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(54) **Piano key assembly and method of adjusting a piano key assembly**

(57) A piano key assembly (11) with an elongated body (12)having a first key end (13) and a second key end (15). The first key end defines a playing surface (14) and the opposite second key end is for actuation of a piano hammer. A weighted member (16) is provided, which is adjustably attached to an adjustment region (17) at the second key end. A piano can be equipped with such piano key assemblies, wherein the piano key assemblies are arranged on a balancing rail (8) defining a balancing surface. The force required to depress the piano keys can be adjusted by the presented method, wherein the weighted member are displaced within the adjustment region.

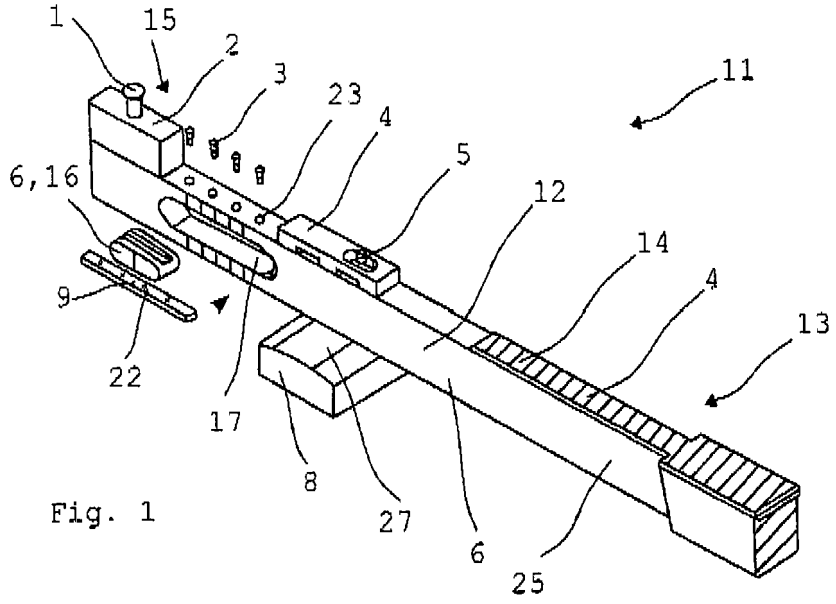

Fig. 1

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Description

[0001] The present invention relates to a piano key assembly and pianos having lever action piano keys which displace variable mass hammers when depressed. The present invention further relates to a method for adjusting the touch force required to depress a piano key.

[0002] Numerous types of mechanisms have been employed in piano key action. In the typical piano key action, when the front portion of a piano key is depressed, the rear portion of the piano key actuates a piano hammer operating mechanism. The piano hammer operating mechanism subsequently causes the felt-covered piano hammer to strike its respective piano string. The touch force required to depress a piano key varies over the scale due to differences in the weight of the piano hammers. The weight of the piano hammers varies over the normally from about 10 to 12 grams at the bass end of the scale, to about 3 to 4 grams at the treble end of the scale. Additionally, the force required to actuate the hammers is affected by the difference in lever ratio arising from the length of a black key being shorter than the length of the white key.

[0003] The variation in touch force makes it extremely difficult for anyone but a highly experienced, professional pianist to maintain a uniform dynamic range as the piano is played. Accordingly, it is desirable for the force required to depress a piano key be uniform over the scale. Moreover, it is desirable to vary the touch of the keys to suit individual preference and to be able to effect this variation or adjust quickly and conveniently.

[0004] It is common practice to adjust the touch of key by placing permanent weights into holes bored through the side of the piano keys. The weights are placed a distance from the fulcrum so that all the keys use the same touch force. This method of adjusting the piano key touch force is subject to multiple sources of error. Furhter, once the weights are affixed, they cannot be adjusted anymore. Furthermore, through use, the hammers will become worn, thus affecting the accuracy of the original weight adjustment.

[0005] The object of the present invention is to provide an adjustable piano key assembly, a piano with such key assemblies, and a method for adjusting such piano key assemblies.

[0006] This purpose is fulfilled by a piano key assembly according to claim 1, a piano with such key assemblies according to claim 13 and a method of adjusting the force required to depress a piano key according to claim 14. Preferred configurations are object of the subclaims. Further features and advantages are presented in the described embodiments.

[0007] It will be understood that the present invention is directed to a touch force adjustment means wherein key weights are used to obtain a substantially equal static touch force from key to key. The adjustment means of the present invention enables adjustment of the touch force required to depress a piano key to accommodate pianists with varying preferences and requirements. The ability to easily vary the piano key touch force avoids the need to purchase multiple pianos for different pianist. Yet another object of the present invention is to provide a touch force adjustment means which can inexpensively be incorporated into new or existing pianos without substantial structural modifications.

