-mounted crank-pins

References

Informative references

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

Elastic connecting-rods	F16C 7/04

F16C 3/28

Adjustable cranks or eccentrics

References

Informative references

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

Adjustable crank mechanisms	F16H 21/20

F16C 7/00

Connecting-rods or like links pivoted at both ends (coupling-rods for locomotive driving-wheels B61C 17/10); Construction of connecting-rod heads (heads rigid with crossheads F16C 5/00)

References

Limiting references

This place does not cover:

Heads rigid with cross heads	F16C 5/00
Inhibiting shift in gearing during unfavourable conditions	F16H 61/16
Pivotal connection of pistons with connecting-rods	F16J 1/14
Piston-rods, i.e. rods rigidly connected to the piston	F16J 7/00

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:

Coupling-rods for locomotive driving wheels	B61C 17/10
Variable connecting rods in internal combustion engines	F02B 75/045
Varying compression ratio by alteration of piston stroke	F02D 15/02
Piston drive of fuel pumps	F02M 59/10
Actuating brakes by pistons	F16D 65/14
Gearing with links and levers	F16H 21/00

Informative references

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

Forged or pressed connecting rods	B21K 1/766

Synonyms and Keywords

Connecting-rod	conrod, con rod, piston rod

F16C 9/02

Crankshaft bearings

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:

Crankshaft bearings fitted in the crankcase	F02F 7/0053

F16C 9/045

{the bearing cap of the connecting rod being split by fracturing}

References

Informative references

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

Breaking machines for rings, i.e. pre-cutting and subsequent breaking	B23D 31/003

F16C 9/06

Arrangements for adjusting play in bearings, operating either automatically or not

References

Informative references

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

Bearings adjustable for play in general	F16C 25/00

F16C 11/02

Trunnions; Crank-pins (fastening crank-pins to webs, crank-pins integral with cranks F16C 3/06, F16C 3/22)

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:

Fastening crank-pins to webs of crankshafts	F16C 3/06
Crank-pins integral with cranks	F16C 3/22

F16C 11/04

Pivotal connections (hinges for doors, windows or wings E05D)

Definition statement

This place covers:

Articulated joints which are primarily designed to introduce push-pull movements to an elongated mechanical engineering element, such as connecting rods (cf. F16C 7/00) and "Bowden-cables" (cf. F16C 1/10).

Relationships with other classification places

Hinges (for mounting plate like objects such as lids) are not pivotal connections as part of Subclass F16C (to mount end parts of rods or push-pull cables). Joints for transmitting torque are to be classified in F16D.

References

Limiting references

This place does not cover:

Hinges for doors, windows, or wings	E05D
Devices for moving wings into open or closed position	E05F
Yielding couplings, i.e. with means permitting movement between the connected parts during the drive	F16D 3/00
Rubber springs with stiff outer sleeve and inner sleeve or pin	F16F 1/38
Hinges of laptops	G06F 1/1616
Hinges of mobile phones	H04M 1/0206

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:

Joints in manipulators	B25J 17/00
Pivoted suspension arms	B60G 7/00
Arrangement of steering linkage connections	B62D 7/16
Pivots in dredgers for soil-shifting	E02F 9/006
Centre pivot of rocking arms	F01L 1/18
Pipe joints with hinge	F16L 27/0849
Stands with attachment allowing pivoting	F16M 11/06
Hinges for spectacles	G02C 5/22

F16C 11/06

Ball-joints; Other joints having more than one degree of angular freedom, i.e. universal joints (universal joints in which flexibility is produced by means of pivots or sliding or rolling connecting parts F16D 3/16)

References

Limiting references

This place does not cover:

Universal joints in which flexibility is produced by means of pivots or sliding or rolling connecting parts	F16D 3/16
Supports for apparatus with ball-joint heads	F16M 11/14

Informative references

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

Bellows	F16J 3/042

F16C 13/00

Rolls, drums, discs, or the like (guide rollers in feeding webs B65H 27/00; calender rolls, bearings therefor D21G 1/02; rotary drums or rollers for heat-exchange or heat-transfer apparatus F28F 5/02); Bearings or mountings therefor

Definition statement

This place covers:

Rotary bodies shaped substantially as a body of revolution, i.e. axisymmetrical bodies respectively bodies having rotational symmetry, with an outer or inner functional surface such as:

- rolls
- drums
- discs.

