G01G

WEIGHING (sorting by weighing B07C 5/16)

Definition statement

This place covers:

- Weighing devices and methods are apparatus and methods for determining the mass of an object by the use of constant and homogenous gravitational acceleration.
- Particularly apparatus and methods wherein the mass of an object is determined by balancing its gravitational mass with another known gravitational mass (G01G 1/00).
- Particularly apparatus and methods wherein the mass of an object is determined by measuring its weight. The weight is the absolute value of the gravitational force exerted on the object.
- The gravitational force determined by measuring the shear or tensile deformation of a solid state member (G01G 3/00).
- The gravitational force determined by measuring pneumatic or hydraulic pressure or using buoyancy (G01G 5/00).
- The gravitational force determined by balancing with electromagnetic or electrostatic forces (G01G 7/00).
- Particularly apparatus and methods wherein the mass of an object is determined by ways not otherwise provided for (G01G 9/00).
- Exceptionally apparatus and methods wherein the mass of an object is determined by measuring its inertial mass.
- Measurement of inertial mass is restricted to microbalances such as quartz crystal microbalances (QCM) (G01G 3/165), electronic weighing devices for postal parcels and letters (G01G 19/005) and weighing devices for incorporation in vehicles wherein the vehicle mass is dynamically estimated (G01G 19/086).
- Exceptionally apparatus and methods wherein the mass of a known substance is determined by measuring its density by using electromagnetic radiation (G01G 9/005).
- Apparatus and methods using weighing devices and methods of groups G01G 1/00-G01G 9/00 with the exceptions of subgroups G01G 19/005 and G01G 19/086:
- Particularly apparatus and methods adapted for measuring the mass or mass flow of a continuous stream of objects or material.
- Comprises conveying means such as belts, worms/augers or vibratory means as well as mass flow controlling means and/or integrating means to transform a mass flow to a mass (G01G 11/00).
- Particularly apparatus and methods adapted for generating a batch of identical objects/ homogenous material of predetermined mass.
- Comprises pooling means such as integrated dischargeable chutes or hoppers for forming a batch of identical objects/homogenous material and means for controlling its mass (G01G 13/00).
- Particularly apparatus and methods adapted for check-weighing and/or correcting of batches of identical objects/homogenous material pre-dispensed into transportable containers such as bottles.
- Comprises dispensing means for forming a batch of identical objects/homogenous material inside the transportable container and means for checking and/or correcting its mass (G01G 15/00).
- Particularly apparatus and methods adapted for determining the mass of objects/material of special form or property such as pharmaceuticals, fiber, pulp, fluids, gases or animals (G01G 17/00).
- Particularly apparatus and methods for determining mass adapted for postal parcels and letters, vehicles, suspended loads, humans, as well as combinatorial weighing, weighing apparatus combined with domestic appliances and weighing apparatus for determining an other quantities such as a price or caloric content from the mass of an object (G01G 19/00).
- Particular constructional details of any apparatus or method using a weighing device or method (G01G 21/00).

- Auxiliary means ensuring correct conduction of mass measurements, indicating means such as displays and recording means such as databases or paper records (G01G 23/00).

Relationships with other classification places

Measuring of forces is classified in groups G01L 1/00 and G01L 5/00. The borderline between subclass G01G and subclass G01L should be determined based on whether the features relevant for classification are focussed on the force sensor or on the weighing device.

Packaging articles is classified in subclass B65B whereas apparatus for conveying articles are classified in subclass B65G. The borderline between subclass G01G and subclasses B65B, B65G should be determined on whether the features relevant for classification are focused on packaging/ conveying or on weighing.

