

G10K

SOUND-PRODUCING DEVICES; METHODS OR DEVICES FOR PROTECTING AGAINST, OR FOR DAMPING, NOISE OR OTHER ACOUSTIC WAVES IN GENERAL; ACOUSTICS NOT OTHERWISE PROVIDED FOR

Definition statement

This place covers:

Devices that produce a sound by striking a resonating body, such as bells, chimes, gong.

Whistles, siren devices that produce a sound driven by rotating member, motor, or fluids, e.g., compressed gas.

Devices that produce a sound by vibrating a diaphragm or analogous element, such as foghorns, vehicle hooter, buzzer.

Methods or devices that transmit, conduct, or direct a sound wave.

Methods or devices for protection against, or damping of, acoustic waves.

Cones, diaphragms, or the like, for emitting or receiving sound.

Acoustics not otherwise provided for.

Arrangements for generating mechanical vibrations in fluids.

The production of sounds which may not be audible to human beings but which are audible to animals.

Relationships with other classification places

When classifying in subgroups [G10K 9/122-G10K 9/22](#), the subgroups do not cover the construction of, or circuits for, broadband-transducers, such as loudspeakers or microphones, which are covered by subclass [H04R](#).

When classifying in subgroups [G10K 11/162-G10K 11/168](#), the subgroups do not cover protecting against, or damping of, acoustic waves adapted for particular applications, which are covered by the subclasses for these applications, provided that there is a specific provision for this aspect.

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:

Scaring devices, e.g. bird-scaring devices	A01M 29/00
Hunting appliances	A01M 31/00
Diagnosis using ultrasonic, sonic or infrasonic waves	A61B 8/00
Vibration massage	A61H 23/00
Devices for producing sleep by acoustical means	A61M 21/00
Sound producing toys	A63H 5/00
Employing sonic or ultrasonic vibrations in chemical or physical processes	B01J 19/10
Disintegrating devices using ultrasonic waves	B02C 19/18

Application-oriented references

Spraying or atomising liquids using ultrasonic waves	B05B 17/06
Acoustic devices used in vehicle signalling	B60Q 5/00
Acoustic signal devices used on bicycles	B62J 3/00
Fluid oscillators or pulse generators for fluid pressure systems	F15B 21/12
Systems using the reflection or reradiation of acoustic waves	G01S 15/00
Signalling or calling arrangements, alarm arrangements	G08B
Percussive musical instruments	G10D 13/00

Informative references

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

Medical stethoscopes	A61B 7/02
Generation or transmission of mechanical waves, in general	B06B
Apparatus specifically adapted for transmitting mechanical vibrations of infrasonic, sonic, or ultrasonic frequency	B06B 3/00
Gas-flow silencers or exhaust apparatus for machines or engines, in general, for internal combustion engines	F01N
Intake silencers for internal-combustion engines	F02M 35/00
Suppression of undesired vibrations	F16F 7/00
Means or arrangements for avoiding or reducing out-of-balance forces due to motion	F16F 15/00
Preventing noise in valves	F16K 47/02
Noise absorbers in pipes	F16L 55/02
Arrangements for suppressing noise in direct-contact trickle coolers	F28C 1/10
Silencers for weapons	F41A 21/30
Investigating materials by the use of ultrasonic, sonic or infrasonic waves	G01N 29/00
Generating seismic energy	G01V 1/02
Non-electronic musical instruments	G10B , G10C , G10D , G10F
Details of electrophonic musical instruments	G10H 1/00
Synthesis of speech	G10L 13/00
Information storage based on relative movement between record carrier and transducer	G11B
Generation of oscillations, directly or by frequency-changing, by circuits employing active elements which operate in a non-switching manner; generation of noise by such circuits	H03B
Electro-acoustic amplifiers	H03F 13/00
Impedance networks comprising electro-acoustic elements	H03H 9/00
Transmission systems employing ultrasonic, sonic or infrasonic waves	H04B 11/00
Loudspeakers, microphones, gramophone pick-ups, or the like, acoustic electromechanical transducers	H04R
Diaphragms for electromechanical transducers	H04R 7/00
Piezoelectric, electrostrictive, or magnetostrictive elements, in general	H10N 30/00

Special rules of classification

When classifying in subgroups [G10K 11/16-G10K 11/172](#), classification is also made in subclass [B32B](#), in so far as any layered product is concerned.

For details which are not covered by specific subgroups of [G10K](#), the Indexing Codes [G10K 2200/00](#) and [G10K 2200/00](#) should be applied.

