

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-330496

(43)Date of publication of application : 15.11.2002

(51)Int.Cl.

H04R 17/00

H04R 7/18

(21)Application number : 2001-130910

(71)Applicant : KENWOOD CORP

(22)Date of filing : 27.04.2001

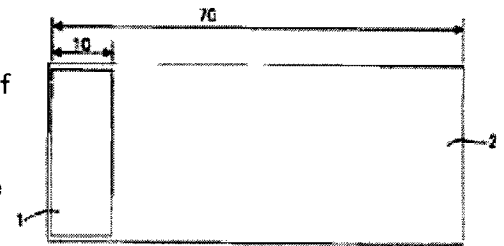
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(54) PIEZOELECTRIC SPEAKER

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a piezoelectric speaker that makes the best use of a motion of a piezoelectric element.

SOLUTION: In the piezoelectric speaker where the piezoelectric element 1 is stuck to a panel 2, the piezoelectric element 1 and the panel 2 are formed in a rectangular shape, the piezoelectric element 1 is stuck to an end of the panel 2 in its length direction and the length direction of the piezoelectric element 1 is aligned with the short side of the panel 2, and the length directional size of the panel 2 is selected to be an odd number of multiple of the width of the short side of the piezoelectric element 1. Or the piezoelectric element 1 is stuck to a corner or in the middle of the panel 2 so that the length direction of the piezoelectric element 1 is coincident with the length direction of the panel 2, and the length of the panel in the long side and the short side is selected to be an odd number multiple of the length of the long side and the short side of the piezoelectric element.



(19) 日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11) 特許出願公開番号
特開2002-330496
(P2002-330496A)

(43) 公開日 平成14年11月15日 (2002. 11. 15)

(51) Int.Cl. ⁷	識別記号	F I	テマコード* (参考)
H 0 4 R 17/00		H 0 4 R 17/00	5 D 0 0 4
	7/18		5 D 0 1 6

審査請求 未請求 請求項の数 6 O L (全 4 頁)

(21) 出願番号 特願2001-130910(P2001-130910)

(22) 出願日 平成13年4月27日 (2001. 4. 27)

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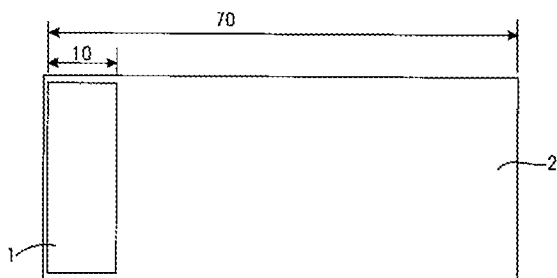
Fターム(参考) 5D004 AA01 CD07
5D016 AA01

(54) 【発明の名称】 圧電型スピーカ

(57) 【要約】

【課題】 圧電素子の動きを最大限活かしたものと言える圧電型スピーカを実現する。

【解決手段】 圧電素子1をパネル2に貼り付けた圧電型スピーカにおいて、圧電素子1およびパネル2が長方形にされており、圧電素子1はパネル2の長手方向の端に圧電素子1の長手方向がパネル2の短手方向の辺に沿うように貼り付けられており、パネル2の長手方向の寸法は、圧電素子1の短手方向の幅の奇数倍とされている。或いは、圧電素子1の長手方向とパネル2の長手方向が一致するように、圧電素子1がパネル2の角又は中央に貼付けられており、パネルの長手、短手方向の長さが圧電素子の長手、短手方向の長さの奇数倍とされている。



【特許請求の範囲】

【請求項1】 圧電素子をパネルに貼り付けた圧電型スピーカにおいて、圧電素子およびパネルは長方形であり、該圧電素子は該パネルの長手方向の端に該圧電素子の長手方向が該パネルの短手方向の辺に沿うように貼り付けられており、該パネルの長手方向の寸法は、該圧電素子の短手方向の幅の奇数倍とされていることを特徴とする圧電型スピーカ。

