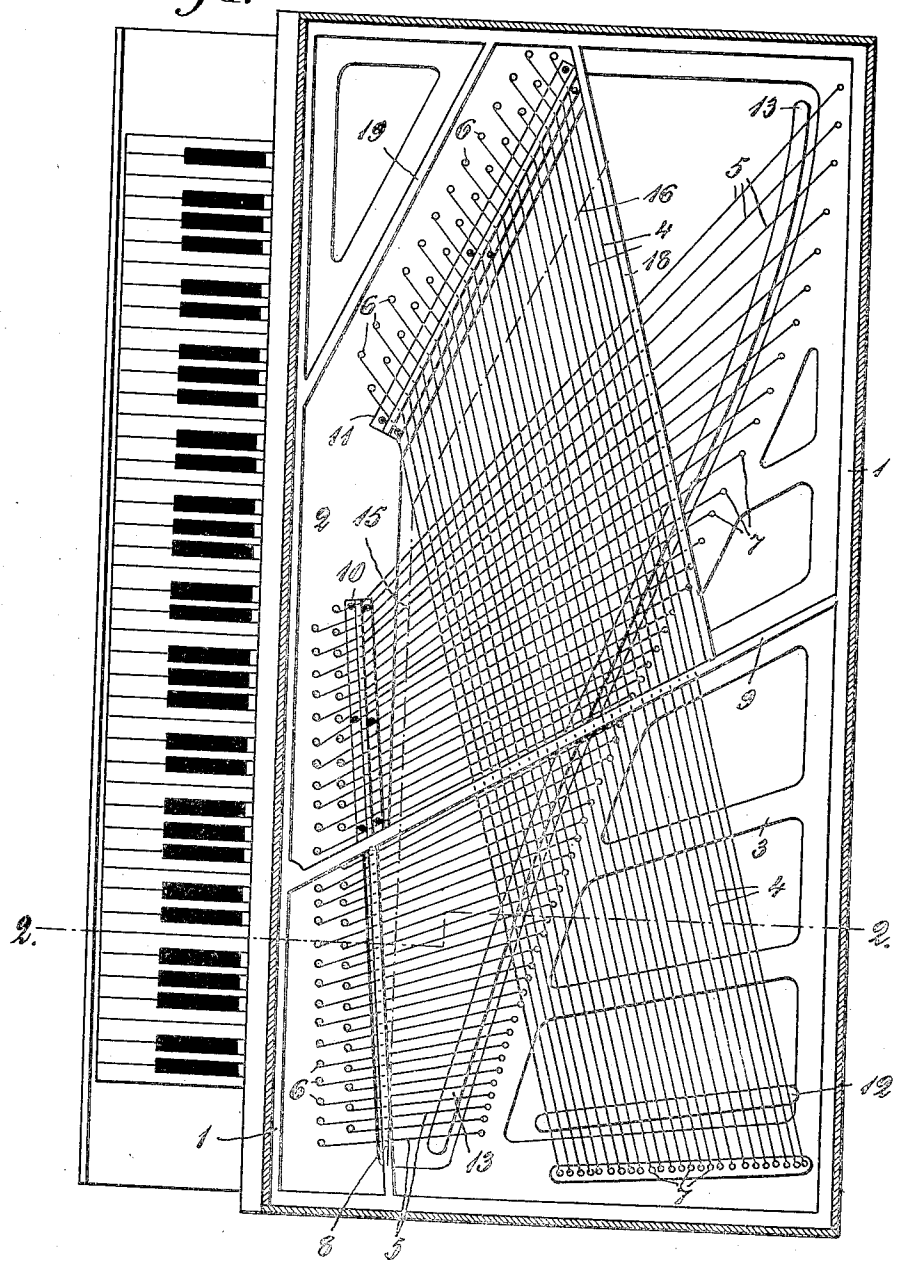
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PIANO STRING SYSTEM

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Fig. 1.



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Fig. 2.