References

Limiting references

This place does not cover:

Determining weight by measuring volume	G01F
Measuring gravitational fields or waves, or gravimetric prospecting using balances	G01V 7/08
Ratio control of two or more flows by sensing weight of individual components	G05D 11/04
Testing of coins by weight	G07D 5/04

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:

Measuring mass flow of a fluid or a fluent solid material	G01F 1/76
Coin-freed apparatus for controlling dispensing of fluids, semi-liquids or granular material from reservoirs by weight	G07F 13/04

Informative references

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

Packaging, bottling and sorting according to weight.	B65B 1/00, B65B 3/00, B67C 3/00, B07C 5/00 , B07B 13/00
Indicating devices for soil-shifting machines	E02F 9/26
Bearings	F16C
Shock-absorbers	F16F
Measuring forces	G01L 1/00
Measurement of several components of forces	G01L 5/16
Control of flow	G05D 7/00
Digital data processing	G06F
Counting	G06M

Synonyms and Keywords

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

- "scale", "balance", and "weighing device"

G01G 1/00

Weighing apparatus involving the use of a counterweight or other counterbalancing mass

Definition statement

This place covers:

Weighing devices and methods wherein the mass of an object is determined by balancing its gravitational mass with another known gravitational mass.

These comprise mostly vertically hinged pendulum weighing devices with integrated counterweights and balances with a mostly horizontally hinged beam adapted to support removable counterweights.

The main difference between both kinds of weighing devices is given by the way the measurement of mass is established

Within pendulum weighing devices the deflection angle of the pendulum is translated to a mass measurement.

Within weighing devices with a horizontally hinged beam mass measurement is performed by balancing with a collection of known masses or by considering the distance of the counterweight towards the hinge.

For pendulum weighing devices counterweights might also be adapted to be arranged with a variable distance towards the hinge in order to switch to different ranges of mass.

G01G 3/00

Weighing apparatus characterised by the use of elastically-deformable members, e.g. spring balances

Definition statement

This place covers:

Weighing devices and methods wherein the mass of an object is determined by measuring the shear or tensile deformation of a solid state member due to the weight of the object.

Exceptionally inertial mass instead of heavy mass is measured by microbalances such as quartz crystal microbalances (QCM) in G01G 3/165.

Microbalances comprise a substrate that is stimulated to vibration. The substrate changes its characteristic frequency once an object of a certain mass is adsorbed. The object's mass is determined by the frequency shift.

Substrates may consist of quartz crystals such as piezoelectric material that is actively stimulated to vibration by an AC voltage. These microbalances are commonly referred to as quartz crystal microbalances (QCM).

Substrates may also consist of micromachined material such as silicon. Stimulation to vibration is commonly performed by interlocking combs that are charged by opposing AC voltage.

Further details of subgroups

G01G 3/13;

This subgroup comprises only passive piezoelectric weighing elements, wherein active deformation due to the weighing force is generating a voltage within the piezoelectric weighing elements.

Therefore this subgroup does not comprise piezoelectric resonators as used within quartz crystal microbalances.

G01G 3/165;

This subgroup comprises all active piezoelectric weighing elements, meaning that a voltage is applied to the piezoelectric weighing element in order to cause a deformation of this element.

Examples are piezoelectric resonators used within quartz crystal microbalances.

References

Limiting references

This place does not cover:

Weighing devices and methods wherein the mass of an object is determined by measuring the electrical properties of an elastically-deformable capacitive element.	G01G 7/06

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:

Analysing materials by weighing by absorbing or adsorbing components of material	G01N 5/02
For determining moisture content	G01N 5/025
Analysing materials by weighing by removing a component and weighing the remainder	G01N 5/04
For determining moisture content	G01N 5/045
Investigating density or specific gravity of materials using variation of the resonant frequency of an element vibrating in contact with the material submitted to analysis	G01N 9/002

Informative references

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

Measuring force by elastic deformation	G01L 1/04
Measuring force by elastic deformation by helical springs	G01L 1/042
Measuring force by elastic deformation by leaf springs	G01L 1/044
Measuring force by elastic deformation by spiral springs	G01L 1/046
Measuring force by elastic deformation by torsional deformable elements	G01L 1/048
Measuring force by measuring variations of frequency of stressed vibrating elements	G01L 1/10
Measuring force by measuring variations of frequency of stressed vibrating elements with optical excitation or measuring of vibrations	G01L 1/103
Measuring force by measuring variations of frequency of stressed vibrating elements, the constructional details thereof	G01L 1/106
Measuring force by using properties of piezo-resistive materials	G01L 1/18

