M. CLARK.

STEP FEED FOR AUTOMATIC MODIFYING DEVICES FOR AUTOMATIC MUSICAL INSTRUMENTS.

APPLICATION FILED NOV. 12, 1910.

1,013,862. Patented Jan. 9, 1912.

Fig. 1.

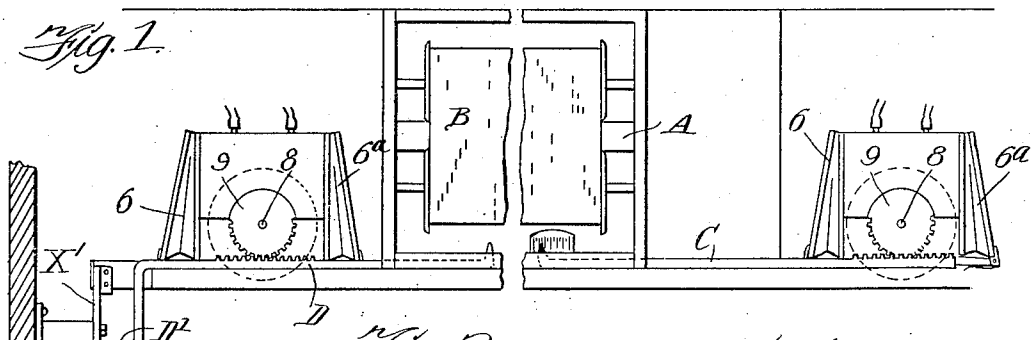


Fig. 2.

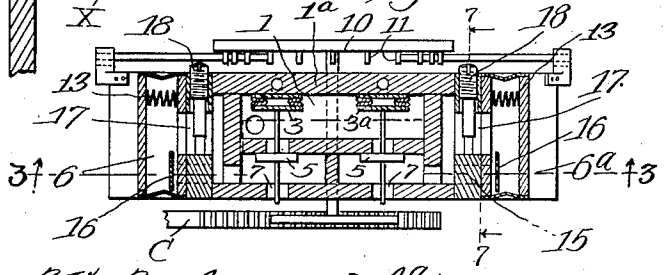


Fig. 4.

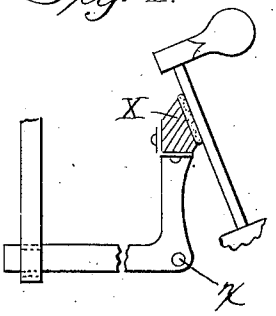


Fig. 3.

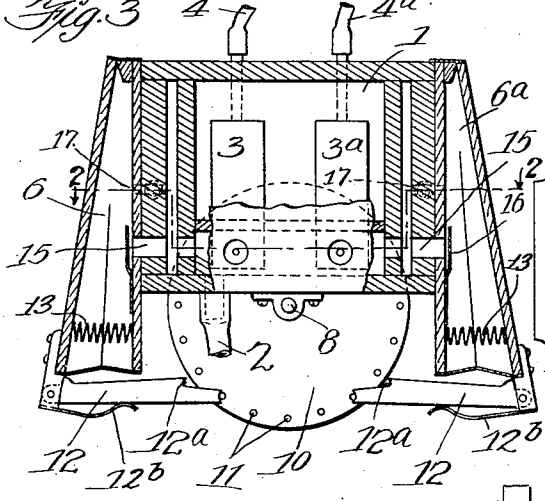


Fig. 5.

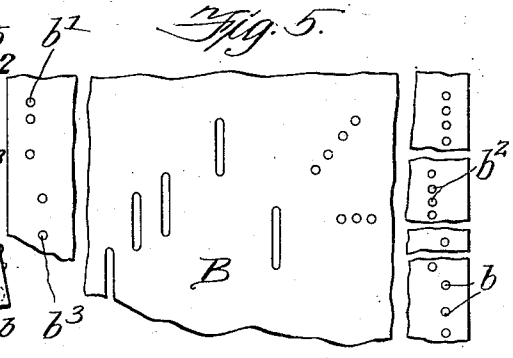
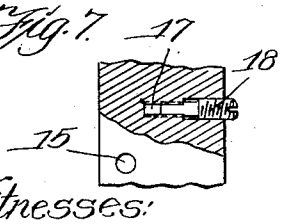


Fig. 6.

