

F04F

PUMPING OF FLUID BY DIRECT CONTACT OF ANOTHER FLUID OR BY USING INERTIA OF FLUID TO BE PUMPES; [N: evacuating by sorption F04B]; SIPHONS [N: Conveying materials in bulk by flow of gas, liquid or foam B65G53/00]

Definition statement

This subclass/group covers:

Machines inducing a flow of a pumped fluid wherein the displaced fluid is directly in contact with an inducing fluid different from said displaced fluid.

Relationship between large subject matter areas

Related subclasses [F04B](#), [F04C](#) and [F04D](#) cover the same type of machines using reciprocating, rotary or non-positive displacement means for pumping fluids.

References relevant to classification in this subclass

This subclass/group does not cover:

Conveying materials in bulk through troughs, pipes, or tubes by floating the materials, or by flows of gas, liquid, or foam	B65G 53/00
Containers or packages with special means for dispensing liquid or semi-liquid contents by internal gaseous pressure	B65D 83/14
Evacuating by sorption or thermal means	F04B 37/00

Informative references

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

Rotary-piston or oscillating piston machines for liquids and elastic fluids	F01C
Positive-displacement engines driven by liquids	F03C
Positive displacement machines for	F04B

liquids, or pumps in which the working-fluid is displaced by one or more reciprocating pistons or by flexible working members	
Rotary-piston or oscillating piston machines for liquids	F04C
Non-positive displacement pumps	F04D
Fluid pressure actuators	F15B
Rotary fluid gearing using pumps and motors of the volumetric type for conveying rotary motion	F16H
Sealing in general	F16J
Means for thermal insulation in general	F16L
Dynamo electric machines	H02K

Special rules of classification within this subclass

Where combinations of pumps covered by this subclass with other pumps are defined, such combinations shall be classified in this subclass if such a system of pumps is characterised by an interaction or a specific combination of these pumps.

Glossary of terms

In this subclass/group, the following terms (or expressions) are used with the meaning indicated:

Pump	Device for continuously raising, forcing, compressing, or exhausting fluid by mechanical means
Machine	Device that could equally be both an engine and a pump and not a device which is restricted to an engine or one which is restricted to a pump
Positive displacement pumps	Pumps using pistons or other mechanical members to displace a

	working fluid in a working chamber, the dynamic effect on the fluid being of minor importance
Positive displacement engines	The energy of a working fluid is transformed into mechanical energy, in which variations of volume created by the working fluid in a working chamber produce equivalent movement of mechanical members, e.g. pistons transmitting the energy, the dynamic effect of the fluid being of minor importance
Oscillating piston machine	A positive-displacement machine in which a fluid-engaging, work-transmitting member oscillates, e.g. a vane piston swinging back and forth about a fixed axis
Reciprocating piston	A fluid-engaging, work-transmitting member of an reciprocating-piston type machine or pump that slides alternately back and forth usually along a straight line or path
Rotary piston	A fluid engaging, work-transmitting member of a rotary-piston machine or pump that can completely rotate about a fixed axis or about an axis moving along a circular or similar orbit when operating, e.g. rotor having vanes or teeth
Free-piston machine	A linear , "crankless" reciprocating piston machine in which the piston motion is not controlled by a crankshaft but determined by the interaction forces from the fluid pressure in the working chamber, a rebound device (e.g. a piston in a closed cylinder) and a load device (e.g. a gas compressor or a linear alternator)
Rotary piston machine	Positive-displacement machine in which a liquid-engaging, work-transmitting member rotates about a fixed axis or about an axis

	moving along a circular or similar orbit, e.g. machine with a rotor having vanes or teeth
Cooperating members	The "oscillating piston" or "rotary piston" and another member, e.g., the working-chamber wall, which assists in the pumping action or machine's action
Movement of the cooperating members	To be interpreted as relative, so that one of the "cooperating members" may be stationary, even though reference may be made to its rotational axis, or both may move
Teeth or tooth equivalents	Includes lobes, projections or abutments
Internal axis type	The rotational axes of the inner and outer co-operating members remain at all times within the outer member, e.g., in a similar manner to that of a pinion meshing with the internal teeth of a ring gear
Working fluid	Driven fluid in a pump or driving or driven liquid in a machine. The working fluid can be in a compressible, gaseous state, e.g. steam, called elastic fluid, a liquid state, or a state where there is coexistence of elastic fluid and liquid state

Synonyms and Keywords

In patent documents the words "gas", "steam" and "elastic fluid" are often used as synonyms.