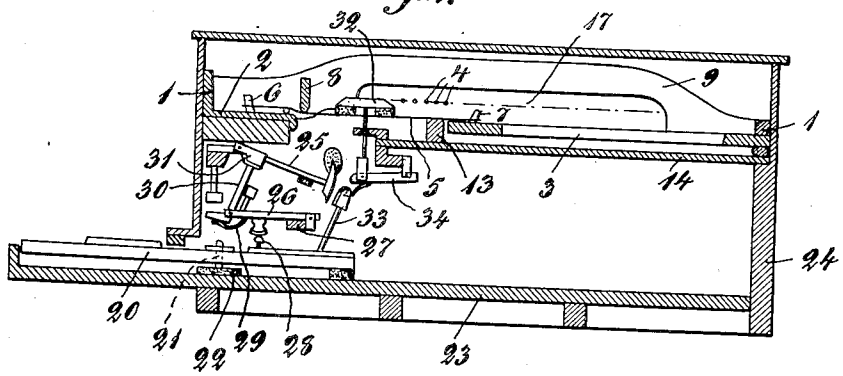
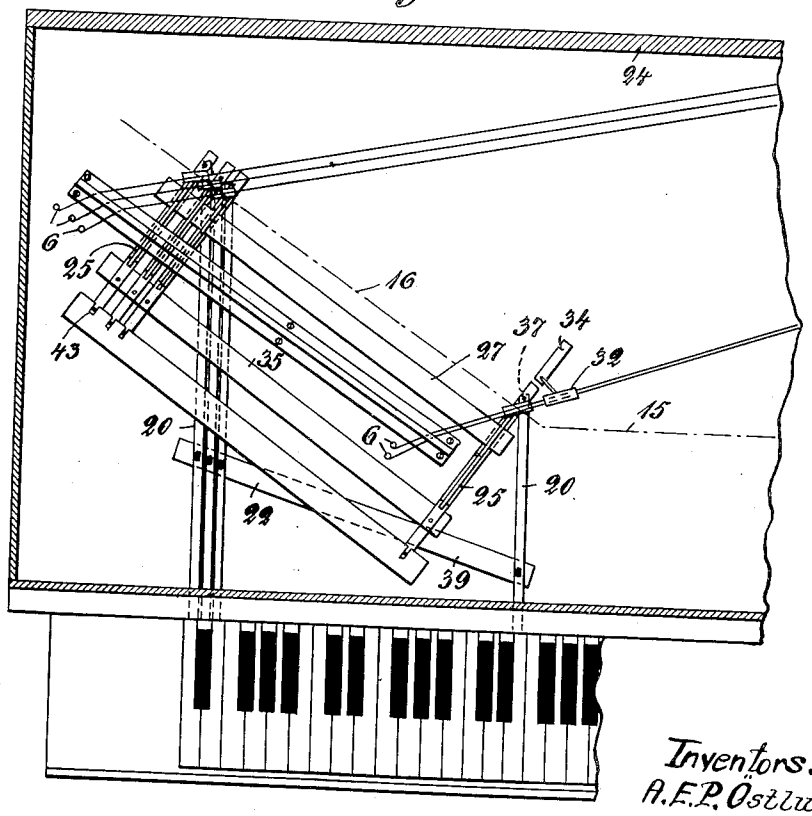


Fig. 3.



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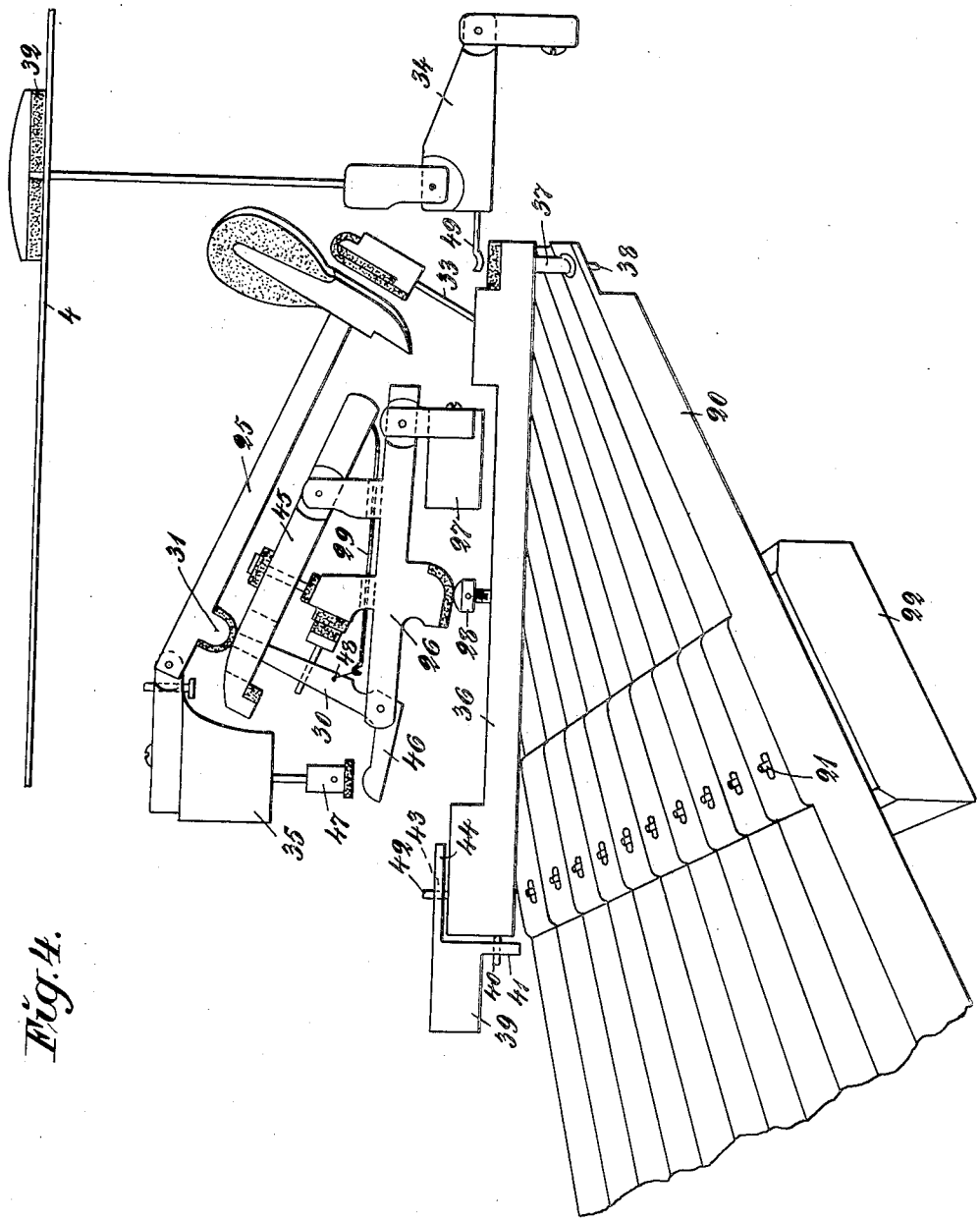