【請求項2】 前記パネルの長手方向の寸法が、前記圧電素子の短手方向の幅の3倍から9倍までの間の奇数倍とされていることを特徴とする請求項1に記載の圧電型スピーカ。

【請求項3】 圧電素子をパネルに貼り付けた圧電型スピーカにおいて、圧電素子およびパネルは長方形であり、該圧電素子は該パネルの短手方向の端に該圧電素子の長手方向が該パネルの長手方向の辺に沿うように貼り付けられており、該パネルの長手方向の寸法は、該圧電素子の長手方向の幅の奇数倍とされており、該パネルの短手方向の寸法は、該圧電素子の短手方向の幅の奇数倍とされていることを特徴とする圧電型スピーカ。

【請求項4】 前記パネルの長手方向の寸法が、前記圧電素子の長手方向の幅の3倍か5倍の奇数倍とされており、該パネルの短手方向の寸法が、該圧電素子の短手方向の幅の3倍から9倍までの間の奇数倍とされていることを特徴とする請求項3に記載の圧電型スピーカ。

【請求項5】 圧電素子をパネルに貼り付けた圧電型スピーカにおいて、圧電素子およびパネルは長方形であり、該圧電素子は該パネルの中心付近に該圧電素子の長手方向と該パネルの長手方向が同方向になるように貼り付けられており、該パネルの長手方向の寸法は、該圧電素子の長手方向の幅の奇数倍とされており、該パネルの短手方向の寸法は、該圧電素子の短手方向の幅の奇数倍とされていることを特徴とする圧電型スピーカ。

【請求項6】 前記パネルの長手方向の寸法が、該圧電素子の長手方向の幅の3倍か5倍の奇数倍とされ、該パネルの短手方向の寸法が、前記圧電素子の短手方向の幅の1倍から5倍までの間の奇数倍とされていることを特徴とする請求項5に記載の圧電型スピーカ。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は圧電型スピーカに関する。

【0002】

【従来の技術】従来、圧電型スピーカは、図4(A)に示すように、圧電素子2を基材となる金属板3に固定し、同図(B)または同図(C)に示すような極性で電圧を掛け発音させていた。または、金属板3を含む圧電素子を、より大きい樹脂板等に貼り付けて発音させていた。

【0003】

【発明が解決しようとする課題】前述のような構造において、金属板3や樹脂板の大きさは特に取り付ける場所の制約等で定められており、圧電素子の大きさとの関係は特に考慮はされていなかった。そのため、従来の圧電型スピーカは、圧電素子の動きを最大限活かしたものとは言えなかった。本発明の目的は、上記従来技術の欠点を解消し、圧電素子の動きを最大限活かしたものである。圧電型スピーカを実現することにある。

【0004】

【課題を解決するための手段】上記目的達成のため請求項1の発明では、圧電素子をパネルに貼り付けた圧電型スピーカにおいて、圧電素子およびパネルは長方形であり、該圧電素子は該パネルの長手方向の端に該圧電素子の長手方向が該パネルの短手方向の辺に沿うように貼り付けられており、該パネルの長手方向の寸法は、該圧電素子の短手方向の幅の奇数倍とされている（なお、「長い方」が「長手」と称されるから、本明細書では、「短い方」を「短手」と称する。）。また、請求項2の発明では、請求項1にいうパネルの長手方向の寸法が、請求項1にいう圧電素子の短手方向の幅の3倍から9倍までの間の奇数倍とされている。

【0005】また請求項3の発明では、圧電素子をパネルに貼り付けた圧電型スピーカにおいて、圧電素子およびパネルは長方形であり、該圧電素子は該パネルの短手方向の端に該圧電素子の長手方向が該パネルの長手方向の辺に沿うように貼り付けられており、該パネルの長手方向の寸法は、該圧電素子の長手方向の幅の奇数倍とされており、該パネルの短手方向の寸法は、該圧電素子の短手方向の幅の奇数倍とされている。また請求項4の発明では、請求項3にいうパネルの長手方向の寸法が、請求項3にいう圧電素子の長手方向の幅の3倍か5倍の奇数倍とされており、該パネルの短手方向の寸法が、該圧電素子の短手方向の幅の3倍から9倍までの間の奇数倍とされている。