[0008] The piano key assembly according to the present invention comprises an elongated body having a first key end defining a playing surface and an opposite, second key end for actuation of a piano hammer. A weighted member is provided, which is adjustably attached to an adjustment region at the second key end.

[0009] Such a piano key assembly offers many advantages. One substantial advantageous is that the touch force required to depress a piano key can easily be adjusted to specific preferences of a user. Furthermore, the touch force can also be readjusted after a long time of usage or after house moving.

[0010] Preferably, the adjustment region is a slot in the second key end of the elongated body.

[0011] In advantageous configurations, the slot is elongated in shape with rounded corners.

[0012] In favored embodiments, the weighted member is adapted and constructed to fit into the slot and wherein the weighted member has a shorter length than the slot.

[0013] It is also preferred that the weighted member is adjustably attached to the slot by means of a security strip.

[0014] Preferably, the security strip is made at least in part of metal, plastic or wood. In especially soft metal like iron or copper is suitable.

[0015] In other preferred configurations, the security strip comprises at least one, preferably more than one and in particular four holes. These holes preferably correspond to at least one, preferably more than one and in particular four holes provide in the elongated body defining the adjustment region.

[0016] The security strip and the weighted member are in preferred embodiments fixable in a specific position in the adjustment region by at least one screw.

[0017] Preferably, the security strip is received in a corresponding guide slot in the weighted member.

[0018] In advantageous configurations, the weighted member is a lead block.

[0019] The piano key assembly according to any of the preceding claims, wherein the adjustment region and the weighted member comprise an adjustment scale.

[0020] Preferably, the piano key assembly further comprises a rear bed plate with a nail and/or a center bed plate with a balancing nail.

[0021] The piano according to the present inventions comprises a balance rail defining a balance surface and at least one piano key assembly as described before. The at least one piano key assembly is supported by said balance surface of said balance rail for pivoting movement in response to application of force applied to the first key end of the at least one piano key assembly.

[0022] The method of adjusting the force required to depress a piano key according to the present invention comprises the steps of providing a balance rail defining a balance surface and providing at least one piano key assembly as described before. The at least one piano key assembly is supported by said balance surface of said balance rail for pivoting movement in response to application of force applied to the first key end of the at least one piano key assembly. The weighted member adjustably attached to the adjustment region is displaced within said adjustment region to adjust the touch force required to depress the piano key.

[0023] Preferably, at least one screw is used to fix the weighted member is a specific position.

[0024] In the drawings

FIG. 1 depicts an exploded side view of the piano key touch force adjustment system;
FIG. 2a depicts the side view of piano key touch force adjustment system with the key weight positioned to maximize required touch force;
FIG. 2b depicts the side view of piano key touch force adjustment system with the key weight positioned to minimize required touch force;
FIG. 3a depicts the side view of the key weight;
FIG. 3b depicts the perspective view of the key weight;
FIG. 3c depicts the top view of the key weight;
FIG. 4a depicts the top view of the strip; and
FIG. 4b depicts the side view of the strip.

[0025] Referring to FIG. 1, which shows one embodiment of the piano key assembly 11 according to the present invention. The piano key 6 is arranged on a balance rail 8 defining a balance surface 27. The piano key 6 comprises an elongated body 12 having a first key end 13 defining a playing surface 14 and an opposite, second key end 15 positioned for actuation of a piano hammer. Mounted on the balance rail 8 is a fulcrum pin or balance nail 5. The piano key 6 has a bore receiving the fulcrum pin 5. On the top surface of the first key end 13, the piano key 6 is provided with a key covering 7 defining a playing surface 14, typically made of plastic. The center bed plate 4 is attached to the top surface of the piano key 6. The rear bed plate 2 is attached to the top surface of the second key end 15 of piano key 6, comprising a nail 1.

[0026] Within the portion of piano key 6 between the center bed plate 4 and rear bed plate 2 is the adjustment region 17 which in this case is a slot 18 in the elongated body 12. The slot 18 is a kind of elongated chamber 18, wherein this elongated chamber 8 preferably has rounded ends and is approximately 60 mm in length, 10,2 mm in width, and 10,2 mm in height. Between the center bed plate 4 and rear bed plate 2 are four holes 22 traversing the top surface of piano key 6 through to the adjustment region 17. In other embodiments another number of holes 22 can advantageous.