Glossary of terms

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

Acoustics; Sound	The terms acoustics and sound cover the technical fields dealing with mechanical vibrations at all infrasonic, sonic, and ultrasonic frequencies. However, generation or transmission of mechanical waves, in general, is covered by subclass B06B , subject to the exception specified in special rules of classification within this subclass mentioned above.
Musical instrument	Musical instrument can include a device that emits a single sound signal or, in other words, does not exclude a device that emits a single sound signal.

G10K 1/00

Devices in which sound is produced by striking a resonating body, e.g. bells, chimes or gongs (multi-toned musical instruments [G10D 13/08](#); automatic carillons [G10F 1/10](#))

References

Limiting references

This place does not cover:

Multi-toned musical instruments	G10D 13/08
Automatic carillons	G10F 1/10

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:

Combinations with clocks or watches	G04B , G04C
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G10K 1/062

electrically operated

References

Informative references

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

Self-interrupting relays	H01H 51/34
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G10K 1/065**for timed or repeated operation****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Producing acoustic time signals by electrical means for electromechanical alarm-clocks	G04C 21/00
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G10K 1/076**for timed or repeated operation****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Producing acoustic signals by non-electrical means for mechanically-driven alarm-clocks	G04B 23/00
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G10K 1/36**Means for silencing or damping****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Means or arrangements for avoiding or reducing out-of-balance forces due to motion	F16F 15/00
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G10K 3/00**Rattles or like noise-producing devices {, e.g. door-knockers}****Definition statement***This place covers:*

Door-knockers

G10K 5/00**Whistles****Definition statement***This place covers:*

Infrasonic, sonic, and ultrasonic whistles

References

Informative references

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

Whistling kettles	A47J 27/212
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G10K 7/00

Sirens

Definition statement

This place covers:

Sirens where the sound is created by chopping a flow of air

References

Informative references

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

Sirens in which the sound is created by a vibrating membrane	G10K 9/00
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G10K 7/02

in which the sound-producing member is rotated manually or by a motor
([G10K 7/06](#) takes precedence)

References

Limiting references

This place does not cover:

Sirens in which the sound-producing member is driven by a fluid	G10K 7/06
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Informative references

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

Musical tops	A63H 1/28
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G10K 7/06

in which the sound-producing member is driven by a fluid, e.g. by a compressed gas

References

Informative references

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

Fluidically operated vibrators	B06B 1/18
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G10K 9/00

Devices in which sound is produced by vibrating a diaphragm or analogous element, e.g. fog horns, vehicle hooters or buzzers (loudspeakers or like acoustic electromechanical transducers [H04R](#))

References

Limiting references

This place does not cover:

The construction of, or circuits for, broadband-transducers, such as loudspeakers, microphones or like acoustic electromechanical transducers	H04R
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Informative references

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

Mechanically driven vibrators	B06B 1/10
Arrangements or adaptations of acoustic signalling devices for ships	B63B 45/08

G10K 9/18

Details, e.g. bulbs, pumps, pistons, switches or casings

References

Informative references

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

Cones, diaphragms	G10K 13/00
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G10K 11/00

**Methods or devices for transmitting, conducting or directing sound in general;
Methods or devices for protecting against, or for damping, noise or other acoustic waves in general**

Definition statement

This place covers:

Methods or devices that transmit, conduct, or direct a sound wave.

Methods or devices for protection against, or damping of, acoustic waves.

Methods or devices for damping acoustic waves by electroacoustically regenerating the original acoustic waves in antiphase, and superimposing the two acoustic waves

Diffusers ([G10K 11/20](#))

Damping or steering of surface acoustic waves

Relationships with other classification places

The subgroups [G10K 11/162-G10K 11/168](#) cover the selection of materials for the devices for protecting against, or damping of, acoustic waves. Subject-matter, which normally would be covered by these groups, which is adapted for particular applications, which are covered by the classes for these applications, is to be classified with those applications provided that there is a specific provision for the aspect of protecting against, or damping of, acoustic waves.

