



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
28.09.2011 Bulletin 2011/39

(51) Int Cl.:
G10C 3/00 (2006.01)

(21) Application number: **10158056.1**

(22) Date of filing: **26.03.2010**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL
PT RO SE SI SK SM TR**
Designated Extension States:
AL BA ME RS

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(54) **Device for damping the sound of a grand piano**

(57) Device for damping the sound of a grand piano, comprising a muter, characterized in that said device comprises a frame arranged to be placed on a floor under a grand piano, wherein said muter is arranged above said frame, connecting means which connect said muter

with said frame, said connecting means being extendable such that said muter can be moved to a desired height under the beams on the lower side of the sound board and/or such that said muter can be moved against said beams with a certain force.

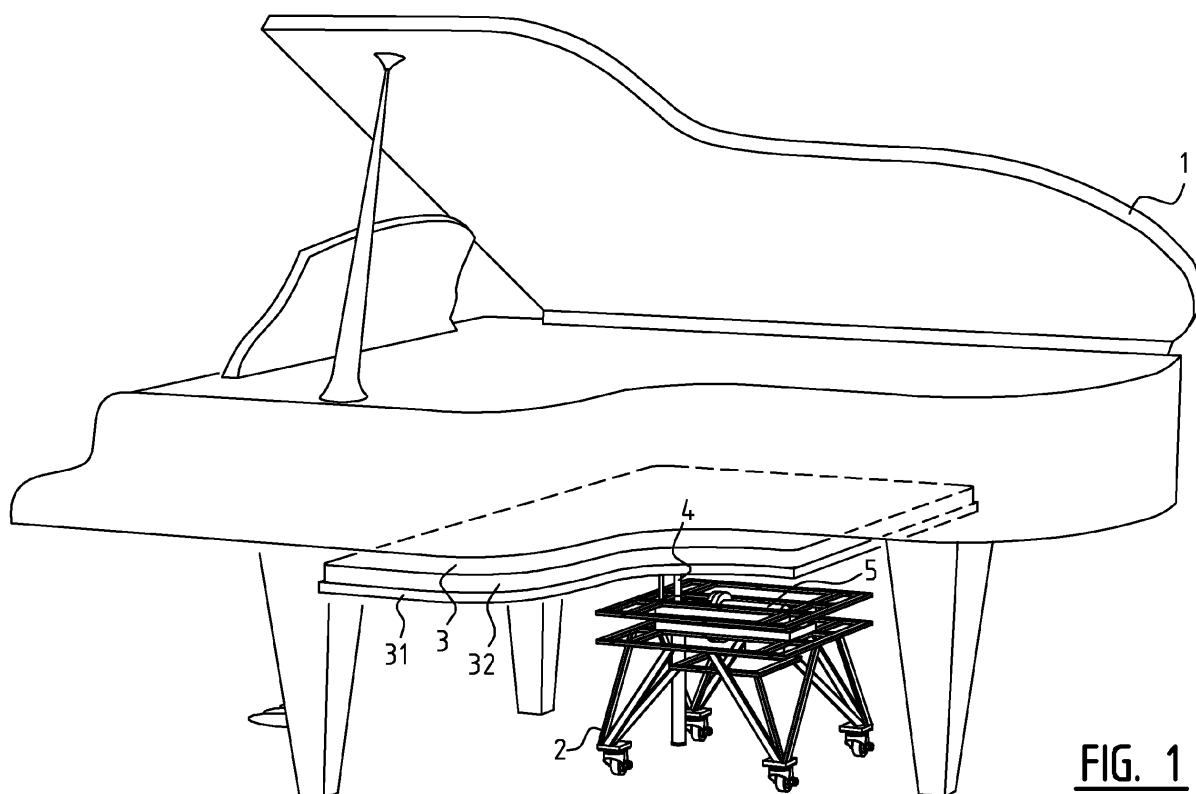


FIG. 1

Description

[0001] The invention relates to a device for damping the sound of a grand piano, comprising a muter.

[0002] Such a device is described in US 6,720,489, wherein the muter is comprised of acoustic foam to be placed beneath the soundboard of the piano, between the beams thereof, in order to attenuate the downward transmission of sound.

[0003] The goal of the invention is a device which is able to attenuate the transmission of sound more effectively and/or which is able to attenuate the transmission of sound to a desired degree which can be set by a user.