【0006】また、請求項5の発明では、圧電素子をパネルに貼り付けた圧電型スピーカにおいて、圧電素子およびパネルは長方形であり、該圧電素子は該パネルの中心付近に該圧電素子の長手方向と該パネルの長手方向が同方向になるように貼り付けられており、該パネルの長手方向の寸法は、該圧電素子の長手方向の幅の奇数倍とされており、該パネルの短手方向の寸法は、該圧電素子の短手方向の幅の奇数倍とされている。また請求項6の発明では、請求項5にいうパネルの長手方向の寸法が、該圧電素子の長手方向の幅の3倍か5倍の奇数倍とされ、請求項5にいうパネルの短手方向の寸法が、前記圧電素子の短手方向の幅の1倍から5倍までの間の奇数倍とされている。

【0007】

【発明の実施の形態】以下、本発明の詳細を図示実施の形態例に基いて説明する。第1の実施の形態例を図1に

示す。この実施の形態例は、請求項1又は請求項2の発明の一実施の形態例に当たる。圧電素子1及びパネル2は長方形であり、圧電素子1はほぼ同じ大きさの金属板に貼り付けられている。それと同時に、圧電素子1の長手方向がパネル2の短手方向の辺に沿うように、ここではパネル2の左端に貼り付けられている。このとき圧電素子1の厚さは50 μ 、金属板の厚さも50 μ 、パネル2の厚さは300 μ である。パネル2の材料はポリプロピレンで、パネル2の長辺の寸法は70mm、圧電素子1の短辺寸法は10mmである。即ちパネル2の長辺の寸法は、圧電素子1の短辺寸法の7倍に設定されている。

【0008】このように、圧電素子1およびパネル2を長方形にして、その大きさを請求項1又は請求項2に言うが如く規定すると次のような作用がある。すなわち、圧電素子1の基本振動としては、図4の(B)、(C)のように圧電素子1全体の屈曲振動があり、これは長手方向、短手方向ともに基本振動として現れる。この基本振動をきちんと再生することで、圧電素子1の振動を最大限活かすことができる。そのためには、貼り付けるパネル2の寸法を、圧電素子1の基本振動が奇数回乗るような寸法にすると良い。これにより、パネル2自体も共振しやすくなり、大きな音が出せるようになる。もし、この時パネル2の寸法が基本振動が偶数回乗るような寸法になっていると、この時もパネル2は共振しやすいが、位相の逆な振動が同じだけ生じるために音を打ち消してしまい、音は出にくくなる。なお、このような作用は、後述の第2の実施の形態例によって説明される請求項3又は請求項4という発明、或いは第3の実施の形態例によって説明される請求項5又は請求項6の発明に関しても同様である。

【0009】なお、倍率としては、パネル2の長手方向の寸法が、圧電素子1の短手方向の幅の3倍から9倍までの間の奇数倍、即ち、3倍、5倍、7倍、9倍の何れかとするのが好ましい。

【0010】この第1の実施の形態例の圧電スピーカの特性を図5に示す。4kHz付近にピークがあり、この周波数が圧電素子の幅で決まる共振周波数であると考えられる。確認のため、パネル2をカットして、6倍の長さにして特性を見ると、図6に示されるように4kHz付近はディップとなっており、打ち消し合いが起きていることが確認できた。

【0011】第2の実施の形態例を図2に示す。この実施の形態例は、請求項3又は請求項4の発明の一実施の形態例に当たる。ここでも、圧電素子1及びパネル2は長方形であり、圧電素子1はほぼ同じ大きさの金属板に貼り付けられている。それと同時に、圧電素子1はパネル2の短手方向の端に圧電素子1の長手方向がパネル2の長手方向の辺に沿うように、ここでは、パネル2の右下端に横方向に貼り付けられている。なお、圧電素子1

の厚さ、金属板の厚さ、及びパネル2の厚さと材料は、第1の実施の形態例と同じである。パネル2の長辺の寸法は120mm、短辺の寸法は70mm、圧電素子1の長辺の寸法は40mm、短辺の寸法は10mmである。即ちパネル2の長辺の寸法は、圧電素子1の長辺寸法の3倍に、パネル2の短辺の寸法は圧電素子1の短辺寸法の7倍に設定されている。

【0012】なお、倍率としては、パネル2の長手方向の寸法が、前記圧電素子1の長手方向の幅の3倍か5倍の奇数倍とされており、該パネルの短手方向の寸法が、該圧電素子の短手方向の幅の3倍から9倍までの間の奇数倍とするのが好ましい。