The rotary body allows relative movement of another part or product tangentially along the rotary body, particularly along a linear path, i.e. it is used to support, transport and/or treat another part or product which moves relatively along the functional surface.

Relationships with other classification places

Rolls are only classified in group F16C 13/00 when the general built up of the roll itself is of relevance.

Most rolls, particularly those for treating material, are specifically designed for that purpose and are therefore to be classified in the appropriate field of application (see the references relevant to classification below).

Wheels which support vehicles to move along a path come within the ambit of the above definition of rolls, discs or the like in group F16C 13/00. However, wheels as dedicated complete systems, do not qualify as "engineering elements or units" in the sense of F16.

Vehicle wheels and castors are to be classified in Subclass B60B.

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:

Treatment of products moving tangentially relatively to a roll

Shape or construction of rollers of roller mills	B02C 4/30
Rollers or balls co-operating with rings or discs for disintegrating	B02C 15/00
Using rollers to apply liquids	B05C 1/08
Rollers for hand tools for applying liquids	B05C 17/02
Rolls used in rolling of metal	B21B 27/00
Backing rolls acting on rolls to inhibit deflection of same under load	B21B 29/00
Adaptation of roll neck bearings of rolls used in rolling of metal	B21B 31/07
Deflection control of rolls used in rolling of metal	B21B 37/30
Bending sheet metal by drawing procedure making use of forming-rollers	B21D 5/08
Making tubes by bending sheet metal making use of forming-rollers	B21D 5/12
Rolls used in continuous casting of metals	B22D 11/1287

Rollers for making articles of indefinite length in compression moulding	B29C 43/46
Rollers used in pressing for surface shaping	B29C 59/04
Producing rollers or cylinders	B29D 99/0035
Presses characterised by the use of rotary pressing members, e.g. rollers, rings, discs	B30B 3/00
Embossing paper	B31F 1/07
Cylinders of printing machines	B41F 13/08
Construction of inking rollers in printing machines	B41F 31/26
Shells for rollers of printing machines	B41N 7/00
Rollers in drafting machines or arrangements (spinning or twisting)	D01H 5/74
Roll for heating or cooling yarn, thread, cord, rope, or the like	D02J 13/00
Rolls for calendering, pressing, ironing, glossing or glazing textile fabrics	D06C 15/08
Rolls, e.g. as guiding mechanism, in wet end of machines for making continuous webs of paper	D21F 1/00
Rolls, e.g. pressure rolls or suction rolls, in wet presses of the press section of paper making machines	D21F 3/00
Cylinders in dryer section of paper making machines	D21F 5/00
Rolls or their bearings in calenders	D21G 1/02
Rolls, e.g. for developing or fixing, in apparatus for electrographic processes	G03G 15/00
Rollers as part of ohmic resistance heating devices	H05B 3/00
Heated rollers with induction heating apparatus	H05B 6/14

Rollers used in supporting, transporting, respectively feeding or conveying

Balls as rolling elements in ball bearings	F16C 33/32
Rollers or needles as rolling elements in roller bearings	F16C 33/34
Rollers or wheels for sliding drawers	A47B 88/487, A47B 88/493, A47B 88/497
Wheels for roller skates	A63C 17/22
Rollers for supporting or handling sheets in typewriters or printers	B41J 13/02
Rolls used in conveying	B65G 39/00
Rollers for feeding articles separated from piles;Feeding articles to machines	B65H 5/06
Feed or guide rollers for handling thin or filamentary material	B65H 27/00
Construction of conveyor rollers for transporting hot glass sheets or ribbons	C03B 35/18
Rollers or pulleys in means for varying tension of belts, ropes, or chains	F16H 7/08
Rollers as cam followers	F16H 53/06
Toothed wheels	F16H 55/17
Chain wheels	F16H 55/30
Pulleys	F16H 55/36

Conveyor rollers in furnaces	F27D 3/02

Application oriented places for drums

Closed drums for drying solid material	F26B 11/02
Rolls, drums, cylinders of long length for drying material with progressive movement	F26B 13/14
Rotary drum furnaces	F27B 7/00
Rotary drums or rollers for heat-exchange or heat-transfer apparatus	F28F 5/02

Informative references

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

Making wheels or the like from sheet metal	B21D 53/26

F16C 15/00

Construction of rotary bodies to resist centrifugal force (flywheels, correction weights F16F 15/30, F16F 15/32)

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:

Flywheels	F16F 15/30

F16C 17/00

Sliding-contact bearings for exclusively rotary movement (F16C 32/06 takes precedence; adjustable bearings F16C 23/00, F16C 25/00)

Relationships with other classification places

Hydrostatic bearings are to be classified in F16C 32/06.

