N. C. FERRIS.

MUSIC ROLL PERFORATOR.

APPLICATION FILED JAN. 25, 1917.

1,257,836.

Patented Feb. 26, 1918.

Fig. 1.

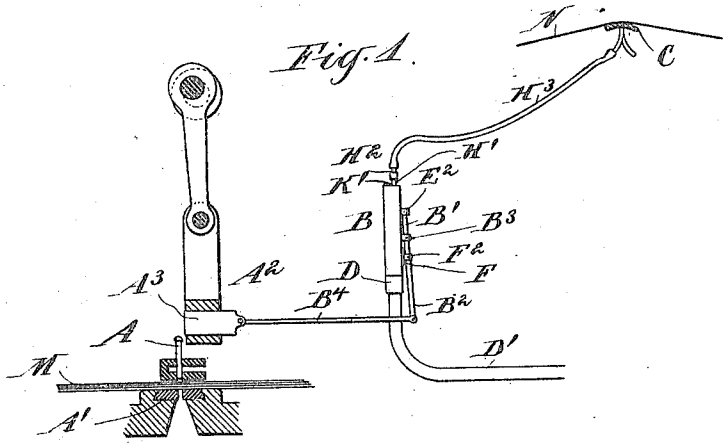


Fig. 2.

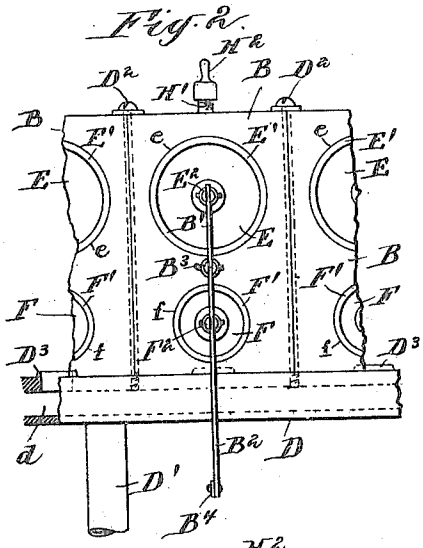


Fig. 3. Fig. 4. Fig. 5.

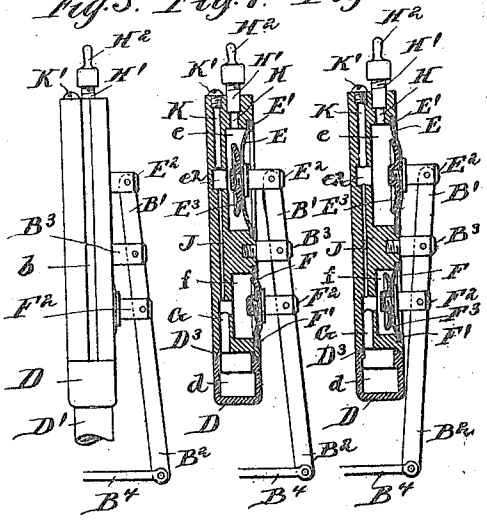


Fig. 7.

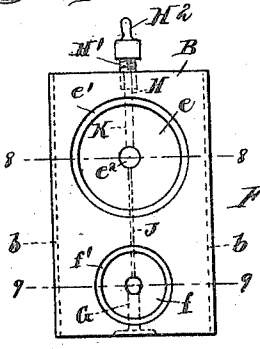


Fig. 6.

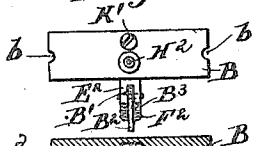


Fig. 8.

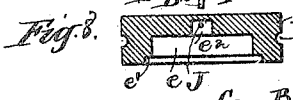
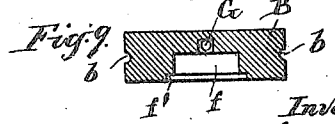


Fig. 9.



Inventor:
Nancy Clarence Ferris,
by his attorney,
Charles R. Searle.

UNITED STATES PATENT OFFICE.

NUNEZ CLARENCE FERRIS, OF BROOKLYN, NEW YORK, ASSIGNOR TO ELIZABETH F. BOYLE, OF BROOKLYN, NEW YORK.

MUSIC-ROLL PERFORATOR.

1,257,836. Specification of Letters Patent. Patented Feb. 26, 1918.

Application filed January 25, 1917. Serial No. 144,328.

To all whom it may concern:

Be it known that I, NUNEZ CLARENCE FERRIS, a citizen of the United States, residing in the city of New York, borough of Brooklyn, in the county of Kings and State of New York, have invented a certain new and useful Improvement in Music-Roll Perforators, of which the following is a specification.

The invention relates to apparatus for perforating the music sheets used in self-playing musical instruments, and more particularly to the pneumatics controlled by the master-roll for actuating the punches in such apparatus.