Measuring force by using properties of piezo-resistive materials by measuring variations of frequency of vibrating piezo-resistive material	G01L 1/183
Measuring force by using properties of piezo-resistive materials by measuring variations of frequency of vibrating piezo-resistive material using optical excitation or measuring of vibrations	G01L 1/186
Measuring forces by measuring Ohmic resistance	G01L 1/20
Measuring forces by measuring Ohmic resistance using resistance strain gauges	G01L 1/22
Measuring force by measuring variations in optical properties	G01L 1/24

Glossary of terms

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

QCM	quartz crystal microbalance

G01G 5/00

Weighing apparatus wherein the balancing is effected by fluid action

Definition statement

This place covers:

Weighing devices and methods wherein the mass of an object is determined by measuring pneumatic or hydraulic pressure or using buoyancy resulting from the weight of the object.

References

Informative references

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

Measuring forces by hydraulic or pneumatic means	G01L 1/02
Measuring forces by hydraulic or pneumatic counterbalancing forces	G01L 1/083
Measuring steady or quasi-steady pressure in a fluid by mechanical means	G01L 7/00
In the form of elastically deformable gauges	G01L 7/02
In the form of pistons	G01L 7/16
Using liquid as a pressure sensitive medium	G01L 7/18
Measuring steady or quasi-steady pressure in a fluid by electrical or electro-mechanical means	G01L 9/00
Measuring steady or quasi-steady pressure in a fluid by means not provided for in G01L 7/00 or G01L 9/00	G01L 11/00
Devices or apparatus for measuring two or more pressure values simultaneously	G01L 15/00
Testing or calibrating of apparatus measuring fluid pressure	G01L 27/00

G01G 7/00

Weighing apparatus wherein the balancing is effected by magnetic, electromagnetic, or electrostatic action, or by means not provided for in the preceding groups

Definition statement

This place covers:

Weighing devices and methods wherein the mass of an object is determined by balancing with electromagnetic or electrostatic forces or

wherein the mass of an object is determined by measuring the electrical properties of an elastically-deformable capacitive element.

References

References out of a residual place

Examples of places in relation to which this place is residual:

Places in relation to which this group is residual (with regard to the balancing in the weighing apparatus):

Weighing apparatus involving the use of a counterweight or other counterbalancing mass	G01G 1/00
Weighing apparatus characterised by the use of elastically-deformable members, e.g. spring balances	G01G 3/00
Weighing apparatus wherein the balancing is effected by fluid action	G01G 5/00

Informative references

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

Measuring force by using electrostatic or electromagnetic counterbalancing forces	G01L 1/086
Measuring force by measuring variations of magnetic properties	G01L 1/12
Measuring forces by measuring variations in capacitance or inductance	G01L 1/14
Measuring forces by measuring variations in capacitance or inductance by using capacitors	G01L 1/142

Glossary of terms

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

PID	Proportional-Integral-Derivative feedback loop control mechanism

G01G 9/00

Methods of, or apparatus for, the determination of weight, not provided for in groups G01G 1/00 - G01G 7/00

Definition statement

This place covers:

Apparatus and methods wherein the mass of an object is determined by ways not otherwise provided for.

Particularly determining the mass of a known substance by measuring its density using electromagnetic radiation.