Other fluid bearings (hydrodynamic) are to be classified in the appropriate place in F16C 17/00 and/or F16C 33/10.

Not all sliding elements are part of a sliding-contact bearing.

Also other sliding parts, e.g. parts of pistons and cylinders (cf. groups F16J 1/00 - F16J 10/00), sliding-seals (cf. group F16J 15/34+), valves (cf. subclass F16K) and toothed gear wheels (cf. subclass F16H) are sometimes referred to in a generalised way as sliding element, e.g. in the claims.

In such cases the description is to be checked to apply the correct subclass.

References

Limiting references

This place does not cover:

Bearing surfaces of pistons	F16J 1/02
Particular materials of piston rings	F16J 9/26

F16C 19/02

with bearing balls essentially of the same size in one or more circular rows

Definition statement

This place covers:

Ball bearings whereby all of the following requirements are met:

- only balls are provided as load supporting rolling elements,
- the balls are of essentially the same size,
- the balls are provided in rows, and
- the row(s) of balls are circular, i.e. the balls move along a full circle.

F16C 19/22

with bearing rollers essentially of the same size in one or more circular rows, e.g. needle bearings

Definition statement

This place covers:

Roller bearings whereby all of the following requirements are met:

- only rollers are provided as load supporting rolling elements,
- the rollers are of essentially the same size,
- the rollers are provided in rows, and
- the row(s) of rollers are circular, i.e. the rollers move along a full circle.

F16C 19/50

Other types of ball or roller bearings

Definition statement

This place covers:

Other types of rolling bearings include e.g. rolling bearings whereby:

- the size of balls or rollers of one row differ substantially in size with respect to those of another row,
- the balls or rollers are provided in an irregular array,
- the balls or rollers are stationary but rotatable with respect to one of the relatively moving members, e.g. rollers giving local support at two or more points (cf. F16C 13/04),
- the balls or rollers are provided in a partial circular row, i.e. with only partial enclosure of the member to be borne, e.g. with recirculation
- the balls or rollers move along a helical path.

The other types of ball and roller bearings have in common that the following requirements of groups F16C 19/02 and F16C 19/22 (cf. corresponding definition statements above) do not apply, i.e. that:

- the rolling elements are of essentially the same size,
- the rolling elements are provided in rows,
- the rows are circular, i.e. the rolling elements run in a full circle.

F16C 19/52

with devices affected by abnormal or undesired conditions

Definition statement

This place covers:

Measures taken in view of conditions which are not normal, i.e. not relating to the proper functioning of the bearing at its operating speed, and which are not already covered by other groups. A few examples are:

- starting or stopping
- Brinelling;
- creeping of rings, fretting;
- corrosion.

Examples of groups dealing with a variety of undesired conditions:

- Misalignment (cf. F16C 23/00)
- Load or preload; Play; Thermal expansion (cf. F16C 25/00)
- Vibration/Noise (cf. F16C 27/00)
- Thermal load (cf. F16C 37/00)

References

Informative references

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

Force sensors associated with a bearing	G01L 5/0009
Testing of bearings	G01M 13/04

F16C 21/00

Combinations of sliding-contact bearings with ball or roller bearings, for exclusively rotary movement (F16C 17/24, F16C 19/52 take precedence)

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:

Hooke's joint with ball or roller bearings	F16D 3/41

F16C 23/00

Bearings for exclusively rotary movement adjustable for aligning or positioning (F16C 27/00 takes precedence {; hydrostatic bearings F16C 32/067})

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:

Arrangements for adjusting play in crankshaft bearings	F16C 9/03
Arrangements for adjusting play in connecting-rod bearings	F16C 9/06

F16C 25/00

Bearings for exclusively rotary movement adjustable for wear or play (F16C 27/00 takes precedence)

References

Informative references

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

Measuring play on bearings	G01B 7/144

F16C 27/00

Elastic or yielding bearings or bearing supports, for exclusively rotary movement (shock-damping bearings for watches or clocks G04B 31/02)

References

Limiting references

This place does not cover:

Elastic hydrostatic bearings	F16C 32/067
Shock-damping bearings for watches or clocks	G04B 31/02

Informative references

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

Centrifuges	B04B 9/12
Squeeze film damping	F16F 15/0237

F16C 27/06

by means of parts of rubber or like materials (F16C 27/08 takes precedence; with sliding surfaces of rubber or synthetic rubber F16C 33/22)

References

Limiting references

This place does not cover:

Bearings with sliding surfaces of rubber or synthetic rubber	F16C 33/22

Informative references

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

Construction of units comprising rigid inner and outer members with rubber or the like between them	F16F 1/38

F16C 29/00

Bearings for parts moving only linearly (F16C 32/06 takes precedence; incorporated in flexible shafts F16C 1/28 {; parts of bearings in general and special methods for making bearings or parts thereof in general F16C 33/00})

References

Limiting references

This place does not cover:

Complete systems such as railways and conveyor systems are similar to linear bearings (F16C 29/00) but do not qualify as "engineering elements or units" in the sense of Class F16. They are dealt with in the appropriate parts of "Transporting" in Section B, particularly in Subclass B61 ("Railways") and B65 ("Conveying; ... ").

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:

Slides or guides for drawers in furniture	A47B 88/40
Arrangement of ways in the general build-up of a machine tools	B23Q 1/017
Movable or adjustable work or tool supports	B23Q 1/25
With sliding pairs only	B23Q 1/56
Slide constructions in car seats	B60N 2/07
Fluid actuated devices	F15B 15/00
Optics	G02B 7/003
Apparatus for microlithography	G03F 7/70
Positioning in chip manufacture	H01L 21/68

F16C 29/08

Arrangements for covering or protecting the ways {(protective coverings for parts of machine tools B23Q 11/08)}

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:

Protective coverings for parts of machine tools	B23Q 11/08

F16C 29/10

Arrangements for locking the bearings

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:

Means for securing sliding members in any desired position	B23Q 1/28

Informative references

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

Preventing relative movement between machine parts in general	F16B

F16C 31/00

Bearings for parts which both rotate and move linearly

References

Limiting references

This place does not cover:

Screw mechanisms, e.g. with balls or rollers	F16H 25/20

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:

Movable tool or work supports with sliding pairs and rotating pairs	B23Q 1/48

F16C 32/00

Bearings not otherwise provided for

Definition statement

This place covers:

Details for all types of bearings, i.e. they are not limited to rotary sliding contact or rolling element bearings but, as far as applicable, they also cover the other bearing types (e.g. linear, magnetic, hydrostatic etc.).

F16C 32/04

using magnetic or electric supporting means

References

Limiting references

This place does not cover:

Magnetic levitation devices	H02N 15/00

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:

Blood pumps	A61M 60/00
Magnetic suspension or levitation of vehicles	B60L 13/04
Railway systems with sliding or levitation systems	B61B 13/08
Vacuum pumps	F04D 19/04
Fluid pumps with magnetic bearings	F04D 29/048
Pumps for elastic fluid with magnetic bearings	F04D 29/058
Flywheel systems;	F16F 15/30
Electro-motor with magnetic bearings	H02K 7/09

F16C 33/00

Parts of bearings; Special methods for making bearings or parts thereof

References

Informative references

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

Materials

Making alloys by powder metallurgy	C22C 1/04
Alloys based on copper	C22C 9/00
Alloys based on tin	C22C 13/00
Alloys based on nickel or cobalt	C22C 19/00

Alloys based on aluminium	C22C 21/00
Making ferrous alloys by powder metallurgy	C22C 33/02
Ferrous alloys (steel)	C22C 38/00