[0004] According to the invention, the device comprises a frame arranged to be placed on a floor under a grand piano, wherein said muter is arranged above said frame, connecting means which connect said muter with said frame, said connecting means being extendable such that said muter can be moved to a desired height under the beams on the lower side of the sound board and/or such that said muter can be moved against said beams with a certain force. Tests have proven that the amount of damping can be regulated to a desired level by moving the muter farther or closer to the beams under the soundboard, and that a maximum amount of damping is obtained by not only moving the muter against said beams, but also by pushing with a certain force such that no vibrating air can escape the room above and between the beams.

[0005] Said muter is preferably dimensioned so as to be able to close the area between the lower sides of the beams and the sound board. Said muter has preferably substantially the same shape as a sound board of a grand piano. Preferably the upper side of said muter is substantially flat. Said muter preferably comprises a layer of rigid material with a layer of resilient material on top of it, preferably a layer of acoustic insulation material. Preferably said layer of acoustic insulation material comprises a lower layer of insulating felt like material, and an upper layer of acoustically structured absorbing open cell foam.

[0006] Said connecting means are preferably connected to a motor for extending said connecting means. Said motor is preferably arranged to be automatically switched off when a predetermined power threshold is reached. Said motor comprises preferably input means to set said power threshold.

[0007] Preferably said connecting means comprise a vertical externally threaded shaft or a rack, which is attached to said muter, and slidingly mounted in a vertical tube in said frame. Said shaft or rack is preferably driven by said motor through a worm and worm gear. In order to prevent the muter from rotating with the threaded shaft, said connecting means further preferably comprise at least one vertical stationary shaft, which is coupled to said muter at a distance from and parallel to said threaded shaft and which is slidingly mounted in said frame.

[0008] Said frame preferably comprises wheels for moving the frame on a floor.

[0009] The invention will be elucidated by means of a preferred embodiment as shown in the drawings, wherein:

Figure 1 is a perspective view of a grand piano with a device in accordance with the invention; and

Figure 2 is a more detailed perspective view of the device of figure 1.

[0010] According to figure 1, the device for damping the sound of a grand piano 1 comprises a metal frame 2, which arranged to be placed on a floor under the grand piano 1, a muter 3 and connecting means 4, said connecting means 4 connecting the muter 3 with the frame 2. The frame 2 is further provided with an electrical motor 5 for extending and retracting the connecting means 4 in vertical direction, such that the muter 3 can be moved upward and downward.

[0011] According to figure 2, the frame 2 comprises a substantially square lower main frame 21 extending in a horizontal plane, and connected to a substantially identical upper main frame 22 extending parallel thereto. The motor 5 is mounted between said main frames 21, 22.

[0012] Each corner of the lower main frame is provided with legs 23, which have castors 24 at their lower ends, so that the frame can be rolled on the floor. The castors are further connected to a subsidiary inner frame 25, which extends under said main frame 21, and which provides extra strength for preventing the legs 23 with the castors 24 to bend outwardly if a downward force is exerted on the frame.

[0013] A vertical tube 41 is mounted in the frame 1, and attached to the lower main frame 21 and upper main frame 22. In the tube 41 an externally threaded shaft 42 is slidingly mounted. The shaft 42 is 290 mm long and is driven in vertical direction by the motor 5, by means of a worm and worm gear (not shown), such that if the motor axis rotates at 1500 rpm the shaft moves at 15 mm/s.

[0014] The frame 2 is further provided with one or two vertical stationary shafts 43, at a distance from and parallel to the threaded shaft 42 and which are slidingly mounted their own vertical tubes (not shown) in the frame 2.

[0015] The motor 5 comprises a power cord and a power adapter (not shown) for connecting the motor to the mains. The power of the motor 5 is chosen such that the maximum upward force of the shaft is about 500 N (or 50 kg). The motor 5 is arranged to automatically be switched off when this maximum force is reached. Preferably the motor 5 comprises input and control means to limit said maximum force to another, lower, value, for instance by means of a microcontroller controlling the maximum torque of the motor. Further the motor can be manually switched on and off and the direction of movement of the shaft 42 can be chosen, by means of a tumbler switch, whereby a user can move the muter to any desired height between the lowest position wherein the mut-