[0027] On the surface of piano key 6 exterior to the elongated chamber 18 are graduated markings spaced preferably between 5 mm and 8 mm. This adjustment scale 26 is helpful to adjust the force required to depress the piano key 6. The key weight 10 respectively the weighted member 16 is elongated shaped as depicted in FIG 3. Preferably, the weighted member 16 is approximately 26 mm in length, 10 mm in width, and 10 mm in height. On the top surface of the weighted member 16 is a guide slot 24, approximately 2 mm in depth and 4 mm in width as depicted in FIG 3b and FIG. 3c. The key weight 10 also includes a graduated marking belonging to the adjustment scale 26. In this embodiment, the weighted member 16 is a lead block 25.

[0028] A security strip 9 can be inserted into the guide slot 24, which in this embodiment is located on the top surface of weighted member 16. The strip 9 is preferably made of a soft metal 19 such as copper or iron. It can also advantageously be made of plastic 20 or wood 21.

[0029] The security strip 9 is in this embodiment approximately 3,5 mm in width, 1,5 mm in thickness, and is approximately the length of the slot 18 as depicted in FIG 4a and FIG 4b. The strip 9 may in some embodiments be fixedly attached to the weighted member 16 such as by gluing or welding, or may be detachably secured to the weighted member 16 such as with a clip, clasp, or velcro.

[0030] In this embodiment, however, the security strip 9 is loosely inserted into the guide slot 24 and is only hold in position by the sidewalls of the guide slot 24 and the top wall of the adjustment region 18. The weighted member 16 with the inserted security strip 9 is pushed into the elongated chamber 18. Now it is possible to slide the weighted member 16 along the security strip 9 in the adjustment region 17 to adjust the touch force required to depress the piano key 6.

[0031] The security strip 9 contains a series of holes 22 as depicted in FIG 4b. In this embodiment, the strip 9 has four holes 22. The outermost holes are approximately 6 mm from the end of the security strip 9. The spacing between the holes in the middle of security strip 9 is approximately 12 mm. The weighted member 16 with strip 9 attached is inserted into the elongated chamber 18 of piano key 6.

[0032] The four holes 22 in the strip 9 align with the four holes 23 in piano key 6. The lateral movement of weighted member 16 is restricted by rotating screws 3 from the top surface of piano key 6 into the corresponding holes 22 in security strip 9. The piano key 6 touch force may be adjusted by loosening the screws 3, repositioning weighted member 16 longitudinally within elongated chamber 18, and then rotating screws 3 from the top surface of piano key 6 into the corresponding holes 22 in security strip 9. Moving the weighted member 16 toward center bed plate 4 reduces piano key 6 touch force. Moving the weighted member 16 toward rear bed plate 4 increases piano key 6 touch force.

[0033] Although the foregoing description of the present invention covers a presently preferred embodi-

ment, it will nevertheless be understood and appreciated by those familiar with the art that changes, modifications and substitution of equivalent functioning elements may be made in the described embodiment without departing from the spirit and scope of this invention.

Reference numbers

[0034]

1	nail
2	rear bed plate
3	screw
4	center bed plate
5	balance nail
6	piano key
7	key covering
8	balance rail
9	security strip
10	key weight
11	piano key assembly
12	elongated body
13	first key end
14	playing surface
15	second key end
16	weighted member
17	adjustment region
18	slot, elongated chamber
19	metal
20	plastic
21	wood
22	hole
23	hole
24	guide slot
25	lead block
26	adjustment scale
27	balance surface

Claims

1. A piano key assembly (11) with an elongated body (12) having a first key end (13) defining a playing surface (14) and an opposite, second key end (15) for actuation of a piano hammer, **characterized in that**
a weighted member (16) is provided, which is adjustably attached to an adjustment region (17) at the second key end (15).

2. The piano key assembly (11) according to claim 1, wherein the adjustment region (17) is a slot (18) in the second key end (15) of the elongated body (12).

3. The piano key assembly according (11) to claim 2, wherein the slot (18) is elongated in shape with rounded corners.

4. The piano key assembly according (11) to any of claims 2-3, wherein the weighted member (16) is adapted and constructed to fit into the slot (13) and wherein the weighted member (16) has a shorter length than the slot (18).

5. The piano key assembly (11) according to any of claims 2-4, wherein the weighted member (16) is adjustably attached to the slot (18) by means of a security strip (9).

6. The piano key assembly (11) according to claim 5, wherein the security strip (9) is made at least in part of metal (19), plastic (20) or wood (21).