Methods used in making parts of bearings

Flanging or other edge treatment, e.g. of tubes by action of pressing tools	B21D 19/08
Making parts of bearings by working or processing of sheet metal or metal tubes, rods or profiles without essentially removing material or punching	B21D 53/10
Making cages for bearings by working or processing of sheet metal or metal tubes, rods or profiles without essentially removing material or punching	B21D 53/12
Making rings for balls or roller bearings by rolling metal	B21H 1/12
Making balls, rollers, cone rollers, or like bodies for bearings by rolling metal	B21H 1/16
Upsetting (working sheet metal);	B21J 5/08
Riveting (working sheet metal)	B21J 15/00
Making balls or rollers for bearings by forging or pressing	B21K 1/02
Making ball races by forging or pressing	B21K 1/04
Making cages by forging or pressing	B21K 1/05
Casting using a mould or core of bearing shells	B22D 15/02
Treating or finishing surfaces mechanically, e.g. smoothing or roughening of bearings	B23P 9/00
Producing bushes for bearings from plastics or from substances in a plastic state	B29D 33/00
Heat treatment, e.g. annealing, hardening, quenching, tempering, adapted for rings or bearing races	C21D 9/36
Heat treatment, e.g. annealing, hardening, quenching, tempering, adapted for rings or bearing races	C21D 9/40
Changing the physical structure of non-ferrous metals or alloys by heat treatment or by hot or cold working	C22F 1/00
Electroplating of bearings	C25D 7/10

Other

Lubrication in general	F16N

F16C 33/22

Sliding surface consisting mainly of rubber or synthetic rubber (F16C 33/24 - F16C 33/28 take precedence)

References

Limiting references

This place does not cover:

Elastic or yielding bearings whereby rubber is of interest apart from the surface itself	F16C 27/063

F16C 33/72

Sealings

Definition statement

This place covers:

Bearings with details of the sealing arrangements.

Seals specifically constructed to be incorporated in or which are directly associated with bearings.

References

Informative references

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

Sealings in general	F16J 15/00

F16C 35/00

Rigid support of bearing units; Housings, e.g. caps, covers (F16C 23/00 takes precedence)

Definition statement

This place covers:

Mounting of a bearing to surrounding parts in a fixed way.

Housings such as bearings shields which can be handled as a unit together with the bearing.

Relationships with other classification places

Mounting of bearings which is not rigid, i.e. in such a way that they are adjustable for position, alignment, wear or play with respect to the housing or with resilient support, are to be classified in the appropriate places for rotary bearings in groups F16C 23/00, F16C 25/00 and F16C 27/00 respectively for linear bearings in F16C 29/00.

References

Informative references

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

Hand tools for inserting or withdrawing sleeves or bearing races	B25B 27/06

Devices for fastening in general	F16B
Attachment of a member on a shaft	F16D 1/06

F16C 37/00

Cooling of bearings

Definition statement

This place covers:

Means to remove heat from the bearing area, i.e. by radiation, conduction or heat exchange, excluding cooling lubricant or by means of lubricant (cf. groups F16C 33/10 and F16C 33/66).

F16C 39/00

Relieving load on bearings

Definition statement

This place covers:

Means exerting a force on the relative moving part directed against the load and cooperating in the load direction with the actual bearing which attains the desired position.

Means providing a preload on the bearing, which could be considered as negative relief, actually serve to reduce play and are e.g. to be classified in the appropriate groups (e.g. F16C 25/00, F16C 29/12, F16C 32/067).

F16C 41/00

Other accessories, {e.g. devices integrated in the bearing not relating to the bearing function as such}

Definition statement

This place covers:

Elements which are not directly related to the bearing function, i.e. parts mounted to or integrated with the bearing but providing an additional functionality such as speed sensors, as far as there integration in the bearing is of relevance.

Load-equalizing elements.

Elements involved in protecting the bearing when not in use.

References

Informative references

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

Means for measuring angular speed mounted in bearings	G01P 3/443

F16C 43/00

Assembling bearings

Definition statement

This place covers:

Joining of the parts of a bearing, optionally simultaneously with mounting. It also embraces joining bearing parts which are split.

For a slide bearing this involves typically joining bearing bushes, shells and washers; optionally providing other parts such as seals.

For a rolling element bearing this involves typically providing rolling elements between the races, optionally providing other parts such as cages and seals.

References

Informative references

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

Machines or tools for assembling parts	B23P 19/04
Devices for fastening in general	F16B

F16C 2202/40

Magnetic

References

Informative references

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

Magnets or magnetic bodies characterised by the magnetic materials therefor; Selection of materials for their magnetic properties	H01F 1/00