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 devices for the ears	A61F 11/06
Sound insulation for vehicles	B60R 13/08
Sound insulation for aircraft	B64C 1/40
Reduction of noise on the permanent way	E01B 19/00
Absorption of air-transmitted noise from road or railway traffic	E01F 8/00
Noise insulation, absorption or reflection in buildings	E04B 1/74
Sound insulation in floors	E04F 15/20
Intake silencers for internal-combustion engines	F02M 35/00
Preventing noise in valves	F16K 47/02
Noise absorbers in pipes	F16L 55/02
Arrangements for suppressing noise in direct-contact trickle coolers	F28C 1/10
Silencers for weapons	F41

Informative references

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

Using a coupling medium when making a diagnosis using infrasonic, sonic, or ultrasonic waves	A61B 8/00
Providing a coupling medium when performing lithotripsy	A61B 17/225
Sound insulating materials	C04B 26/00 - C04B 38/00
Room acoustics	E04B 1/99
Gas-flow silencers or exhaust apparatus for machines or engines in general, for internal-combustion engines	F01N
Suppression of undesired vibrations	F16F 7/00
Using an acoustic coupling when investigating materials	G01N 29/28
Constructional features of sonar devices	G01S 7/521

Special rules of classification

When classifying in subgroups [G10K 11/16-G10K 11/172](#), classification is also to be made in subclass [B32B](#), in so far as any layered product is concerned.

G10K 11/002

{Devices for damping, suppressing, obstructing or conducting sound in acoustic devices ([G10K 1/06](#) - [G10K 1/10](#) take precedence; for electro-mechanical transducers for communication [H04R 3/002](#))}

Definition statement

This place covers:

Devices for damping, suppressing, obstructing or conducting sound in acoustic devices, e.g. for preventing cavitation in acoustic devices

References

Limiting references

This place does not cover:

Resonating devices having the shape of a bell, plate, rod, or tube	G10K 1/06 - G10K 1/10
Electro-mechanical transducers for communication	H04R 3/002

G10K 11/16

Methods or devices for protecting against, or for damping, noise or other acoustic waves in general ([G10K 11/36](#) takes precedence)

References

Limiting references

This place does not cover:

Devices for manipulating acoustic surface waves	G10K 11/36
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Application-oriented references

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

Sound insulation for vehicles	B60R 13/08
Sound insulation in boats or ships	B63B 3/68
Sound insulation in aircraft	B64C 1/40
Silencing jet engines	B64D 33/06
Acoustic insulation for internal combustion engines	F02B 77/13
Air-intakes for gas-turbine or jet-propulsion plants having provision for noise suppression	F02C 7/045
Sound absorbing structures for jet-propulsion plants	F02K 1/82
Intake silencers for internal-combustion engines	F02M 35/00
Sound attenuation for pumps	F04D 29/66
Means or arrangements for avoiding or reducing out-of-balance forces due to motion	F16F 15/00
Suppressing noise in air-conditioning systems	F24F 13/24

Arrangements for suppressing noise in direct-contact trickle coolers	F28C 1/10
Silencers for weapons	F41A 21/30

Informative references

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

Sound insulation materials (see relevant places)	C04B 26/00 - C04B 38/00
Reduction of noise in permanent way	E01B 19/00
Absorption of air-transmitted noise from road or railway traffic	E01F 8/00
Noise insulation, absorption, or reflection in buildings	E04B 1/74
Room acoustics	E04B 1/99
Sound insulation in floors	E04F 15/20
Gas-flow silencers or exhaust apparatus for machines or engines, in general, for internal combustion engines	F01N 1/00
Suppression of undesired vibrations	F16F 7/00
Preventing noise in valves	F16K 47/02
Noise absorbers in pipes	F16L 55/02
Surface acoustic wave resonators	H03H 9/00

G10K 11/165

Particles in a matrix

Definition statement

This place covers:

Sound absorbers where the matrix is a gas and where the particles are in a fixed position

G10K 11/178

by electro-acoustically regenerating the original acoustic waves in anti-phase

Definition statement

This place covers:

Acoustic active noise cancellation [ANC], i.e. issuing an acoustic wave field that destructively interferes with a pre-existing acoustic wave field, for the purposes of reducing or damping the pre-existing acoustic wave field.

The scheme has 4 main branches:

- [G10K 11/1781](#)

The analysis of input signals, output signals, or relationships between them, which are used by the invention in a special way to achieve its goal is classified in [G10K 11/1781](#). For instance, if an application analyses a musical signal and turns off ANC if the music is very loud, [G10K 11/17827](#) should be assigned.

- [G10K 11/1783](#)

Definition statement

The handling of specific non-standard conditions, e.g. detection of instabilities or other malfunctions in the device, or detection of specific signals that must not be cancelled, e.g. speech, sirens or warnings, is classified in [G10K 11/1783](#).