【0013】第3の実施の形態例を図3に示す。この実施の形態例は、請求項5又は請求項6の発明の一実施の形態例に当たる。ここでも圧電素子1及びパネル2は長方形であり、圧電素子1はほぼ同じ大きさの金属板に貼り付けられている。それと同時に、圧電素子1はパネル2の中心付近に圧電素子1の長手方向とパネル2の長手方向が同方向になるように、パネル2に貼り付けられている。なお、圧電素子1の厚さ、金属板の厚さ、及びパネル2の厚さと材料は、第1の実施の形態例と同じである。パネル2の長辺の寸法は150mm、短辺の寸法は54mm、圧電素子1の長辺の寸法は50mm、短辺の寸法は18mmである。即ちパネル2の長辺の寸法は、圧電素子1の長辺の寸法の3倍に、またパネル2の短辺寸法は圧電素子1の短辺寸法の3倍に設定されている。

【0014】なお、倍率としては、パネル2の長手方向の寸法が、圧電素子1の長手方向の幅の3倍か5倍の奇数倍とされ、該パネルの短手方向の寸法が、前記圧電素子1の短手方向の幅の1倍から5倍までの間の奇数倍、即ち、1倍、3倍、5倍の何れかとするのが好ましい。

【0015】

【発明の効果】以上説明したように、本願各発明では、圧電素子およびパネルを長方形にして、これらの辺の長さを奇数倍の関係とした。従って、圧電素子の基本振動をパネルの振動としてきちんと再生することができ、圧電素子の振動を最大限活かしたものとすることができる。

【図面の簡単な説明】

【図1】本発明の第1の実施の形態例を示す正面図。

【図2】本発明の第2の実施の形態例を示す正面図。

【図3】本発明の第3の実施の形態例を示す正面図。

【図4】圧電型スピーカの基本原理を示す側面図で、(A)は電圧を印加しない状態(断面で示す)、(B)は、圧電素子側に+の電圧を印加した状態、(C)は、圧電素子側に-の電圧を印加した状態を示す。