7. The piano key assembly (11) according to any of claims 5-6, wherein the security strip (9) comprises at least one, preferably more than one and in particular four holes (22) corresponding to at least one, preferably more than one and in particular four holes (23) provide in the elongated body (12) defining the adjustment region (17).

8. The piano key assembly (11) according to any of claims 5-7, wherein the security strip (9) and the weighted member (16) are fixable in a specific position in the adjustment region (17) by at least one screw (3).

9. The piano key assembly (11) according to any of claims 5-8, wherein the security strip (9) is received in a corresponding guide slot (24) in the weighted member (16).

10. The piano key assembly (11) according to any of the preceding claims, wherein the weighted member (16) is a lead block (25).

11. The piano key assembly (11) according to any of the preceding claims, wherein the adjustment region (17) and the weighted member (16) comprise an adjustment scale (26).

12. The piano key assembly (11) according to any of the preceding claims, further comprising a rear bed plate (2) with a nail (1) and/or a center bed plate (4) with a balance nail (5).

13. A piano comprising a balance rail (8) defining a balance surface (27) and at least one piano key assembly (11) according to any of claims 1-12, wherein said at least one piano key assembly (11) is supported by said balance surface (27) of said balance rail (8) for pivoting movement in response to application of force applied to the first key end (13) of the at least one piano key assembly (11).

14. A method of adjusting the force required to depress

a piano key comprising the steps of providing a balance rail (8) defining a balance surface (27) and providing at least one piano key assembly (11) according to any of claims 1-12, wherein said at least one piano key assembly (11) is supported by said balance surface (27) of said balance rail (8) for pivoting movement in response to application of force applied to the first key end (13) of the at least one piano key assembly (11), **characterized in that** the weighted member (16) adjustably attached to the adjustment region (17) is displaced within said adjustment region (17) to adjust the force required to depress the piano key (6).

15. The method of claim 14, wherein at least one screw (3) is used to fix the weighted member (16) is a specific position.