The object of the invention is to provide pneumatics of simple construction, easily manufactured and assembled, which shall be positive and quickly responsive in action, and adapted to be arranged or grouped in small space, with provisions for easily and quickly removing any one in a group or series for inspection or repairs without disturbing the others.

Another important object is to provide means for clearing dust or other obstructions from the recesses and passages in such pneumatics without removing the latter from their positions or breaking their connection to the vacuum pump.

The invention consists in certain novel features and details of construction and arrangement by which the above objects are attained, to be hereinafter described and claimed.

The accompanying drawings form a part of this specification and show the invention as it has been carried out in practice.

Figure 1 is a diagrammatic elevation, partly in vertical section, showing one of the pneumatics and its connections to the master-roll and to the perforating mechanism.

The remaining figures are on a larger scale.

Fig. 2 is a face view of one of the pneumatics and a portion of the adjacent pneumatic on each side thereof.

Fig. 3 is a corresponding side view.

Fig. 4 is a vertical section on the center line, partly in elevation, showing the pneumatic conditioned to hold its punch out of action.

Fig. 5 is a similar view showing the pneumatic in condition to actuate its punch.

Fig. 6 is a top view corresponding to Fig. 3.

Fig. 7 is a front view of the body of the pneumatic with the diaphragms and lever removed.

Fig. 8 is a transverse section taken on the line 8—8 in Fig. 7.

Fig. 9 is a similar section taken on the line 9—9 in Fig 7.

Similar letters of reference indicate the same parts in all the figures.

A is one of a series of punches extending across the superposed sheets M to be perforated, and suitably guided and held in operative relation to its die A^1 beneath the sheets. A^2 is a plunger extending transversely of the sheets adjacent to the line of punches, reciprocating vertically and carrying a series of slides A^3 adapted to engage and actuate the punches when moved outwardly above the latter, on the down stroke of the plunger. Each slide is operated by a pneumatic B through a lever B^1 and a link B^4 extending from the lever to its slide A^3. All the pneumatics are under a partial vacuum and each is connected to a corresponding aperture in the bridge or tracker-board C, the aperatures of which are controlled by the perforations in the master-sheet or roll N, so that the punches are actuated automatically to produce perforations in the rolls or sheets M corresponding to those in the master-roll N. Any suitable feeding means, not shown, may be employed to feed the sheets M and master-roll N.

The pneumatics in each series are each in the form of a plate or rectangular block of metal forming the body B, adapted to stand vertically side by side close to its adjacent neighbors, upon a bar D having an internal channel *d* communicating through a pipe D^1 with a pump, not shown, by which the desired partial vacuum is maintained. The blocks are held to the bar by long screws D^2 extending vertically between the side edges of each pair and received in a semicircular groove *b* in each.

The bar is provided with a series of tubular conical bosses D^3, one for each pneumatic, matching to corresponding recesses in the bottoms of the pneumatics and making a

ground air-tight joint therewith through which communication is established from the channel d to the several recesses and passages in the body B, now to be described.

Each body has a circular recess e in the upper portion, open at the front, and a similar but smaller recess f near the bottom, and each has an annular rabbet, e^1, f^1 adapted to receive a corresponding ring E^1, F^1. E is a rubber diaphragm of circular form covering the recess e and held by the engagement of its circular margin between the ring E^1 and rabbet e^1, the joint being sealed by suitable cement, and F is a similar but smaller diaphragm corresponding to the diaphragm E, covering the recess f and held by the ring F^1 in the rabbet f^1. The diaphragm E carries an outwardly projecting stud E^2 joined to a convex follower E^3 on the inner face of the diaphragm, and the diaphragm F is similarly equipped with a stud F^2 and follower F^3.

On the body B between the recesses e and f is a stud B^3 serving as a fulcrum for the vertically arranged lever B^1, the upper end of which is pivotally engaged with the stud E^2 and the lower arm B^2 with the stud F^2; the lower arm extends downwardly below the bar D and is connected, as above described, through a link B^4 to its slide A^3.

It will be noted that an outward movement of the diaphragm E or an inward movement of the diaphragm F tends to throw the lever B^1 in one direction, and that opposite conditions of the diaphragms cause a reverse movement of the lever. These movements are effected by changes in air pressures in the recesses and the action of atmospheric pressure on the exteriors of the diaphragms. G is a vertical vacuum passage leading from the recess f through the boss D^3 to the channel d subject to the suction of the pump, not shown, so that the recess f is under constant vacuum pressure and the exterior face of its diaphragm F is subject to atmospheric pressure. H is an air passage leading to the recess e through a short screwthreaded pipe H^1 having a nipple H^2 thereon, and tube H^3, from one of the apertures in the tracker-board or bridge C, which when in coincidence with an opening in the master-sheet establishes atmospheric pressure in the recess e, and as the outer face of the diaphragm E is subject to atmospheric pressure at all times, the pressure is equal on both faces of the diaphragm E and the latter is neutral except as hereinafter described.