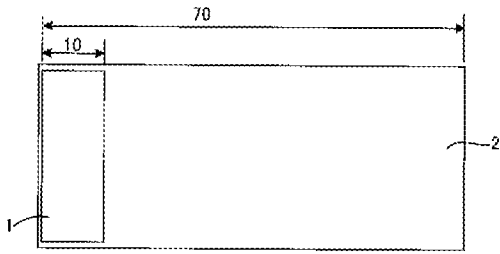
【図5】本発明の第1の実施の形態例の周波数特性を示すグラフ。

【図6】本発明の第1の実施の形態例でパネル2の長辺の長さを圧電素子1の短辺の6倍の長さにカットした場合

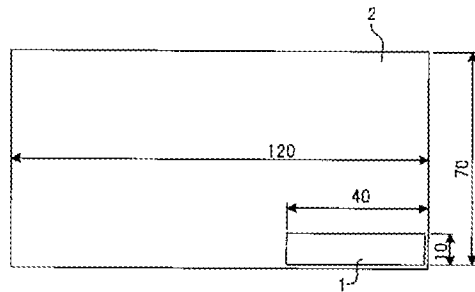
合の周波数特性を示すグラフ。
【符号の説明】

1…圧電素子
2…パネル
3…金属板

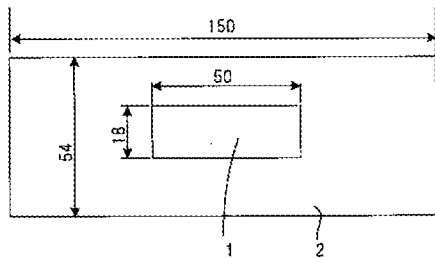
【図1】



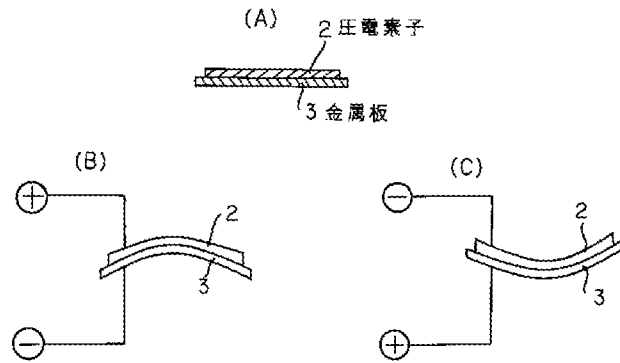
【図2】



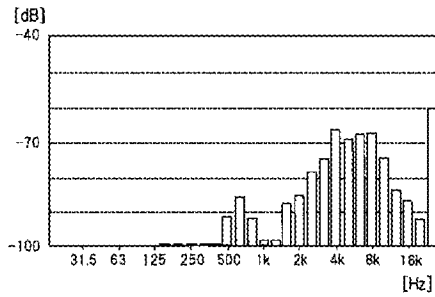
【図3】



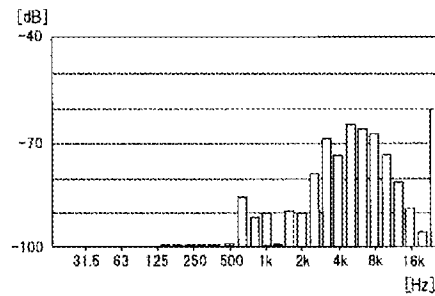
【図4】



【図5】



【図6】



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CLAIMS

[Claim(s)]

[Claim 1]In a piezo electric speaker which stuck a piezoelectric device on a panel, a piezoelectric device and a panel are rectangles, A piezo electric speaker, wherein this piezoelectric device is stuck so that a longitudinal direction of this piezoelectric device may be along an end of a longitudinal direction of this panel at a neighborhood of the transverse direction of this panel, and a dimension of a longitudinal direction of this panel is made into odd times of width of the transverse direction of this piezoelectric device.

[Claim 2]The piezo electric speaker according to claim 1, wherein a dimension of a longitudinal direction of the aforementioned panel is made into odd times of a before [from 3 times of width of the transverse direction of the aforementioned piezoelectric device / 9 times].

[Claim 3]In a piezo electric speaker which stuck a piezoelectric device on a panel, a piezoelectric device and a panel are rectangles, This piezoelectric device is stuck so that a longitudinal direction of this piezoelectric device may be along an end of the transverse direction of this panel at a neighborhood of a longitudinal direction of this panel, and a dimension of a longitudinal direction of this panel, A piezo electric speaker, wherein it is carried out by odd times the width of a longitudinal direction of this piezoelectric device and a dimension of the transverse direction of this panel is made into odd times of width of the transverse direction of this piezoelectric device.

[Claim 4]The piezo electric speaker according to claim 3, wherein a dimension of a longitudinal direction of the aforementioned panel is made into odd 3 times of width of a longitudinal direction of the aforementioned piezoelectric device, or 5 times as many times and a dimension of the transverse direction of this panel is made into odd times of a before [from 3 times of width of the transverse direction of this piezoelectric device / 9 times].

[Claim 5]In a piezo electric speaker which stuck a piezoelectric device on a panel, a piezoelectric device and a panel are rectangles, This piezoelectric device is stuck near the center of this panel so that a longitudinal direction of this piezoelectric device and a longitudinal direction of this panel may become in the direction, and a dimension of a longitudinal direction of this panel, A piezo electric speaker, wherein it is carried out by odd times the width of a longitudinal direction of this piezoelectric device and a dimension of the transverse direction of this panel is made into odd times of width of the transverse direction of this piezoelectric device.

[Claim 6]The piezo electric speaker according to claim 5, wherein a dimension of a longitudinal direction of the aforementioned panel is made into odd 3 times of width of a longitudinal direction of this piezoelectric device, or 5 times as many times and a dimension of the transverse direction of this panel is made into odd times of a before [from 1 time of width of the transverse direction of the aforementioned piezoelectric device / 5 times].

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]The present invention relates to a piezo electric speaker.

[0002]

[Description of the Prior Art]The piezo electric speaker fixed the piezoelectric device 2 to the metal plate 3 used as a base material, and was making voltage apply and pronounce conventionally, with polarity as shown in the figure (B) or the figure (C), as shown in Fig.4 (A). Or the piezoelectric device containing the metal plate 3 was stuck on the larger resin sheet etc., and was made to pronounce.