F04F 1/00

Pumps using positively or negatively pressurized fluid medium acting directly on the liquid to be pumped (using only negative pressure F04F3/00; jet pumps F04F5/00; siphons F04F10/00)

Definition statement

This subclass/group covers:

Machines in which the displacing power comprises a pressurising force subjected upon a fluid other than the fluid to be pumped. The fluids may e.g. be a liquid, or a gas, e.g. steam, or also a mixture of a liquid with solids.

F04F 3/00

Pumps using negative pressure acting directly on the liquid to be pumped (siphons F04F10/00)

Definition statement

This subclass/group covers:

Machines where the delivery outlet for evacuation is exposed to negative fluid pressure inside a working chamber.

References relevant to classification in this group

This subclass/group does not cover:

Siphons	F04F 10/00
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F04F 5/00

Jet pumps, i.e. devices in which flow is induced by pressure drop caused by velocity of another fluid flow (diffusion pumps F04F9/00 ; combination of jet pumps with pumps of other than jet type F04B; use of jet pumps for priming or boosting non-positive-displacement pumps F04D)

Definition statement

This subclass/group covers:

Jet-pumps, injectors, ejectors, or thermocompressors using the Venturi effect of a converging-diverging nozzle to convert the pressure energy of an inducing fluid to velocity energy which creates a low pressure zone that draws in and displaces a suction fluid. The inducing fluid may be a liquid, or a gas, e.g. steam. The displaced suction fluid may be a gas, e.g. steam, or a liquid, a slurry, or a dust-laden gas stream.

F04F 7/00

Pumps displacing fluids by using inertia thereof, e.g. by generating vibration therein

Definition statement

This subclass/group covers:

Machines inducing a flow of fluid by generating vibration in a resonatable fluid, e.g. by acoustic energy.

References relevant to classification in this group

This subclass/group does not cover:

Loudspeakers	H04R 1/00
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F04F 7/02

Hydraulic rams

Definition statement

This subclass/group covers:

Machines using the fluid hammer effect to develop pressure that allows a portion of the input fluid to reach a higher pressure or to be moved. The fluid hammer effect is a pressure surge or wave resulting when a fluid in motion is forced to stop or change direction suddenly, i.e. momentum change.

F04F 9/00

Diffusion pumps

Definition statement

This subclass/group covers:

Momentum transfer pumps using a high speed jet of vapour to direct gas molecules in the pump down into the bottom of the pump and out through an exhaust, e.g. to obtain a high vacuum.

References relevant to classification in this group

This subclass/group does not cover:

Pumps for evacuation by absorption or adsorption	F04B 37/02
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Special rules of classification within this group

Combinations of pumps covered by this group with other pumps are only

classified in this group if such other pumps are intended for preliminary pumping for diffusion pumps.

F04F 10/00

Siphons

Definition statement

This subclass/group covers:

Machines which cause a liquid to flow above the surface of a reservoir, without pumps, powered by the fall of the liquid as it flows down a tube under the pull of gravity, and is discharged at a level lower than the surface of the reservoir.

F04F 13/00

Pressure exchangers

Definition statement

This subclass/group covers:

Machines for exchanging pressure energy between relatively high and relatively low pressure fluid systems, wherein the fluid being may include gases (steam), liquids and pumpable mixtures of liquids and solids. The exchange of pressure energy is used for transfer of energy from one fluid stream to another.

References relevant to classification in this group

This subclass/group does not cover:

Processes of separation using semi-permeable membranes, e.g. osmosis, reverse-osmosis	B01D 61/02
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Subject matter not provided for in other groups of this subclass

Definition statement

This subclass/group covers:

Machines inducing a flow of fluid by means not provided for in other groups of this subclass, e.g. by magnetohydrodynamic effects, by electrostatic effects, or by electro-osmotic flow effects.

Informative references

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

Micro pumps	F04B 19/006
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