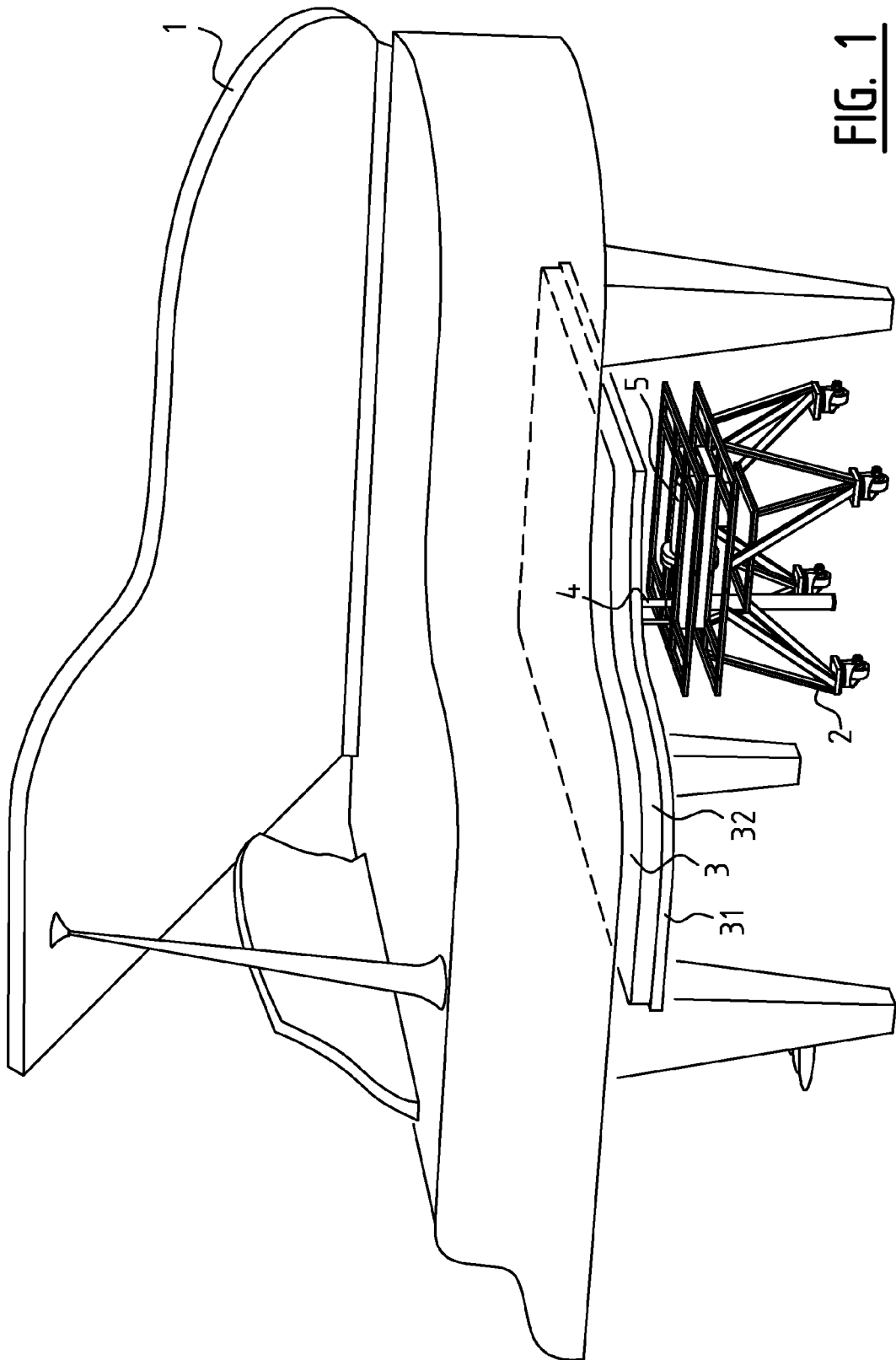
er extends on or near the upper main frame 22, and the highest position wherein the muter 3 pushes against the lower sides of the beams under the sound board of the grand piano 1 with maximum force.