[0003]

[Problem to be solved by the invention]in the above structures, by restrictions etc. of the place to attach, it set and came out, especially the size of the metal plate 3 or a resin sheet was, and, as for the relation with the size of a piezoelectric device, consideration in particular was not carried out. Therefore, the conventional piezo electric speaker was not able to be referred to as having harnessed the motion of a piezoelectric device to the utmost. The object of this invention eliminates the fault of the above-mentioned prior art, and there is in realizing the piezo electric speaker which can be referred to as having harnessed the motion of a piezoelectric device to the utmost.

[0004]

[Means for solving problem]In the piezo electric speaker which stuck the piezoelectric device on the panel by invention of Claim 1 for the above-mentioned purpose achievement, A piezoelectric device and a panel are rectangles, and this piezoelectric device is stuck so that the longitudinal direction of this piezoelectric device may be along the end of the longitudinal direction of this panel at the neighborhood of the transverse direction of this panel, The dimension of the longitudinal direction of this panel is made into odd times of the width of the transverse direction of this piezoelectric device (in addition, since "the longer one" is called a "stretcher", on these Descriptions, "the shorter one" is called the "shorter side"). In invention of Claim 2, the dimension of the longitudinal direction of the panel said to Claim 1 is made into odd times of a before [from 3 times of the width of the transverse direction of the piezoelectric device said to Claim 1 / 9 times].

[0005]In the piezo electric speaker which stuck the piezoelectric device on the panel in invention of Claim 3, A piezoelectric device and a panel are rectangles, and this piezoelectric device is stuck so that the longitudinal direction of this piezoelectric device may be along the end of the transverse direction of this panel at the neighborhood of the longitudinal direction of this panel, The dimension of the longitudinal direction of this panel is made into odd times of the width of the longitudinal direction of this piezoelectric device, and the dimension of the transverse direction of this panel is made into odd times of the width of the transverse direction of this piezoelectric device. In invention of Claim 4, the dimension of the longitudinal direction of the panel said to Claim 3 is made into odd 3 times of the width of the longitudinal direction of the piezoelectric device said to Claim 3, or 5 times as many times, and the dimension of the transverse direction of this panel is made into odd times of a before [from 3 times of the width of the transverse direction of this piezoelectric device / 9 times].

[0006]In the piezo electric speaker which stuck the piezoelectric device on the panel in invention of Claim 5, A piezoelectric device and a panel are rectangles, and this piezoelectric device is stuck so that the longitudinal direction of this piezoelectric device and the longitudinal direction of this panel may become in the direction near the center of this panel, The dimension of the longitudinal direction of this panel is made into odd times of the width of the longitudinal direction of this piezoelectric device, and the dimension of the transverse direction of this panel is made into odd times of the width of the transverse direction of this piezoelectric device. In invention of Claim 6, the dimension of the longitudinal direction of the panel said to Claim 5 is made into odd 3 times of the width of the longitudinal direction of this piezoelectric device, or 5 times as many times, and the dimension of the transverse direction of the panel said to Claim

5 is made into odd times of a before [from 1 time of the width of the transverse direction of the aforementioned piezoelectric device / 5 times].

[0007]

[Mode for carrying out the invention] Hereafter, the details of the present invention are described based on the example of a graphic display embodiment. The first example of an embodiment is shown in Fig.1. This example of an embodiment hits Claim 1 or the example of 1 embodiment of invention of Claim 2. The piezoelectric device 1 and the panel 2 are rectangles, and the piezoelectric device 1 is stuck on the metal plate of the substantially same size. Simultaneously with it, it is stuck on the left end of the panel 2 here so that the longitudinal direction of the piezoelectric device 1 may be along the neighborhood of the transverse direction of the panel 2. As for the thickness of the piezoelectric device 1, at this time, the thickness of 50 micro and a metal plate of the thickness of 50 micro and the panel 2 is also 300micro. The material of the panel 2 is polypropylene and 70 mm and the shorter side dimension of the piezoelectric device 1 of the dimension of the long side of the panel 2 are 10 mm. Namely, the dimension of the long side of the panel 2 is set up by 7 times the shorter side dimension of the piezoelectric device 1.