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:

Apparatus and method for weighing material of filamentary or sheet form	G01G 17/02

References out of a residual place

Examples of places in relation to which this place is residual:

Weighing apparatus involving the use of a counterweight or other counterbalancing mass	G01G 1/00
Weighing apparatus characterised by the use of elastically-deformable members, e.g. spring balances	G01G 3/00
Weighing apparatus wherein the balancing is effected by fluid action	G01G 5/00
Weighing apparatus wherein the balancing is effected by magnetic, electromagnetic, or electrostatic action, or by means not provided for in the preceding groups	G01G 7/00

Informative references

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

Investigating density or specific gravity of materials by observing the transmission of wave or particle radiation through the material	G01N 9/24
Investigating or analysing material by the use of wave or particle radiation by transmitting radiation through the material and measuring the absorption	G01N 23/06

G01G 11/00

Apparatus for weighing a continuous stream of material during flow; Conveyor belt weighers

Definition statement

This place covers:

Apparatus and methods adapted for measuring the mass or mass flow of a homogenous continuous stream of objects or material.

Comprises typically conveying means such as belts, worms/augers or vibratory means as well as mass flow controlling means and/or integrating means to transform a mass flow to a mass.

References

Limiting references

This place does not cover:

Measuring volume flow or mass flow of fluid or fluent solid material	G01F 1/76

Informative references

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

Controlling flow of solid materials by electrical means	G05D 7/0605

G01G 13/00

Weighing apparatus with automatic feed or discharge for weighing-out batches of material (for weighing a continuous stream G01G 11/00; check-weighing G01G 15/00; for fluids G01G 17/04; apportioning by weight materials to be mixed G01G 19/22; combinatorial weighing G01G 19/387)

Definition statement

This place covers:

Apparatus and methods adapted for generating a batch of identical objects/homogenous material of predetermined mass.

Comprises typically pooling means such as integrated dischargeable chutes or hoppers for forming a batch of identical objects/homogenous material and means for controlling its mass.

Relationships with other classification places

G01G 13/00 and its subgroups are related to packaging fluent solid material by controlling or determining the quantity by weighing classified in B65B 1/32, B65B 1/34 and B65B 1/46. The borderline should be determined on whether the features relevant for classification are focused on packaging/conveying or on weighing.

References

Limiting references

This place does not cover:

For weighing a continuous stream	G01G 11/00

Check-weighing	G01G 15/00
For weighing fluids	G01G 17/04
Weighing apparatus or methods adapted for apportioning materials by weighing prior to mixing them	G01G 19/22
Weighing apparatus or methods adapted for combinatorial weighing, i.e. selecting a combination of articles whose total weight or number is closest to a desired value	G01G 19/387

G01G 15/00

Arrangements for check-weighing of materials dispensed into removable containers (packaging aspects B65B; {electric measuring arrangements involving comparison with a reference value G01R 17/00})

Definition statement

This place covers:

Apparatus and methods adapted for check-weighing and/or correcting of batches of identical objects/ homogenous material pre-dispensed into uniform transportable containers such as bottles.

Typically comprises dispensing means for forming a batch of identical objects/homogenous material inside the uniform transportable container and means for checking and/or correcting its mass

Relationships with other classification places

G01G 15/00 and its subgroups are related to packaging fluent solid material by controlling or determining the quantity by weighing classified in B65B 1/32, B65B 1/34 and B65B 1/46. The borderline should be determined on whether the features relevant for classification are focused on packaging or on weighing.

They are also related to packaging plastic material, semi-liquids, liquids or mixed solids and liquids by controlling or determining the quantity by weighing classified in B65B 3/28. The borderline should be determined on whether the features relevant for classification are focused on packaging or on weighing.

They are further related to bottling liquids or semiliquids with provisions for metering the liquids introduced by weighing classified in B67C 3/202. The borderline should be determined on whether the features relevant for classification are focused on bottling or on weighing.

Lastly, they are related to sorting according to weight classified in B07C 5/16, Grading or sorting solid materials by dry methods according to weight B07B 13/08. The borderline should be determined on whether the features relevant for classification are focused on sorting or on weighing.

G01G 17/00

Apparatus for or methods of weighing material of special form or property (determining weight by measuring volume G01F)

Definition statement

This place covers:

Apparatus and methods adapted for determining the mass of objects/material of special form or property such as pharmaceuticals, fiber, pulp, fluids, gases or stock.