- [G10K 11/1785](#)

Inventions about specific details, e.g. specific details of the adaptive filter, hardware or software implementations for lowering power requirements or improving speed, geometric placement of loudspeakers and microphones or combinations with other acoustic elements, are classified in [G10K 11/1785](#).

- [G10K 11/1787](#)

The overall ANC circuit structure is classified in [G10K 11/1787](#), with the idea of having similar circuits together in one group. For instance, ANC in cars often involves a synthesizer using a reference signal based on engine parameters; as another example, systems in which music is to be played together with the ANC signal mostly have sub circuits that estimate and subtract the music signal from the error signal before the error signal is used to adapt the ANC signal.

Relationships with other classification places

This group is a "function-oriented place" for acoustic active noise cancellation and covers active cancellation of acoustic noise by physical mixing of the pre-existing acoustic noise wave field with the generated acoustic wave field.

Noise cancellation in electronic or electroacoustic signals by mixing, processing or otherwise altering the signal inside the circuitry is classified elsewhere, even though the methods used might often be similar. For example, a phone cancelling or reducing noise that is part of a signal coming from a telephone network, e.g. line noise or echo noise, by filtering this signal, is not seen as acoustic noise cancellation within the scope of [G10K 11/178](#), but falls within the scope of [H04M](#).

However, the mere application of ANC in telephones, e.g. a phone reducing or cancelling ambient noise around the user, by mixing an acoustic anti-noise signal into the signal coming from the network, to destructively interfere with the ambient acoustic noise, is seen as applying acoustic noise cancellation within the scope of [G10K 11/178](#).

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:

Electric external protective devices for the ears for active noise reduction	A61F 11/145
Vibration damping devices for rotor craft	B64C 27/001
Aircraft with means for silencing of exhaust or propulsion jets	B64D 33/06
Exhaust gas silencers for internal combustion engines characterised by using active interference effect	F01N 1/065
Air intakes for gas-turbine plants having provisions for noise suppression	F02C 7/045
Intake silencers for internal combustion engines	F02M 35/125
Sound attenuation for non-positive displacement pumps	F04D 29/663
Suppression of mechanical vibrations	F16F
Noise absorbers in pipes	F16L 55/033
Air-conditioners with means for suppressing noise	F24F 13/24
Means for active and/or passive vibration damping or acoustical noise suppression in gradient magnet coil systems	G01R 33/3854
Substation equipment with measures to prevent eavesdropping	H04M 1/19

Earpieces with reduction of ambient noise	H04R 1/1083
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Informative references

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

Passive noise cancellation	G10K 11/162 - G10K 11/172
Protective devices for the ears	A61F 11/06
Noise filtering for speech processing	G10L 21/0208
Signal processing for reducing noise in signals on information storages	G11B 20/24
Adaptive networks and filters in general	H03H 21/00
Echo cancellers in two-way loudspeaking telephone systems	H04M 9/082
Circuits for combining the signals of two or more microphones	H04R 3/005
Circuits for transducers, loudspeakers or microphones for preventing acoustic reaction	H04R 3/02
Deaf-aid sets with arrangements for obtaining a desired directivity characteristic	H04R 25/40
Deaf-aid sets with prevention of acoustic reaction	H04R 25/45
Hearing devices using active noise cancelation	H04R 2460/01

Special rules of classification

Classification in several subgroups is specifically encouraged in this scheme, especially in the general system configurations subgroup. For instance, a phone general device with active acoustic noise cancellation comprising a diagnostics function, and using a reference microphone, an error microphone and a desired music signal is classified under [G10K 11/17833](#), [G10K 11/17879](#) and [G10K 11/17885](#).

When classifying in [G10K 11/178](#), classifying additional information in the subgroups of [G10K 2210/00](#) is mandatory.

Glossary of terms

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

plant	is interchangeably used to refer to both the primary path and the secondary path
primary path	is used to indicate the acoustic path from the noise source (rather than from the reference input) to the error microphone
feedforward	is used to indicate hybrid feedforward + feedback systems

Background

In acoustic anti-noise systems, an acoustic transducer (e.g. loudspeaker) generates an acoustic signal to compensate for an existing ambient noise signal, such that the total acoustic signal at a specific point or area (the so called "quiet zone") is minimized, by generating the noise signal in anti-phase.

To achieve this goal, a number of different input signals can be used:

- a reference signal (or "feedforward signal"), for detecting or predicting the noise to be cancelled; this could be a microphone for recording the noise acoustically, or any other type of (non-acoustic) input that can be used to predict the noise;

- an error signal (or "feedback signal"), placed inside or close to the quiet zone, to continuously adapt the ANC output such that the quiet zone is truly quiet; and optionally,
- a desired external signal (e.g. "pass-through audio", music or speech), to be output by the acoustic transducer without being cancelled by the ANC system.