[0008] Thus, the piezoelectric device 1 and the panel 2 are made into a rectangle, and when it specifies so that the size may be told to Claim 1 or Claim 2, there are the following operations. That is, as a fundamental oscillation of the piezoelectric device 1, as shown in (B) of Fig.4, and (C), the flexing vibration of the piezoelectric-device 1 whole occurs, and as for this, a longitudinal direction and the transverse direction appear as a fundamental oscillation. By reproducing this fundamental oscillation exactly, vibration of the piezoelectric device 1 can be utilized to the utmost. For that purpose, it is good to make the dimension of the panel 2 to stick into the dimension that the fundamental oscillation of the piezoelectric device 1 rides odd times. Thereby, panel 2 the very thing also resonates easily, and a loud sound can be made now. Also at this time, if the dimension of the panel 2 is the dimension that a fundamental oscillation rides even times, at this time, although the panel 2 resonates easily, since it produces as a reverse vibration of a phase is the same, it drowns a sound, and a sound becomes difficult to come out of it. Such an operation is the same also about invention of Claim 5 or Claim 6 described by invention said to Claim 3 or Claim 4 described by the below-mentioned second example of an embodiment, or the 3rd example of an embodiment.

[0009] As magnification, it is preferable that the dimension of the longitudinal direction of the panel 2 considers it as odd times of a before [from 3 times of Haba of the transverse direction of the piezoelectric device 1 / 9 times], i.e., 3 times, 5 times, 7 times, and 9 times as many either.

[0010] The characteristic of the piezoelectric loudspeaker of this first example of an embodiment is shown in Fig.5. A peak is near 4 kHz and this frequency is considered to be the resonance frequency decided by Haba of a piezoelectric device. When the panel 2 was cut, it was made one 6 times the length of this for the check and the characteristic was seen, as shown in Fig.6, near 4 kHz serves as DIBBU, and it has checked that denial **** had occurred.

[0011] The second example of an embodiment is shown in Fig.2. This example of an embodiment hits Claim 3 or the example of 1 embodiment of invention of Claim 4. Here, the piezoelectric device 1 and the panel 2 are rectangles, and the piezoelectric device 1 is stuck on the metal plate of the substantially same size. Simultaneously with it, the piezoelectric device 1 is stuck on the transverse direction here at the lower right end of the panel 2 so that the longitudinal direction of the piezoelectric device 1 may be along the end of the transverse direction of the panel 2 at the neighborhood of the longitudinal direction of the panel 2. The thickness of the piezoelectric device 1, the thickness of a metal plate and the thickness of the panel 2, and material are the same as the first example of an embodiment. As for the dimension of 120 mm and a shorter side, the dimension of 40 mm and a shorter side of the dimension of the long side of 70 mm and the piezoelectric device 1 is [dimension of the long side of the panel 2] 10 mm. Namely, the dimension of the long side of the panel 2 is set up by 3 times the long side dimension of the piezoelectric device 1, and the dimension of the shorter side of the panel 2 is set up by 7 times the shorter side dimension of the piezoelectric device 1.

[0012] As magnification, the dimension of the longitudinal direction of the panel 2 is made into odd 3 times of the width of the longitudinal direction of the aforementioned piezoelectric device 1, or 5 times as many times, and it is preferable that the dimension of the transverse direction of this panel carries out by odd times from 3 times of the width of the transverse direction of this piezoelectric device before 9 times.

[0013] The 3rd example of an embodiment is shown in Fig.3. This example of an embodiment hits Claim 5 or the example of 1 embodiment of invention of Claim 6. The piezoelectric device 1 and the panel 2 are rectangles also here, and the piezoelectric device 1 is stuck on the metal plate of the substantially same size. Simultaneously with it, the piezoelectric device 1 is stuck on the panel 2 so that the longitudinal direction of the piezoelectric device 1 and the longitudinal direction of the panel 2 may become in the direction near the center of the panel 2. The thickness of the piezoelectric device 1, the thickness of a

metal plate and the thickness of the panel 2, and material are the same as the first example of an embodiment. As for the dimension of 150 mm and a shorter side, the dimension of 50 mm and a shorter side of the dimension of the long side of 54 mm and the piezoelectric device 1 is [dimension of the long side of the panel 2] 18 mm. Namely, the dimension of the long side of the panel 2 is set up by 3 times the dimension of the long side of the piezoelectric device 1, and the shorter side dimension of the panel 2 is set up by 3 times the shorter side dimension of the piezoelectric device 1.