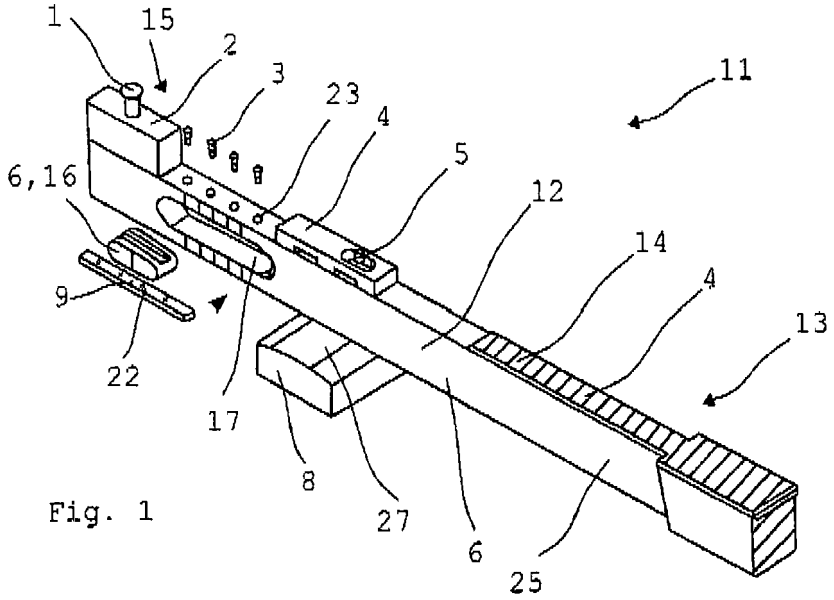

Fig. 1

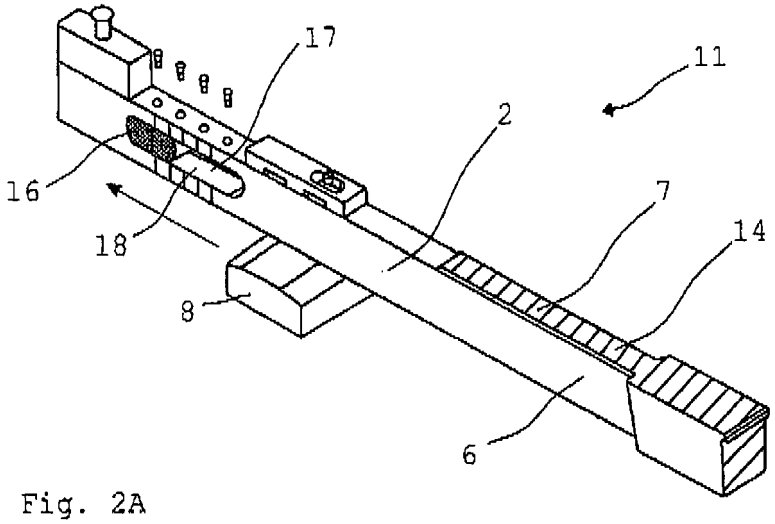

Fig. 2A

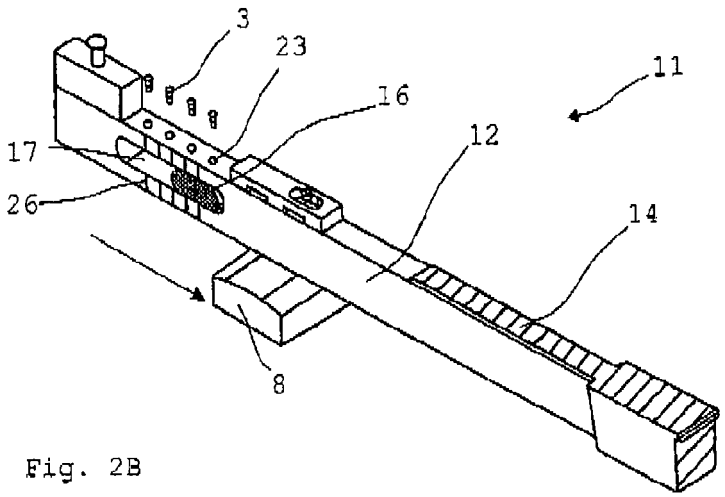

Fig. 2B

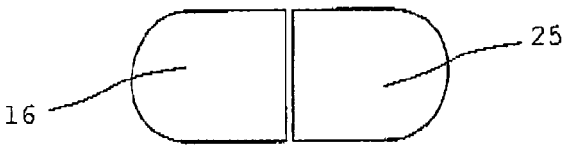

Fig. 3A

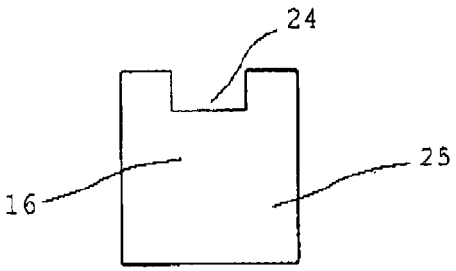

Fig. 3B

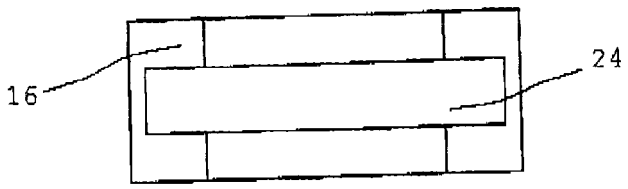

Fig. 3C

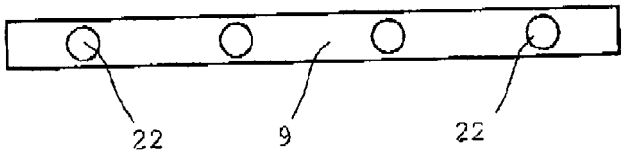

Fig. 4A

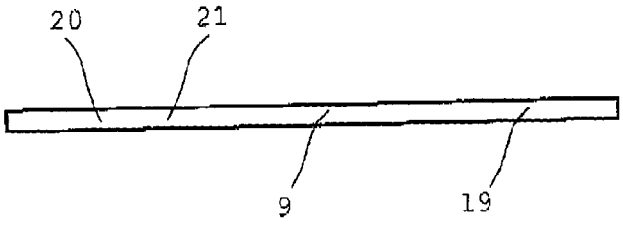

Fig. 4B

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EUROPEAN SEARCH REPORT

Application Number
EP 13 00 0350

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 1 341 035 A (HARRY BELL ET AL) 25 May 1920 (1920-05-25) * the whole document *	1-4, 10-15	INV. G10C3/12
X	US 1 589 745 A (BERTE FEDERLE) 22 June 1926 (1926-06-22) * the whole document *	1,2,4-15	
X	US 2002/073825 A1 (CHONO YASUHIRO [JP]) 20 June 2002 (2002-06-20) * paragraph [0101]; figure 2 *	1	
A	US 2003/070534 A1 (OOKUBO KENICHI [JP]) 17 April 2003 (2003-04-17) * abstract *	1	

TECHNICAL FIELDS SEARCHED (IPC)

G10C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	16 September 2013	Lorne, Benoît

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 13 00 0350

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16-09-2013

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