[0016] On the upper end of the shafts 42, 43 a plate shaped connecting element 44 is mounted, which extends horizontally and on which the muter 3 is mounted at its centre of gravity. The muter 3 comprises a plate shaped 1.2 cm thick wooden board 31, and a layer 32 of 6.5 cm thick resilient material on top of said board. The board 31 and the layer 32 of resilient material may be enclosed in a thin fabric cover. The layer 32 of resilient acoustic insulation and absorption material comprises an insulating lower layer of 3.5 cm of felt like material and a sound absorbing structured upper layer of 3 cm of open cell foam. The muter 3 is tailor made for each type of grand piano in order to narrowly fit against and entirely close the lower opening of the grand piano 1 under the sound board while resting against the beams.

[0017] Although the invention is exemplified by an embodiment thereof, the scope of the current teaching is not restricted to said embodiment. The skilled person will appreciate that many modifications can be made and that equivalent features may substitute the described features without departing from the teachings of the invention.

Claims

1. Device for damping the sound of a grand piano, comprising a muter, **characterized in that** said device comprises a frame arranged to be placed on a floor under a grand piano, wherein said muter is arranged above said frame, connecting means which connect said muter with said frame, said connecting means being extendable such that said muter can be moved to a desired height under the beams on the lower side of the sound board and/or such that said muter can be moved against said beams with a certain force.
2. Device for damping the sound of a grand piano in accordance with claim 1, wherein the upper side of said muter is substantially flat.
3. Device for damping the sound of a grand piano in accordance with claim 1 or 2, wherein said muter is dimensioned so as to be able to close the area between the lower sides of the beams and the sound board.
4. Device for damping the sound of a grand piano in accordance with claim 1, 2, 3, wherein said muter has substantially the same shape as a sound board of a grand piano.
5. Device for damping the sound of a grand piano in accordance with any of the previous claims, wherein said muter comprises a layer of rigid material with a layer of resilient material on top of it.
6. Device for damping the sound of a grand piano in accordance with any of the previous claims, wherein said connecting means are connected to a motor for extending and lowering said connecting means.
7. Device for damping the sound of a grand piano in accordance with claim 6, wherein said motor is arranged to be automatically switched off when a pre-determined power threshold is reached.
8. Device for damping the sound of a grand piano in accordance with claim 6 or 7, wherein said motor comprises input means to set said power threshold.
9. Device for damping the sound of a grand piano in accordance with any of the previous claims, wherein said connecting means comprise a vertical externally threaded shaft or a rack, which is attached to said muter, and slidingly mounted in a vertical tube in said frame.
10. Device for damping the sound of a grand piano in accordance with any of the previous claims, wherein said connecting means further comprise at least one vertical stationary shaft, which is coupled to said muter at a distance from and parallel to said threaded shaft and which is slidingly mounted in said frame.
11. Device for damping the sound of a grand piano in accordance with claim 9 or 10, wherein said shaft is driven by said motor through a worm and worm gear.
12. Device for damping the sound of a grand piano in accordance with any of the previous claims, wherein said frame comprises wheels for moving the frame on a floor.