[0014]It is preferable that the dimension of the longitudinal direction of the panel 2 is made into odd 3 times of the width of the longitudinal direction of the piezoelectric device 1 or 5 times as many times, and the dimension of the transverse direction of this panel considers it as odd times of a before [from 1 time of the width of the transverse direction of the aforementioned piezoelectric device 1 / 5 times], i.e., 1 time, 3 times, and 5 times as many either as magnification.

[0015]

[Effect of the Invention]As described above, in application-concerned each invention, the piezoelectric device and the panel were made into the rectangle, and the length of these neighborhoods was made one odd times the relation of this. Therefore, the fundamental oscillation of the piezoelectric device should be exactly reproduced as vibration of a panel, and vibration of a piezoelectric device should be utilized to the utmost.

[Translation done.]

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TECHNICAL FIELD

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[Translation done.]

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PRIOR ART

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MEANS

[Means for solving problem]In the piezo electric speaker which stuck the piezoelectric device on the panel by invention of Claim 1 for the above-mentioned purpose achievement, A piezoelectric device and a panel are rectangles, and this piezoelectric device is stuck so that the longitudinal direction of this piezoelectric device may be along the end of the longitudinal direction of this panel at the neighborhood of the transverse direction of this panel, The dimension of the longitudinal direction of this panel is made into odd times of the width of the transverse direction of this piezoelectric device (in addition, since "the longer one" is called a "stretcher", on these Descriptions, "the shorter one" is called the "shorter side"). In invention of Claim 2, the dimension of the longitudinal direction of the panel said to Claim 1 is made into odd times of a before [from 3 times of the width of the transverse direction of the piezoelectric device said to Claim 1 / 9 times].

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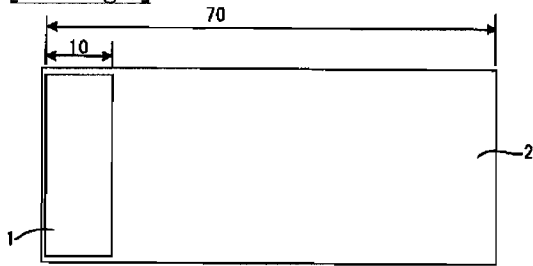
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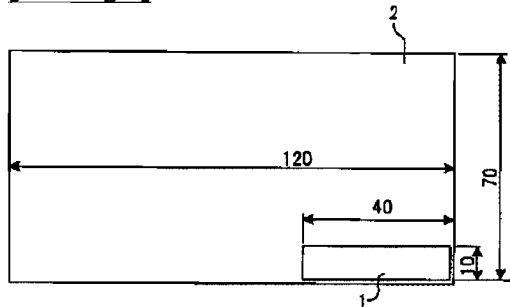
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DRAWINGS

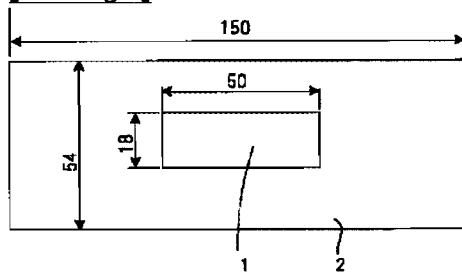
[Drawing 1]



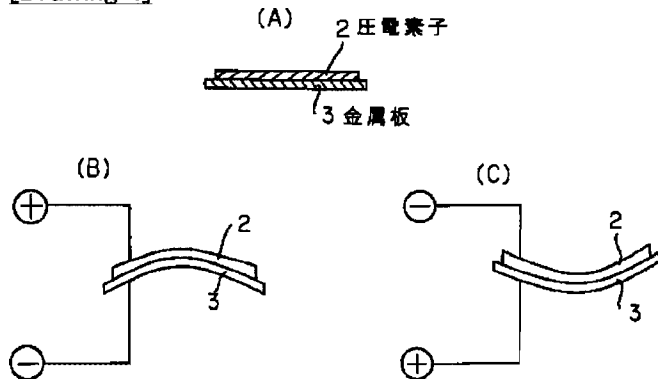
[Drawing 2]



[Drawing 3]



[Drawing 4]



[Drawing 5]