In essence, the basic ANC system of Figure 1 predicts the noise in front of the loudspeaker from signal $x(n)$, by taking into account a time delay and acoustic distortions, and outputs it in anti-phase through the loudspeaker. Ideally, this completely cancels the noise. The input $e(n)$ is used to fine-tune the system, by adapting the ANC filtering such that $e(n)$ is minimized.

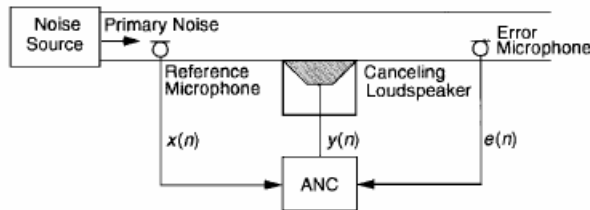


Figure 1. Combined feedforward and feedback ANC in a duct.

It is possible to do ANC with only a reference signal, only an error signal or with both reference and error signals. The desired external signal is an optional extension of the ANC system. ANC with only a reference signal (i.e. without an error signal) is called pure feedforward ANC.

The acoustic path from the reference microphone to the error microphone is referred to here as the primary path, often denoted by $P(z)$. Feedforward (and hybrid) ANC systems usually model this path to predict the noise at the error microphone from the detected reference signal.

The electro-acoustic path through the loudspeaker to the error microphone is referred to here as the secondary path, often denoted by $S(z)$. Feedback (and hybrid) ANC systems model this path to compensate for non-linear effects of the loudspeaker and error microphone and the specific acoustic environment between the two. Also, this path is modelled to be able to remove the desired external signal from the measured error signal.

The electro-acoustic path through the loudspeaker to the reference microphone is sometimes referred to as the leakage path. This path is modelled to be able to remove the anti-noise signal itself from the measured reference signal, e.g. to prevent howling. Also, this path can be modelled to compensate for non-linear effects of the loudspeaker and reference microphone and the specific acoustic environment between the two.

Basic adaptive control is often performed using a combined model $W(z) = -P(z) / S(z)$, which is multiplied by the secondary path, $S(z)$, to arrive at a signal approximating the true $P(z)$. See Figure 2.

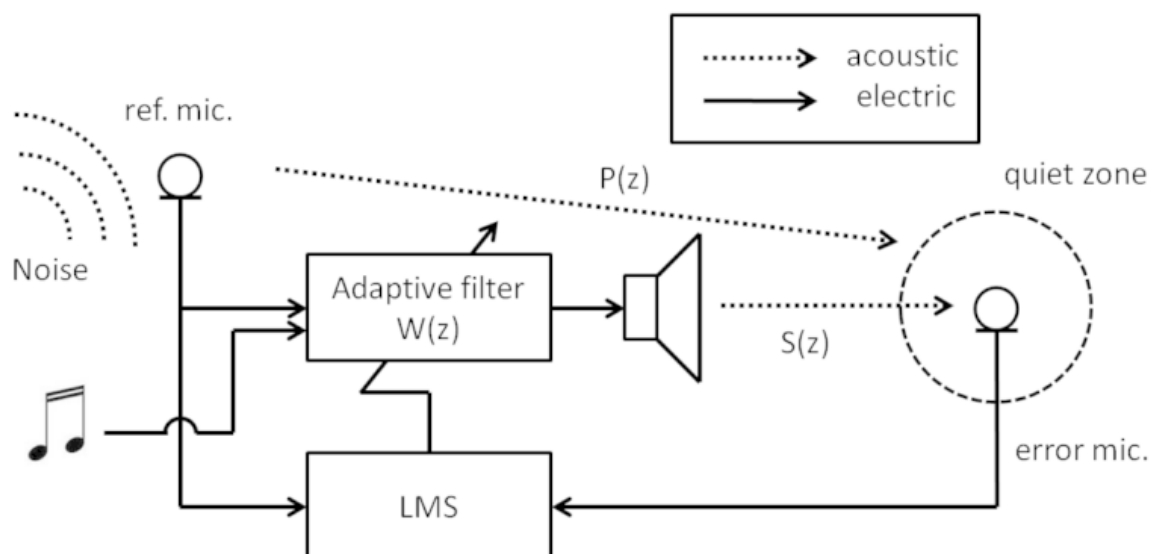


Figure 2. Adaptive feedforward ANC.