Fig. 4.

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PIANO STRING SYSTEM

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In Sweden July 11, 1933

1 Claim. (Cl. 84—197)

The present invention relates to an improved hammer mechanism in pianos having a substantially rectangular string frame, particularly so called square pianos. In pianos of the latter kind the strings are usually so arranged that the striking points of the hammers must be located to a great extent in the rear part of the frame involving the inconvenience that the hammer mechanism or action must be arranged at a comparatively great depth under the strings and that, furthermore, a mechanism construction is obtained which is not suitable from a dynamical point of view. To overcome this inconvenience it has been proposed to so arrange the bass and treble strings that the striking points of the hammers can be located at the front part of the frame nearest to the clavier as is the case in grand pianos. This arrangement of the hammer mechanism renders the transmission of motion, or energy, from the keys to the hammers of the bass strings difficult due to the fact that in such an arrangement the bass strings extend substantially diagonally relative to the frame and the striking line of the bass strings will form, therefore, a considerable angle with the striking line of the treble strings. According to the present invention, this difficulty has been overcome by the arrangement of auxiliary keys between the ordinary key rods and the hammers of the bass strings, as will be more clearly described with reference to the accompanying drawings.

Figure 1 is a horizontal section through the upper portion of a square piano according to the invention. Figure 2 is a vertical section on the line 2—2 in Figure 1. Figure 3 is a partial horizontal view of an arrangement of the hammer mechanism intended for the bass strings. Figure 4 shows a perspective view of the latter arrangement.

The string frame consists of a heavy rectangular portion 1 and of a bottom positioned within said rectangular portion and provided with recesses, the bottom comprising a front portion 2 and a rear portion 3. The strings are assembled in two groups, viz. one group of bass strings 4 and one group of treble strings 5. All strings are secured to the frame in ordinary manner by means of tuning pins 6 and hitch pins 7. The tuning pins of the bass strings as well as of the treble strings are arranged in the front portion 2 of the bottom of the string frame. The pins 7 are arranged in the rear bottom portion 3 of the frame. Some of the treble strings bear in known manner against a tensioning bar 8, placed over the strings, a so called capotasto, which tensioning bar is made integral with the frame and extends from one end thereof to a strengthening rib 9 running across the frame. The other treble strings are in known manner drawn through notches in a tensioning bar 10, a so called agraffe, which is secured by means of screws to the front bottom portion 2. The bass strings 4 are secured in similar manner in a tensioning bar 11 secured to the bottom portion 2 and extending right across the left front corner of the frame. Arranged at the rear ends of the strings are so called steps, namely a bass step 12 for the bass strings and a treble step 13 for the treble strings. The treble step 13 follows substantially the line in which the pins 7 are arranged and thus extends from the right side of the frame all the way to the left rear corner of the frame. The steps 12 and 13 are arranged on the sounding board 14 which is provided under the frame, and serve in known manner to transmit the vibrations from the strings to the sounding board. By arranging the treble strings in the manner shown on the drawings a very even distribution of the pressure from the strings over the entire sounding board is obtained.