Weighing of pharmaceuticals is classified in G01G 17/00.

References

Limiting references

This place does not cover:

Automatic feeding devices for stock or game with mechanisms for delivery of measured doses by weight	A01K 5/0283
Feeding fibres to machines that are regulated in response to changes in volume or weight of fibres fed	D01G 23/06

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:

Indicating or measuring liquid level or level of fluent solid material by measurement of weight	G01F 23/20

G01G 19/00

Weighing apparatus or methods adapted for special purposes not provided for in the preceding groups {(electric measuring arrangements involving comparison with a reference value G01R 17/00)}

Definition statement

This place covers:

Apparatus and methods for determining mass adapted for postal parcels and letters, vehicles, suspended loads, humans, as well as combinatorial weighing, mixing, weighing apparatus combined with domestic appliances and weighing apparatus for determining another quantities such as a price or caloric content from the mass of an object.

Further details of subgroups

G01G 19/002, G01G 19/005, G01G 19/4148;

Weighing devices and methods for postal parcels and letters in which a postal rate is determined are classified in G01G 19/4148. All other weighing devices and methods for postal parcels and letters are classified in G01G 19/002 or G01G 19/005.

G01G 19/03, G01G 19/035;

Weighing apparatus and methods for weighing during motion

That are not wheeled (G01G 19/022, G01G 19/024, G01G 19/045, G01G 19/047),

That are not adapted for measuring the mass or mass flow of a homogenous continuous stream of objects or material (G01G 11/00) and

That are not adapted for check-weighing batches of identical objects/homogenous material pre-dispensed into uniform transportable containers (G01G 15/00).

That are not adapted for combinatorial weighing with a single weighing device (G01G 19/387).

Typically comprises conveyor belt weighing devices for separately weighing objects in succession such as fruits, parcels or end-products.

Relationships with other classification places

Franking apparatus G07B 17/00661. The borderline should be determined on whether the features relevant for classification are focused on franking or on weighing.

Cash registers with control of supplementary check-parameters such as weight or number of articles G07G 1/0054. The borderline should be determined on whether the features relevant for classification are focused on cash registers or on weighing.

Packaging fluent solid material or plastic material, semi-liquids, liquids or mixed solids and liquids by weighing B65B 1/32, B65B 1/34, B65B 1/46 and B65B 3/28, B65B 37/18. The borderline should be determined on whether the features relevant for classification are focused on packaging or on weighing.

Botteling liquids or semi-liquids with provisions for metering the liquids introduced by weighing B67C 3/202 or sorting according to weight classified in B07C 5/16. The borderline should be determined on whether the features relevant for classification are focused on botteling or on weighing.

Diagnostic measurement of body composition by electrical impedance, e.g. tissue hydration or fat content A61B 5/0537, diagnostic measurement of load distribution on feet (Podology) A61B 5/1036, diagnostic measurement means with transmission of measured data to processing or recording apparatus A61B 5/0002, weighing devices combined with diagnosing apparatus A61B 5/107 and weighing cut product in combination with cutting B26D 7/30. The borderlines should be determined on whether the features relevant for classification are focused on the respective diagnostic aspect or on weighing.

References

Limiting references

This place does not cover:

Walking-sticks combined with weighing appliances	A45B 3/08

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 for connecting a tractor to an agricultural machine with means for weighing mounted on the tractor side	A01B 59/069
Weighing devices specially adapted for threshing machines	A01F 12/50
Devices signaling that patients are leaving their beds	A61B 5/1115
Arrangements on vehicles	**B60P5/00**
Arrangements for adjusting wheel-braking force responsive to the vehicle weight with determination of control parameter for electronic regulation means to control breaking	B60T 8/172
Arrangements for adjusting wheel-braking force responsive to the vehicle weight	B60T 8/18
Characterized by load-detecting arrangements	B60T 8/1837
Arrangements for detecting suspension spring load	B60T 8/1856
With fluid output signal	B60T 8/1862
With mechanical output signal	B60T 8/1868
With electrical output signal	B60T 8/1875
Incorporation of weighing devices in cranes	B66C 1/40, B66C 13/16