F16C 2206/80

Cermets, i.e. composites of ceramics and metal

References

Informative references

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

Alloys based on carbides, oxides, nitrides, borides or silicides	C22C 29/00

F16C 2220/02

by casting

References

Informative references

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

Casting of metals in general	B22D
Shaping by casting	B29C 39/00

F16C 2220/04

by injection-moulding

References

Informative references

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

Injection moulding of plastics in general	B29C 45/00

F16C 2220/20

by sintering pulverised material, e.g. powder metallurgy

References

Informative references

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

Working metallic powder in general	B22F

F16C 2220/24

by built-up welding

References

Informative references

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

Welding for other purposes than joining, e.g. built-up welding	B23K 9/04

F16C 2220/28

by winding impregnated fibres

References

Informative references

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

Shaping composites, i.e. plastics material comprising reinforcements, fillers or performed parts, e.g. inserts	B29C 70/00

F16C 2220/42

by working of thin-walled material such as sheet or tube

References

Informative references

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

Working or processing of sheet metal or metal tubes, rods or profiles without essentially removing material	B21D

F16C 2220/44

by rolling

References

Informative references

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

Making particular metal objects by rolling, e.g. screws, wheels, rings, barrels, balls	B21H

F16C 2220/46

by forging

References

Informative references

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

Forging; Hammering; Pressing metal; Riveting; Forge furnaces	B21J

F16C 2220/48

by extrusion, e.g. of metallic profiles

References

Informative references

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

Extruding metal; Impact extrusion	B21C 23/00

F16C 2220/62

by turning, boring, drilling

References

Informative references

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

Turning; Boring	B23B

F16C 2220/66

by milling

References

Informative references

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

Milling in general	B23C

F16C 2220/68

by electrical discharge or electrochemical machining

References

Informative references

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

Working of metal by the action of a high concentration of electric current on a workpiece using an electrode which takes the place of a tool	B23H

F16C 2220/70

by grinding

References

Informative references

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

Machines, devices or processes for grinding or polishing	B24B

F16C 2220/82

by cutting

References

Informative references

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

Cutting; Details common to machines for perforating, punching, cutting-out, stamping-out or severing	B26D

F16C 2220/84

by perforating; by punching; by stamping-out

References

Informative references

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

Perforating; Punching; Cutting-out; Stamping-out; Severing by means other than cutting	B26F

F16C 2223/04

by sizing, by shaping to final size by small plastic deformation, e.g. by calibrating or coining

References

Informative references

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

Treating or finishing metallic surfaces mechanically, with or without calibrating	B23P 9/00

F16C 2223/06

polishing

References

Informative references

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

Machines or devices for polishing surfaces	B24B 29/00
Machines or devices designed for polishing or abrading surfaces on work by means of tumbling apparatus	B24B 31/00

F16C 2223/08

shot-peening, blasting

References

Informative references

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

Abrasive or related blasting with particulate material	B24C

F16C 2223/10

Hardening, e.g. carburizing, carbo-nitriding

References

Informative references

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

Modifying the physical structure of ferrous metals	C21D
Solid state diffusion of only non-metal elements into metallic material surfaces	C23C 8/00

F16C 2223/30

Coating surfaces

References

Informative references

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

Apparatus for applying fluent materials to surfaces, in general	B05C
Coating metallic material; Coating material with metallic material; Coating by vacuum evaporation, by sputtering, by ion implantation or by chemical vapour deposition, in general	C23C

F16C 2223/32

by attaching pre-existing layers, e.g. resin sheets or foils by adhesion to a substrate; Laminating

References

Informative references

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

Layered products, i.e. products built-up of strata of flat or non-flat, e.g. cellular or honeycomb, form	B32B

F16C 2223/40

by dipping in molten material

References

Informative references

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

Hot-dipping or immersion processes for applying the coating material in the molten state without affecting the shape	C23C 2/00

F16C 2223/42

by spraying the coating material, e.g. plasma spraying

References

Informative references

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

Coating by spraying the coating material in the molten state, e.g. by flame, plasma or electric discharge	C23C 4/00

F16C 2223/44

by casting molten material on the substrate

References

Informative references

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

Coating by casting molten material on the substrate	C23C 6/00

F16C 2223/46

by welding, e.g. by using a laser to build a layer

References

Informative references

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

Welding for other purposes than joining, e.g. built-up welding	B23K 9/04

F16C 2223/60

by vapour deposition, e.g. PVD, CVD

References

Informative references

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

Coating by vacuum evaporation, by sputtering or by ion implantation of the coating forming material	C23C 14/00

F16C 2223/70

by electroplating or electrolytic coating, e.g. anodising, galvanising

References

Informative references

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

Processes for the electrolytic or electrophoretic production of coatings; Electroforming	C25D