Often, the secondary path is also adaptively modelled to adapt to changes in the acoustic environment, such as movement of a telephone or head-phone with respect to the user's head.

The coupling through acoustic paths from the loudspeaker to the reference microphone is normally be kept as low as possible, so as to prevent howling (i.e. the ANC system detecting its own output as noise and worsening it). Confusingly, the word "feedback" is sometimes used for this coupling, in reference to the effect in musical performances.

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

ANC	Active Noise Control
ANE	Active Noise Equalization
LMS	Least Mean Squares

G10K 11/18

Methods or devices for transmitting, conducting or directing sound
([G10K 11/02](#), [G10K 11/36](#) take precedence)

References

Limiting references

This place does not cover:

Mechanical acoustic impedances; Impedance matching, e.g. by horns; Acoustic resonators	G10K 11/02
Devices for manipulating acoustic surface waves	G10K 11/36

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:

Medical stethoscopes	A61B 7/02
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G10K 11/20

Reflecting arrangements ([G10K 11/28](#) takes precedence)

Definition statement

This place covers:

Diffusers

References**Limiting references**

This place does not cover:

Sound focusing or directing using reflection	G10K 11/28
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G10K 11/24

for conducting sound through solid bodies, e.g. wires

References**Informative references**

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

Apparatus specially adapted for transmitting mechanical vibrations of infrasonic, sonic, or ultrasonic frequency	B06B 3/00
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G10K 11/26

Sound-focusing or directing, e.g. scanning

Definition statement

This place covers:

Diffraction

References**Informative references**

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

Horns for impedance matching	G10K 11/02
Megaphones	G10K 11/08

G10K 11/28

using reflection, e.g. parabolic reflectors

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:

Hearing aids	A61F 11/30
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G10K 11/36

Devices for manipulating acoustic surface waves (electro-acoustic amplifiers [H03F 13/00](#); networks comprising electro-acoustic elements [H03H 9/00](#))

Definition statement

This place covers:

Damping, steering of Surface Acoustic Waves

References**Limiting references**

This place does not cover:

Electro-acoustic amplifiers	H03F 13/00
Networks comprising electro-acoustic elements	H03H 9/00

G10K 13/00

Cones, diaphragms, or the like, for emitting or receiving sound in general (for electromechanical transducers [H04R 7/00](#))

References**Limiting references**

This place does not cover:

Diaphragms for loudspeakers	H04R 7/00
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G10K 15/00

Acoustics not otherwise provided for

Definition statement

This place covers:

Synthesis of acoustic waves

Sound-producing devices not otherwise provided for

Arrangements for producing a reverberation sound

Definition statement

Acoustic levitation

Matter transportation using acoustic waves

G10K 15/02**Synthesis of acoustic waves (synthesis of speech [G10L 13/00](#))****Definition statement***This place covers:*

Modulation, parametric techniques

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

Synthesis of speech	G10L 13/00
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Informative references*Attention is drawn to the following places, which may be of interest for search:*

Generation of tones in electrophonic musical instruments	G10H
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G10K 15/04**Sound-producing devices ([G10K 15/02](#) takes precedence)****Definition statement***This place covers:*

SASERS

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

Synthesis of acoustic waves	G10K 15/02
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G10K 15/043**{producing shock waves ([G10K 15/046](#), [G10K 15/06](#) take precedence;
generating seismic energy [G01V 1/02](#))}****Definition statement***This place covers:*

Unipolar generators

References

Limiting references

This place does not cover:

Sound producing devices	G10K 15/046
Sound producing devices using electric discharge	G10K 15/06
Calculus smashing apparatus	A61B 17/22
Application of shock-waves for chemical reactions	B01J 3/08
Shaping using shock waves	B21D 26/06

Informative references

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

Generating seismic energy	G01V 1/02
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G10K 2210/107

Combustion, e.g. burner noise control of jet engines

References

Informative references

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

Rotating machines, e.g. engines, turbines, motors; Periodic or quasi-periodic signals	G10K 2210/121
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G10K 2210/112

Ducts

References

Informative references

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

Exhaust pipes or mufflers	G10K 2210/12822
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G10K 2210/32291

Plates or thin films, e.g. PVDF

References

Informative references

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

Methods or apparatus for generating mechanical vibrations of infrasonic, sonic or ultrasonic frequency making use of electrical energy with foil-type piezoelectric elements, e.g. PVDF	B06B 1/0688
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