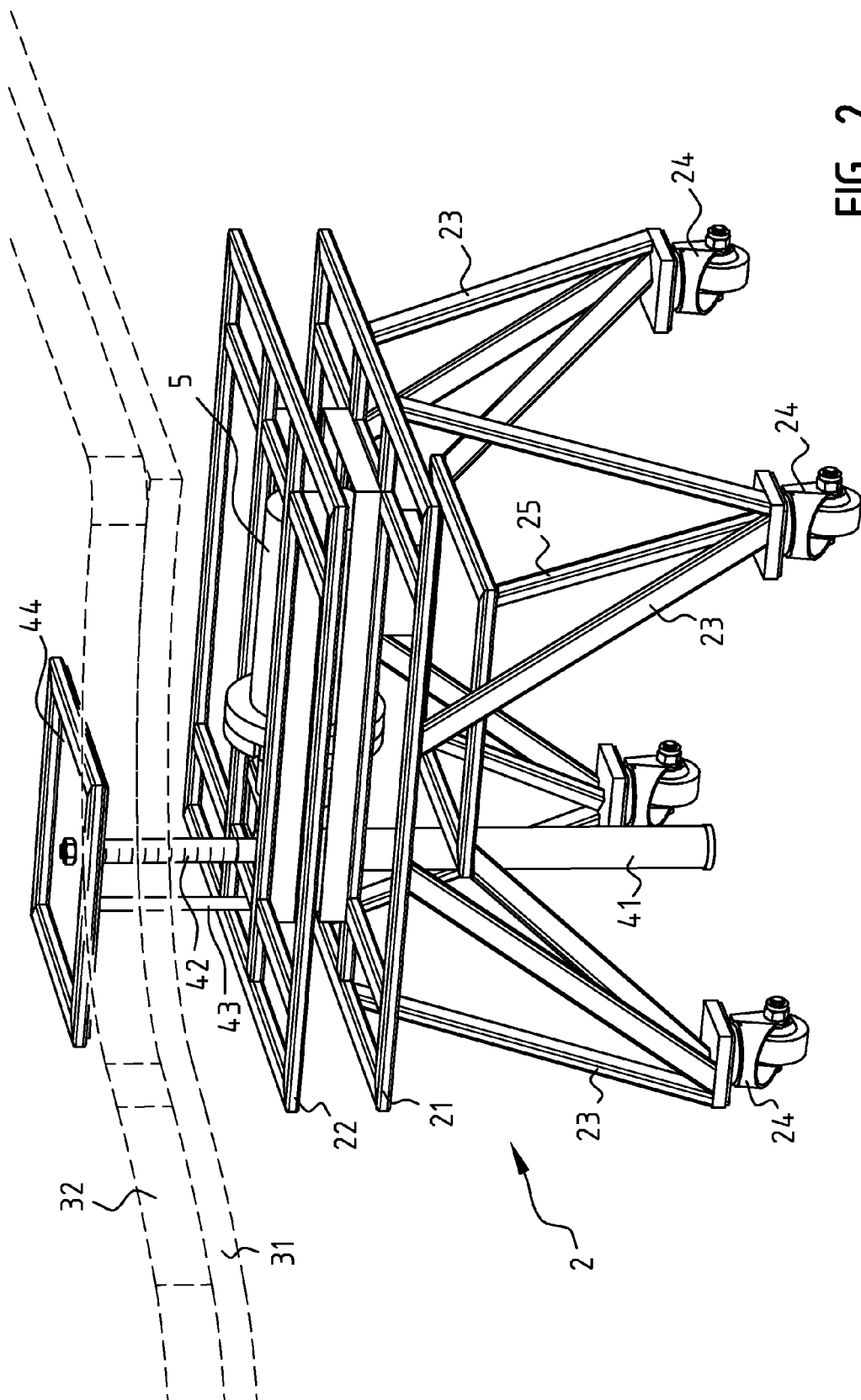


FIG. 2



EUROPEAN SEARCH REPORT

Application Number
EP 10 15 8056

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 6 030 045 A (HOSHINO YOSHIHIRO [JP]) 29 February 2000 (2000-02-29)	1,2,5,9	INV. G10C3/00
A	* the whole document *	4	
X	DE 201 10 276 U1 (MENGLER WALTER [DE]) 20 September 2001 (2001-09-20)	1-3,5	
A	* the whole document *	4	
X	US 50 042 A (SHERLOCK) 19 September 1865 (1865-09-19)	1,9,10	
X	US 2006/238008 A1 (BARANOV MICHAEL V [US] ET AL) 26 October 2006 (2006-10-26)	1,9	
X	DE 199 55 085 A1 (MAUL JAKOB GMBH [DE]) 17 May 2001 (2001-05-17)	1,12	
A	US 2003/226439 A1 (REVENAUGH DANIELL [US]) 11 December 2003 (2003-12-11)	4	
A	WO 93/17299 A1 (REVENAUGH DANIELL [US]) 2 September 1993 (1993-09-02)	4	
The present search report has been drawn up for all claims			
			G10C
Place of search		Date of completion of the search	Examiner
The Hague		16 April 2010	Lupo, Angelo
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

4
EPO FORM 1503 03.82 (P04C01)



Application Number

EP 10 15 8056

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1-5, 9, 10, 12

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).



**LACK OF UNITY OF INVENTION
SHEET B**

Application Number

EP 10 15 8056

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-5, 9, 10, 12

Device for damping the sound of a grand piano having a structure able to bear a muter which has a shape adapted to match the shape the grand piano sound board.

2. claims: 6-8, 11

Device suitable for damping the sound of a grand piano and having motorised means arranged to lifting and lowering the muter and controlling means arranged to switch the motor according to a certain settable power threshold.

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 10 15 8056

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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16-04-2010

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US 2006238008	A1	26-10-2006	NONE
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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 6720489 B [0002]