F16C 2223/80

by powder coating

References

Informative references

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

Manufacture of composite layers, workpieces or articles, comprising metallic powder, by sintering the powder, with or without compacting	B22F 7/00

F16C 2226/00

Joining parts; Fastening; Assembling or mounting parts

References

Informative references

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

Devices for fastening or securing constructional elements or machine parts together, e.g. nails, bolts, circlips, clamps, clips or wedges; Joints or jointing	F16B

F16C 2226/10

Force connections, e.g. clamping

References

Informative references

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

Shrinkage connections, e.g. assembled with the parts at different temperature; Force fits	F16B 4/00
Couplings for rigidly connecting two coaxial shafts or other movable machine elements	F16D 1/00

F16C 2226/14

by shrink fit, i.e. heating and shrinking part to allow assembly

References

Informative references

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

Connecting or disconnecting metal objects by first expanding and then shrinking or vice versa	B23P 11/02

F16C 2226/30

Material joints

References

Informative references

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

Soldering or unsoldering; Welding; Cladding or plating by soldering or welding	B23K

F16C 2226/54

with rivets

References

Informative references

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

Bolts without screw-thread; Pins, including deformable elements; Rivets	F16B 19/00

F16C 2226/60

with threaded parts, e.g. bolt and nut connections

References

Informative references

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

Specially shaped heads of bolts or screws for rotations by a tool	F16B 23/00
Screws that cut thread in the body into which they are screwed, e.g. wood screws	F16B 25/00
Bolts, screws or nuts formed in integral series but easily separable, particularly for use in automatic machines	F16B 27/00
Screwed connection with deformation of nut or auxiliary member while fastening	F16B 29/00
Screwed connections specially modified in view of tensile load; Break-bolts	F16B 31/00
Features common to bold and nut	F16B 33/00
Screw-bolts; Stay-bolts; Screw-threaded studs; Screws; Set screws	F16B 35/00
Nuts or like thread-engaging members	F16B 37/00
Locking of screws, bolts or nuts	F16B 39/00
Measures against loss of bolts, nuts or pins; Measures against unauthorised operation of bolts, nuts or pins	F16B 41/00
Washers or equivalent devices; Other devices for supporting bolt-heads or nuts	F16B 43/00

F16C 2240/00

Specified values or numerical ranges of parameters; Relations between them

References

Informative references

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

Solid materials defined by their properties	F16C 2202/00

F16C 2320/23

Milling apparatus

References

Informative references

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

Crushing, pulverising or disintegrating in general	B02C

F16C 2320/42

Centrifuges

References

Informative references

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

Centrifuges	B04B

F16C 2322/34

Sawing machines

References

Informative references

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

Planning; Slotting; Shearing; Broaching; Sawing; Filing; Scraping	B23D

F16C 2322/39

General buildup of machine tools, e.g. spindles, slides, actuators

References

Informative references

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

Details, components or accessories for machine tools	B23Q

F16C 2322/59

Manipulators, e.g. robot arms

References

Informative references

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

Manipulators; Chambers provided with manipulation devices	B25J

F16C 2324/16

Printing machines

References

Informative references

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

Printing machines or presses	B41F

F16C 2326/01

Parts of vehicles in general

References

Informative references

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

Engines or pumps	F16C 2360/00

F16C 2326/02

Wheel hubs or castors

References

Informative references

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

Vehicle wheels; Castors; Axles for wheels or castors	B60B

F16C 2326/05

Vehicle suspensions, e.g. bearings, pivots or connecting rods used therein

References

Informative references

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

Vehicle suspension arrangements	B60G

F16C 2326/06

Drive shafts

References

Informative references

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

Arrangements or mounting of propulsion units or of transmissions in vehicles	B60K

F16C 2326/08

Vehicle seats, e.g. in linear movable seats

References

Informative references

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

Seats specially adapted for vehicles	B60N

F16C 2326/09

Windscreen wipers, e.g. pivots therefore

References

Informative references

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

Servicing, cleaning, repairing, supporting, lifting or manoeuvring of vehicles	B60S

F16C 2326/24

Steering systems, e.g. steering rods or columns

References

Informative references

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

Motor vehicles; Trailers	B62D

F16C 2326/26

Bicycle steering or suspension

References

Informative references

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

Cycles; Cycle frames; Cycle steering devices	B62K

F16C 2326/28

Bicycle propulsion, e.g. crankshaft and its support

References

Informative references

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

Rider propulsion of wheeled vehicles or sledges; Powered propulsion of sledges or cycles	B62M