Safety devices for limiting or indicating lifting force adapted for forklift trucks	B66F 17/003
Washing machines with arrangements for measuring or detecting the condition of laundry, e.g. by weight	D06F 34/18
Control inputs to change speed or reverse gearing dependent on the weight of the machine, e.g. change in weight resulting from passengers boarding a bus	F16H 59/52
Ratio control of two or more flows by sensing weight	G05D 11/04
Electric ratio control of fluid or fluent material by sensing the weight of individual components	G05D 11/134
Microwave ovens with weight sensors	H05B 6/6464

References out of a residual place

Examples of places in relation to which this place is residual:

Weighing apparatus involving the use of a counterweight or other counterbalancing mass	G01G 1/00
Weighing apparatus characterised by the use of elastically-deformable members, e.g. spring balances	G01G 3/00
Weighing apparatus wherein the balancing is effected by fluid action	G01G 5/00
Weighing apparatus wherein the balancing is effected by magnetic, electromagnetic, or electrostatic action, or by means not provided for in the preceding groups	G01G 7/00
Methods or apparatus for the determination of weight not otherwise provided for	G01G 9/00
For weighing a continuous stream	G01G 11/00
Weighing apparatus with automatic feed or discharge for weighing-out batches of material (for weighing a continuous stream G01G 11/00; check-weighing G01G 15/00; for fluids G01G 17/04; apportioning by weight materials to be mixed G01G 19/22; combinatorial weighing G01G 19/387)	G01G 13/00
Check-weighing	G01G 15/00
Apparatus for or methods of weighing material of special form or property (determining weight by measuring volume G01F)	G01G 17/00

Informative references

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

Accessories for angling	A01K 97/00
Combination of handles with other devices	A45C 13/28
Purses, bags, luggage or other receptacles	A45C 15/00
Accessories for mixers for forming predetermined ratios of substances to be mixed by weighing the components	B01F 35/881
Regulating means for pneumatic resilient suspensions	B60G 17/0155
Seats with passenger detection systems	B60N 2/002

Triggering safety arrangements on vehicles for protecting passengers with means for detecting presence/position of passengers	B60R 21/015
Control devices for dredgers or soil shifting machines	E02F 9/2025
Indicating devices for dredgers or soil shifting machines	E02F 9/26
Transducers converting variations in positions of members into fluid-pressure	F15B 5/00
Measuring force in general in ropes, cables, wires	G01L 5/04
Measuring several components of force	G01L 5/16
Devices for measuring tyre pressure	G01L 17/00
Determining position of center of gravity	G01M 1/122
Measuring arrangements involving comparison with a reference value	G01R 17/00
Program control systems in general	G05B 19/00
Franking apparatus	G07B 17/00
Constructional details	G07B 17/00193
Calculation of postage value	G07B 17/00362
Traffic control systems for road vehicles using treadles built into the road	G08G 1/02
ICT specially adapted for therapies or health-improving plans (e.g. for handling prescriptions, for steering therapy or for monitoring patient compliance) relating to nutrition control (e.g. diets)	G16H 20/60

G01G 19/08

for incorporation in vehicles

Special rules of classification

This group is not used to classify documents. All documents involving weighing means are classified in G01G 19/08

G01G 21/00

Details of weighing apparatus

Definition statement

This place covers:

Particular weighing-specific constructional details of any apparatus or method with a weighing device.

References

Informative references

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

Bearings per se	F16C
Shock-absorbers per se	F16F

G01G 23/00

Auxiliary devices for weighing apparatus

Definition statement

This place covers:

Auxiliary means ensuring correct conduction of mass measurements, indicating means such as displays and recording means such as databases or paper records.

References

Informative references

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

Apparatus or method for measuring several components of force	G01L 5/16
Testing or calibrating of apparatus measuring force, work, torque, mechanical power or mechanical efficiency	G01L 25/00