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L. HUPFELD.

REGULATION OF TONE IN MECHANICAL MUSICAL INSTRUMENTS.

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Fig. 1.

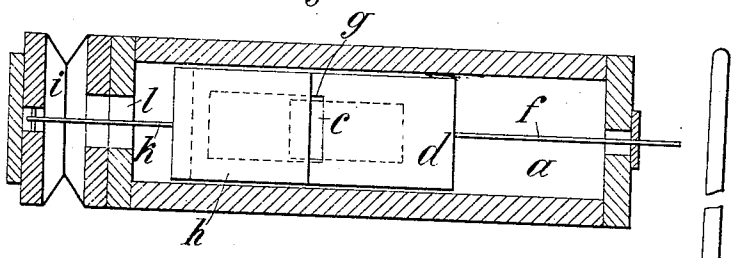


Fig. 2.

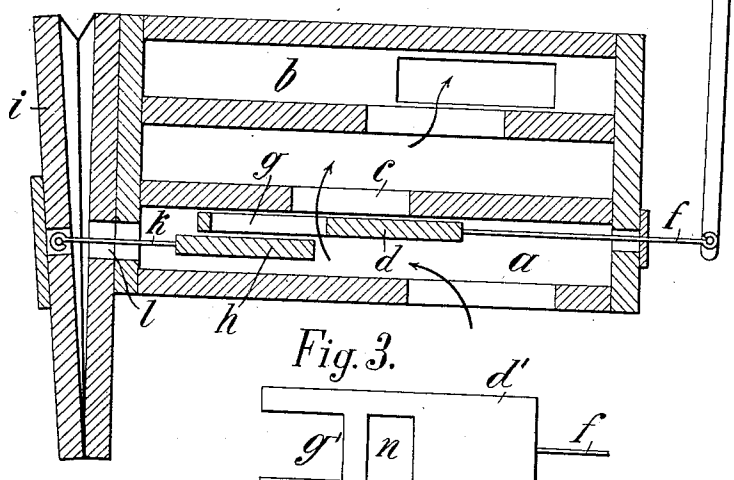
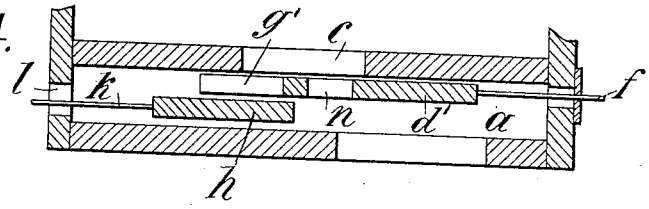


Fig. 3.

Fig. 4.



Witnesses.

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UNITED STATES PATENT OFFICE.

LUDWIG HUPFELD, OF LEIPZIG, GERMANY.

REGULATION OF TONE IN MECHANICAL MUSICAL INSTRUMENTS.

No. 877,082. Specification of Letters Patent. Patented Jan. 21, 1908.

Application filed November 1, 1906. Serial No. 341,615.

To all whom it may concern:

Be it known that I, LUDWIG HUPFELD, a subject of the King of Saxony, residing at Leipzig, Germany, have invented certain new and useful Improvements in and Connected with the Regulation of tone in Mechanical Musical Instruments; and I do hereby declare the following to be a full, clear, and exact description of the invention.

This invention relates to the regulation of tone in mechanical musical instruments and more particularly to mechanical key instruments.

Devices have already been proposed for automatically controlling the stroke of the keys in mechanical key instruments, consisting of a regulating air bellows which controls a slide or other valve. The arrangement has been such that a lever or the like, adjusted by hand or automatically by the note sheet, was so connected with the air bellows, that the slide or other valve was not only affected by the adjusting lever, but also at the same time by the air bellows. In this case, however, the reaction of the regulating air bellows on the adjusting arrangement could not be avoided, being particularly unpleasant when an automatic adjustment was effected by the note sheet.

According to the present invention in contradistinction to the known device, two slide valves are utilized, the one sliding over the other, one valve being adjusted by hand or the note sheet to suit the required strength of tone, while the other is connected with the regulating air bellows. The two valves working in coöperation simultaneously control the area of opening in the suction or pressure passage or trunk but the valves are otherwise independent of each other.

The valve controlled by the regulating air bellows is preferably made to slide on the regulating slide valve but the reverse arrangement may be adopted. Both valves are arranged in a box of small compass. The adjustment which is very sensitive is quite independent of the weather or variations in the material due to change in temperature.