Fig. 7.



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UNITED STATES PATENT OFFICE.

MELVILLE CLARK, OF CHICAGO, ILLINOIS.

STEP-FEED FOR AUTOMATIC MODIFYING DEVICES FOR AUTOMATIC MUSICAL INSTRUMENTS.

1,013,862. Specification of Letters Patent. Patented Jan. 9, 1912.

Application filed November 12, 1910. Serial No. 591,934.

To all whom it may concern:

Be it known that I, MELVILLE CLARK, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Step-Feeds for Automatic Modifying Devices for Automatic Musical Instruments, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

This invention is designed as an improvement upon the device shown in my pending application, Serial No. 489,475, filed April 12, 1909.

It consists in the features of construction shown and described as indicated in the claims.

In the drawings—Figure 1 is a front elevation, showing two identical step feed devices, embodying this invention and applied respectively to the expression and tempo controlling devices of a pneumatic player action. Fig. 2 is a sectional plan view of one of said devices section being made at the line 2—2 on Fig. 3. Fig. 3 is an elevation partly in section as indicated by the line 3—3 on Fig. 2. Fig. 4 illustrates a piano hammer and a hammer rest rail. Fig. 5 is a broken view of a controlling sheet apertured for operating the modifying devices. Fig. 6 illustrates a tracker board provided with tracker mouths communicating with pneumatics of modifying devices. Fig. 7 is a detail section at the line 7—7 on Fig. 2.

In Fig. 1 of the drawings there are illustrated two of the devices embodying this invention but applied for controlling two different moving parts of a pneumatic player action. This figure is somewhat diagrammatic, including at its central portion a representation of the usual tracker bar A and controller sheet B. At the right hand side is represented a pneumatic step feed mechanism for moving the tempo slide bar C and on the other side is shown an exactly similar step feed mechanism arranged for moving the hammer rest-rail operating bar D.

In the structure shown in the drawings, 1 is a pneumatic chamber connected by a trunk 2 with exhaust devices for an exhaust air chamber not shown, of an automatic player action. Mounted upon the wall, 1^a, of the chamber 1 are primary pneumatics 3, 3^a, which are connected by tubes 4, 4^a, with ducts of a tracker-board A for affording access of atmospheric air to the primary pneumatics when proper perforations of the note sheet B register with the tracker duct mouths, and cutting off access of atmospheric air when the tracker duct mouth is covered by an unperforated portion of the note sheet.

The primary pneumatics 3, 3^a operate valves 5 for controlling communication of the motor pneumatics 6, 6^a, which are mounted upon the outside of the chamber 1, the chamber wall being provided with air passages, 7, 7 leading from the seats of the valves 5, 5, respectively, to the motor pneumatics 6, 6^a, respectively, the construction being, in all material respects, such as is common in motor pneumatics controlled by primary pneumatics.

Upon the chamber 1, whose front and rear side walls are conveniently extended downward for that purpose, there is journaled a shaft 8, having at one end a pinion 9, for engaging the operating parts,—as the tempo slide bar C or hammer-rest-rail operating-bar D,—whose movement or adjustment is the means of effecting the desired modification in the action of the instrument. On the other end of the shaft there is mounted a disk 10, having projecting from its face pin teeth 11, producing what may be called a "crown tooth" gear wheel. The moving member of each of the motor pneumatics 6 has a pawl arm 12 mounted for moving with it, the end of said pawl-arm extending past the circumference of the disk 10, in position to encounter the pin teeth 11 near the circumference, the end of the pawl being positioned for such encounter with a tooth which is nearly at the bottom or lower side, and the pawl, in order to reach such tooth, is thrust directly under the next tooth above the one next encountered, and has a shoulder 12^a, which encounters said tooth next above the one encountered by the end of the pawl, for limiting the stroke of the pawl and consequent feed movement of the wheel. For holding the pawl 12 up in position to engage the pins 11 of the disk 10 there is provided a spring 12^b. A spring 13 is provided for reacting upon the moving member of each of the motor pneumatics 6, 6^a to retract it,—that is, for moving it in the direction to expand the pneumatic,—such spring being not too strong to be readily overcome by the atmos-

pheric pressure available upon the exhaustion of the motor pneumatic, but adequate for quickly expanding the pneumatic upon the completion of its stroke.