F16C 2326/30

Ships, e.g. propelling shafts and bearings therefor

References

Informative references

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

Marine propulsion or steering	B63H

F16C 2326/43

Aeroplanes; Helicopters

References

Informative references

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

Aeroplanes; Helicopters	B64C

F16C 2326/47

Cosmonautic vehicles, i.e. bearings adapted for use in outer-space

References

Informative references

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

Cosmonautics; Vehicles or equipment therefor	B64G

F16C 2326/58

Conveyor systems, e.g. rollers or bearings therefor

References

Informative references

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

Transport or storage devices	B65G

F16C 2340/18

Apparatus for spinning or twisting

References

Informative references

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

Spinning or twisting	D01H

F16C 2340/24

Godet rolls

References

Informative references

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

Motor vehicles; Trailers	B62D

F16C 2350/26

Excavators

References

Informative references

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

Dredging; Soil-shifting	E02F

F16C 2350/52

Locks, e.g. cables to actuate door locks

References

Informative references

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

Locks; Accessories therefor; Handcuffs	E05B

F16C 2350/54

Hinges, e.g. sliding bearings for hinges

References

Informative references

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

Hinges or suspension devices for doors, windows or wings	E05D

F16C 2360/18

Camshafts

References

Informative references

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

Cyclically operating valves for machines or engines	F01L

F16C 2360/22

Internal combustion engines

References

Informative references

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

Internal-combustion piston engines; Combustion engines in general	F02B

F16C 2360/23

Gas turbine engines

References

Informative references

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

Gas-turbine plants; Air intakes for jet-propulsion plants; Controlling fuel supply in air-breathing jet-propulsion plants	F02C

F16C 2360/24

Turbochargers

References

Informative references

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

Turbochargers, i.e. plants for augmenting mechanical power output of internal-combustion piston engines by increase of charge pressure	F02C 6/12

F16C 2360/31

Wind motors

References

Informative references

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

Wind motors	F03D

F16C 2360/42

Pumps with cylinders or pistons

References

Informative references

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

Positive-displacement machines for liquids; Pumps	F04B

F16C 2360/43

Screw compressors

References

Informative references

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

Rotary-piston or oscillating-piston, positive-displacement machines for liquids	F04C

F16C 2360/44

Centrifugal pumps

References

Informative references

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

Non-positive displacement pumps	F04D

F16C 2360/45

Turbo-molecular pumps

References

Informative references

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

Multi-stage pumps specially adapted to the production of a high vacuum, e.g. molecular pumps	F04D 19/04

F16C 2361/41

Couplings

References

Informative references

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

Yielding couplings, i.e. with means permitting movement between the connected parts during the drive	F16D 3/00

F16C 2361/43

Clutches, e.g. disengaging bearing

References

Informative references

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

Coupling for transmitting rotation; Clutches; Brakes	F16D

F16C 2361/45

Brakes

References

Informative references

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

Vehicle brake control systems or parts thereof	B60T
Coupling for transmitting rotation; Clutches; Brakes	F16D

F16C 2361/53

Spring-damper, e.g. gas springs

References

Informative references

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

Springs, vibration-dampers, shock-absorbers using a fluid or the equivalent as damping medium	F16F 9/00

F16C 2361/55

Flywheel systems

References

Informative references

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

Suppression of vibrations in systems; Means or arrangements for avoiding or reducing out-of-balance forces, e.g. due to motion	F16F 15/00

F16C 2361/61

Toothed gear systems, e.g. support of pinion shafts

References

Informative references

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

Gearboxes; Mounting gearing therein	F16H 57/02

F16C 2361/71

Chains

References

Informative references

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

Belts, cables or ropes, predominantly used for driving purposes; Chains; Fittings predominantly used therefor	F16G

F16C 2370/38

Electrographic apparatus

References

Informative references

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

Electrography; Electrophotography; Magnetography	G03G

F16C 2380/16

X-ray tubes

References

Informative references

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

X-ray tubes	H01J 35/00

F16C 2380/26

Dynamo-electric machines or combinations therewith, e.g. electro-motors and generators

References

Informative references

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

Dynamo-electric machines	H02K