The described arrangement of the strings makes it possible to place the striking points of the actions or hammer mechanisms in the front portion of the frame near the clavier. The dot and dash line 15 indicates the position of the striking points for the treble strings, whereas the dot and dash line 16 indicates the position of the striking points of the bass strings. As will be seen the striking line of the treble strings extends substantially parallelly with the front side of the frame whereas the striking line of the bass strings extends obliquely across the left corner of the frame adjacent the clavier. Thanks to the oblique position of the striking line of the bass strings a greater number of strings can be housed within the bass string group than would have been possible if the striking line 16 were positioned in the extension of or parallelly with the striking line 15 for the treble strings.

In the shown example the bass strings are superposed on the treble strings and drawn through a recess 17 in the lower edge of the stiffening rib 9. For the purpose of further strengthening the frame, stiffening ribs 18 and 19 are provided.

The treble keys 20 are in ordinary manner fulcrumed by means of pins 21 on a balance rail 22 disposed on the bottom 23 of the box 24 enclosing the string frame and the mechanisms or actions. The key rods actuate in known manner the hammers 25 by means of levers 26

which are pivoted on a supporting rail **27**. Upon actuation of the keys the hammers **25** are pushed upwards thereby that the key by means of a shoulder **28** actuates the lever **26** which in turn actuates the hammer **25** at the cam **31** by means of the so-called jack or sticker **30** which is actuated by a spring **29**. At the same time the damper **32** normally resting on the strings is actuated through the catching arm **33**, secured to the inner end of the key and actuating a link rod **34** by means of which the damper is pivotally secured to the sounding board.

The arrangement described cannot be used conveniently for the hammer mechanism of the bass strings due to the fact that the striking line **16** of the bass strings forms a considerable angle with the striking line **15** of the treble strings, the lateral space available for the hammer mechanism of the bass strings being then considerably reduced. In such an arrangement it is therefore difficult to obtain an entirely satisfactory functioning of the different parts of the mechanism. This inconvenience is avoided according to the invention by arranging the hammer mechanism for the bass strings in the manner shown in Figures 3 and 4.

As is clear from Figure 3, the hammer mechanism for the bass strings is angularly displaced in relation to the latter in such a manner that the hammer shanks extend substantially perpendicularly to the striking line **16** of the strings, the space between the hammers then becoming sufficient to enable the individual hammers and appertaining mechanism to move freely in relation to each other. The hammers **25** which are all of equal length are pivoted in a supporting rail **35** which consequently extends about parallelly with the striking line **16**. The other parts of the hammer mechanism are arranged so as to be movable in the same planes as the hammers or in planes parallel therewith respectively. The key rods **20**, on the other hand, are arranged in ordinary manner approximately perpendicular to the front side of the string frame. They are fulcrumed in the balance rail **22** which forms a small angle with the front side of the frame so that a suitable leverage is obtained.

For the purpose of transmitting the movement from the keys to the hammers, each hammer is provided with an auxiliary key **36** disposed under the appertaining hammer mechanism and adapted to swing in the plane of movement of the hammer or in a plane substantially parallel therewith respectively and which at its free end is pivotally connected with the extended end of the appertaining key rod **20**. In the example shown in Figure 4, said connection consists of a pin **37** secured to the auxiliary key which pin with its thin end engages a hole in the outer end of the key rod, the pin bearing against the key by means of a felt-covered shoulder. At the opposite end the auxiliary key is pivotally supported in a transverse balance rail **39** by means of a pin **40** projecting into a spacious hole in a depending flange **41** on the balance rail. By means of a pin **42** which is movable in a slit **43** in a horizontal portion **44** of the balance rail **39** the auxiliary key is guided so that it is held in a vertical position. The lever **26** is actuated by the auxiliary key by means of a shoulder **28** in similar manner as by the key rod **20** in Figure 2. Said lever carries in addition to the jack or sticker **30** also a lifting arm **45** which serves in known manner to lift the hammer **25** so that the jack or sticker **30** can resume its operative position under the cam **31** after it has been brought to take up a position laterally of the cam **31** on account of the bell crank lever **46** striking against the stopping pin **47**. The lifter is for this purpose actuated by a thread spring **29** which also serves as a restoring spring for the jack in that its other end is connected with the jack **30** at **48**. The catching arm **33** is in this case arranged on the auxiliary key whereas the damper **32** is actuated by the auxiliary key by means of a pin **49** projecting from the link rod **34**.

We claim:—

A piano having a horizontal string frame of substantially rectangular shape, the bass strings extending substantially diagonally relative to such frame and the hammers pertaining to said bass strings angularly displaced relative to the key rods thereof, comprising auxiliary keys arranged above the key rods and pivotally connected with said key rods at the rear ends thereof, said auxiliary keys being arranged to swing in the planes of movement of said hammers, thereby transmitting energy from said keys to said hammers upon actuation of said keys.

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