In the accompanying drawings, Figure 1 is a sectional elevation, and Fig. 2 a sectional plan of one form of valve according to the invention, Fig. 3 being a detail view, and Fig. 4 a sectional plan of another form.

In carrying out the invention according to one mode, for example in the application to a playing device worked on the suction principle, the opening, *c*, forming communication between the wind chest, *a*, and the main suction passage or trunk, *b*, is controlled by a slide valve *d*, comprising a flat slab having an orifice, *g*, corresponding in size to the opening, *c*. The valve *d*, may be moved so as to open or cut off communication more or less according to the tone required, by any suitable rod *f*, and hand lever *e*, the so called expression lever.

By the use of the expression lever *e* to operate the valve *d* or ordinary manual tension throttle, the operator cannot follow the fluctuation required by the varying demands of the pneumatics, as the playing of the composition progresses; whereas by using the autopneumatic regulator *h* operating in conjunction with the primary or throttle *d*, both controlling the same opening *c*, whatever prescribed tension is set by the primary is automatically and uniformly maintained by the secondary or regulator valve *h*. The valve *d* according to the present invention is therefore provided with an orifice corresponding in size with the opening *c* before referred to, and adapted to be brought more or less coincident therewith. A second slide valve, *h*, is movable over the back of the first, the second valve being connected by a rod *k*, with and being moved by an air bellows *i* communicating through a suitable channel *l*, with the wind chest *a*.

Now if, for playing "piano" for example, the main opening *c*, is partly closed by adjusting the first valve *d*, the orifice *g*, in the valve leading thereto is in turn more or less uncovered automatically by the second valve *h*, according to the prevailing pressure in the wind chest *a*, which varies according to the number of notes simultaneously played, that is the number of perforations in the note sheet uncovered at any time. For instance, if one note is played only a small quantity of air enters the wind chest *a*, and the air in same is acted on strongly by the suction trunk *b*, and thereby greatly reduced in pressure. Simultaneously, however, the pressure in the regulating bellows *i* is reduced and the latter collapses and nearly closes the orifice *g*, in the primary valve *d*, by moving the second valve *h*. If, however, several notes are operated simultaneously, then a greater quantity of air enters the wind chest *a*, and its pressure, is not so quickly reduced and hence the regulating bellows are caused to distend and move the secondary valve *h*, to

open the communicating passage *g*, until the normal tension in the wind chest *a*, is obtained. In this manner the secondary valve *h*, regulates the amount of air passing through corresponding to the number of notes played, automatically and independently of the position of the primary regulating valve *d*.

As the secondary valve *h*, slides on the back of the primary valve *d*, and has to fit air tight thereon, it is pressed with considerable force against it and the bellows must overcome this resistance. In order to avoid this difficulty the primary valve may be formed with an open ended slot, *g'*, as shown in Figs. 3 and 4, the slot *g'*, being open toward the wind chest the secondary valve *h*, only controlling the same, while there is a second opening or orifice *n*, in the primary valve *d'*, for greater strength of tone.

If desired other valves than slide valves may be used so long as the one acts as the secondary valve to the other.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

1. In a mechanically played musical key instrument, the combination with the air trunk and the opening thereto; of a primary or throttle valve, a regulating bellows and a secondary valve, both of said valves controlling the opening.

2. In a mechanically played musical key instrument, the combination with the air trunk and the opening thereto; of a primary or throttle valve, a regulating bellows and a secondary valve operated thereby and sliding on the primary valve both controlling the opening.

3. In a mechanically played musical key instrument, the combination with the air trunk and the opening thereto; of a primary or throttle valve controlling said opening and having an open-ended slot therein, a regulating bellows and a secondary valve operated thereby and sliding on and controlling the primary valve and controlling the open-ended slot.

4. In a mechanically played musical key instrument, the combination with the air trunk and the opening thereto; of a primary or throttle valve controlling said opening, said valve having an orifice and open-ended slot therein, a regulating bellows and a secondary valve operated thereby and controlling the open-ended slot.

5. In a mechanically played musical key instrument, the combination with the air trunk and the opening thereto; of a primary or throttle valve controlling said opening, said valve having an orifice *n* and an open-ended slot *g'*, a regulating bellows and a secondary valve operated thereby and sliding on the primary valve to control said slot.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses.

LUDWIG HUPFELD.

Witnesses:
RUDOLPH FRICKE,
SOUTHARD P. WARNER.