The two motor pneumatics 6, 6^a being mounted at opposite sides of the chamber 1, for engaging opposite sides of the crown disk wheel, and their moving members operating by means of the pawls described, to rotate the wheel in opposite directions, it will be understood that the devices which are actuated by the rotation of said wheel are moved in opposite directions, according to whether one pneumatic or the other is energized, and that the perforations of the note sheet for controlling the motor pneumatics are positioned in the note sheet for controlling said pneumatics at proper time to actuate the wheels and the mechanism operated thereby in one direction or the other, according to the requirements of the playing.

The pawls, 12 and 12^a, are shown in Fig. 3 with their ends resting against the pins, 11, the weight of the respective pneumatics, 6 and 6^a, tending to so hold the pawls; but when either pawl is pressed forward by the collapse of its pneumatic, the opposite pawl yields back freely to allow the pin, 11, against which it then rests, to clear it, and then drops back again so that its end stands in the path of the on-coming pins, 11, each of which will push it away and clear it in succession in the same manner.

A quick action of the step-by-step feed device is liable to produce a little clicking noise upon the encounter of the pawls with the pin teeth of the crown disk gear, because, in order to effect perfect clearance, the pawl, upon being retracted back out of touch with the pin which it will next engage, in the short movement which it makes before its encounter gives opportunity for causing the sound upon the encounter. In order to prevent this sound and cause the action to be practically noiseless, it is desirable to provide means to cause the motor pneumatics 6, 6^e, to have a slow movement in collapsing, so that the head of the pawl may come into contact with the pin without any audible stroke. But it is important that the pneumatic should be able to retract the pawl quickly; that is, the pneumatic, for the purpose in view, must be adapted to collapse slowly and to expand quickly. For this purpose, there are provided two ports of communication with each motor pneumatic, one of them, 15, being large enough to permit the pneumatic to fill and be expanded quickly, and being controlled by a flap valve 16 on the inside of the pneumatic, which opens freely to permit the entrance of the air to inflate the pneumatic, but seats automatically upon exhaustion tending to collapse the pneumatic. This port and valve may be termed the "intake" port and valve of the motor pneumatic; another port 17 is provided for exhaust. This latter port is preferably a somewhat elongated slit in the fixed wall of the pneumatic, adequate, when entirely uncovered, to cause the pneumatic to be exhausted and collapsed quickly, but provided with a valve for closing it more or less, said valve consisting of a threaded pin or rod 18, which is screwed in through the edge of the wall of the chamber 1, which constitutes the fixed wall of the motor pneumatic, its inner end portion protruding into the end of the elongated slot which constitutes the port 17, said threaded pin being adapted to be screwed in so as to fully occlude said port, and to be withdrawn so as to open the port to any desired extent. When it is regarded important to prevent the clicking noise which is liable to result from the unchecked operation of the step-feed device, the valve 18 will be screwed in so as to reduce the port-way through the port 17, to considerably less than the port-way into the primary pneumatic, which is controlled by the valve 5, and opened when the primary pneumatic is inflated; making the port-way at 17 so small that the motor pneumatic can not be exhausted quickly through it, but is caused to collapse gradually.

The note sheet for coöperating with a device above described will be provided with apertures at one margin for bringing into action one of the pneumatics, 6^a, and preferably, at the other margin, for bringing into action the opposite pneumatic 6^a. When one device of the character described is employed for controlling the speed of the playing, and in the same instrument, another device of the same character is employed for controlling the expression, as illustrated in the drawings, each device will require a separate row of apertures in the note sheet for each of its actions,—that is, for feeding the operating device which it controls, in each direction, viz: for increasing and diminishing the speed or the loudness of the playing.

In Fig. 5. of the drawings, the apertures b, at the right-hand side, may be understood as coöperating with the tracker duct a, for operating the left-hand pneumatic 6 of the right-hand device for accelerating the speed, and the apertures b^1 at the left-hand margin of the sheet may be understood as coöperating with the tracker duct a^1, for causing the action of the right-hand pneumatic 6^a of said right-hand device for retarding the playing. Similarly, the apertures b^2, near the right-hand margin of the note sheet, cooperate with the tracker duct a^2, for controlling the right-hand pneumatic 6 of the left-hand device for moving the bar D to diminish the loudness of the playing, and the

roll apertures b^3, near the left-hand margin of the note sheet coöperate with the tracker duct a^3 for controlling the left-hand pneumatic 6^a of the left-hand device for moving the bar D in the opposite direction to increase the loudness of the playing.

For actuating the speed or expression controlling devices in each direction, a step-by-step action is provided for, said provision consisting in providing a plurality of closely successive apertures in the note sheet, so as to give closely successive impulses to the feed device, each moving the bar to which it is connected one step in the direction for the desired change, and as many steps being caused as necessary to reach the maximum desired. Thus, in the note sheet there are shown four perforations b, closely successive, indicating that four pulsations of the right-hand motor pneumatic 6 of the right-hand device, when these four apertures pass into registration successively with the tracker duct mouth a and the tempo slide-bar C, will be moved four steps in the direction for accelerating the speed. Similarly, there are shown four closely successive apertures b^2, at the right-hand margin of the note-sheet, indicating that when these apertures successively register with the tracker duct mouth a^2, the right-hand motor pneumatic 6 of the left-hand device will receive four successive feed impulses, causing the bar D to move four steps to the left, rocking the hammer-rest-rail X to a position for causing the hammers to give the lightest stroke. A similar plurality of closely successive apertures b^1 and b^2 are shown at the left hand margin of the note sheet, for causing the bars C and D to be adjusted in the direction for reducing speed and increasing loudness respectively.

The drawings illustrate somewhat diagrammatically, and without intention to present all details of actual structure, means by which the slide bar D operates the hammer-rest-rail for effecting the loudness of the playing. The bar D, which is a rack bar, engages with the pinion 9 on the rear end of the shaft pertaining to the left-hand device, said bar having an offset cam slope D^1, which encounters a lever arm X^1 of the hammer-rest-rail, rocking the rest-rail about its fulcrum x. This particular expedient is no part of the present invention, but is merely introduced to indicate the fact that the bar D, by its movement, controls the loudness of the playing, and any expedient for that purpose operated by a part moved by the pneumatic device described will be within the scope of this invention.

I claim:

1. In an automatic musical instrument, in combination with parts which are movable for modifying the playing, a gear wheel and connections therefrom for actuating said parts; a motor pneumatic and means for controlling it; a pawl connected with the moving member of the motor pneumatic positioned for encounter with the tooth of the wheel in the collapse of the pneumatic, and having a shoulder which stops a subsequent tooth of the wheel to arrest the feeding movement.

2. In an automatic musical instrument, in combination with parts which are movable for modifying the playing, a crown-toothed gear wheel and connections therefrom for actuating said parts; a motor pneumatic and means for controlling it, and a pawl connected with the moving member of the motor pneumatic, positioned to encounter with one of the laterally projecting teeth of the wheel in the collapse of the pneumatic, and having a shoulder which stops against the next succeeding tooth of the wheel to arrest the feeding movement.

3. In an automatic musical instrument, in combination with parts which are movable for modifying the playing, a motor pneumatic and connections therefrom for actuating said parts; means for controlling such motor pneumatics, said motor pneumatics having an inlet port and an exhaust port; a check valve controlling the inlet port opening freely for inlet, and a throttle valve for controlling the exhaust port mounted for adjustment in said exhaust port to reduce the port-way thereof to cause slow collapse of the motor pneumatic.

4. In an automatic musical instrument, in combination with parts which are movable for modifying the playing, a motor pneumatic for actuating said parts, primary pneumatics for controlling said motor pneumatics; a valve operated by the primary pneumatics to open exhaust air communication with the latter for collapsing it, the motor pneumatic having an inlet port and and exhaust port; a check valve which controls the inlet port opening freely for inlet of atmospheric air, and the throttle valve for controlling the exhaust port mounted for adjustment in such exhaust port to reduce the port-way thereof below that of the port which is controlled by the primary pneumatic.

In testimony whereof, I have hereunto set my hand, in the presence of two witnesses, at Chicago, Illinois, this 10th day of November 1910.

MELVILLE CLARK.

Witnesses:
ROBT. N. BURTON.
JEAN ELLIOTT.