The recess e has a cavity or extension e^2, from which extends a "bleeder" passage J of contracted area, to the vacuum passage G, the effect of which is to permit the slow escape of air from the recess e at all times and reduce the pressure therein when the corresponding aperture in the bridge C is closed by an unperforated portion of the master-sheet.

The passages G and J are in axial alinement with each other and also with a cleaning passage K extending from the extension or cavity e^2 to the top of the body B, where it is closed by a screw-plug K^1.

The operation is as follows:—Assuming the bridge aperture to be closed and the pump in operation, air is exhausted from the recess f and, through the bleeder passage J but in lesser degree, from the recess e, and atmospheric pressure on the exterior faces of the diaphragms E and F causes each to act in opposition to the other but as the area of the diaphragm E is greatly in excess of that of diaphragm F, the former prevails and the lever arm B^2 is thrown outwardly into the position shown in Figs. 3 and 4 in which the slide is withdrawn and its punch held in the inoperative position. Upon the presentation of an opening in the master-sheet to the aperture in the bridge, air flows freely to the recess e equalizing the pressure on both faces of the diaphragm E and neutralizing its action, while the diaphragm F, now subjected unresistedly to atmospheric pressure on its exterior face, is driven inwardly as in Fig. 5 and the slide A^3 presented in operative relation to its punch A and a corresponding hole is produced in the sheets M. Closing the bridge aperture immediately returns the parts to the positions shown in Figs. 3 and 4.

The changes are positive and practically instantaneous as the bridge apertures are opened or closed.

One or more of the pneumatics may be easily and quickly removed and replaced by simply disconnecting the lever-arm B^2 from its link, removing the screws D^2 from each side and lifting the complete pneumatic from its seat on the boss D^3 of the bar D. The arrangement of recesses and passages render the pneumatic entirely self-contained and permits the employment of a bridge of the usual construction without alteration.

The recess e in which shreds of paper or particles of dust are likely to lodge may be cleaned without removing the pneumatic, by simply taking off the nipple H^2 and coupling to the short pipe H^1 a suction hose, not shown, through which such shreds or dust may be drawn.

By locating the vacuum passage G, bleeder passage J and cleaning passage K in alinement, these passages may be easily cleared by removing the screw plug K^1 and inserting a cleaning wire or like tool, not shown, and forcing any obstruction downward into the channel d whence it will be drawn by the suction of the pump.

The arrangement permits the pneumatics

to be placed close together to occupy but little space in series, and the several series may be located in close relation, while permitting easy access to each pneumatic for inspection, removal, or substitution.

Although the pneumatic has been described and shown herein as applied to the manufacture of music-rolls, it will be understood that it may be employed to actuate the playing mechanism in various self-playing instruments and in other situations to which it may be adapted.

I claim:—

1. In an apparatus of the character set forth, a pneumatic comprising a body having two recesses therein, flexible diaphragms of unequal areas in said recesses, a lever fulcrumed on said body and connected by one arm to such larger diaphragm and by the other to such smaller diaphragm, said body having a passage leading from the recess for such larger diaphragm to a bridge-aperture and a passage leading from the recess for such smaller diaphragm to a means for producing a partial vacuum.

2. In an apparatus of the character set forth, a pneumatic comprising a body having two recesses therein, flexible diaphragms of unequal areas in said recesses, a lever fulcrumed on said body and connected by one arm to such larger diaphragm and by the other to such smaller diaphragm, said body having a passage leading from the recess for such larger diaphragm to a bridge-aperture, a passage leading from the recess for such smaller diaphragm to a means for producing a partial vacuum, and a contracted bleeder passage connecting said recesses.

3. In an apparatus of the character set forth, a pneumatic comprising a body having two recesses therein, flexible diaphragms of unequal areas in said recesses, a lever fulcrumed on said body and connected by one arm to such larger diaphragm and by the other arm to such smaller diaphragm, a hollow bar supporting such body and having a passage leading from its interior to a means for producing a partial vacuum, said body having a vacuum passage leading from the recess for such smaller diaphragm to the interior of said bar, an air passage from the recess for said larger diaphragm to the exterior of said body and communicating with a bridge-aperture, and a contracted bleeder passage connecting said recesses.

4. In an apparatus of the character set forth, a pneumatic comprising a body having two recesses therein located one above the other, flexible diaphragms of unequal areas in said recesses, a lever fulcrumed on said body between said recesses and connected by one arm to such larger diaphragm in such upper recess and by the other arm to such smaller diaphragm in such lower recess, said body having an air passage leading from said upper recess to the exterior of said body, a pipe connected to said air passage, a removable nipple on said pipe, a tube leading from said nipple to a bridge aperture, and said body having a passage leading from said lower recess to a means for producing a partial vacuum.

5. In an apparatus of the character set forth, a hollow bar having its interior channel under partial vacuum, a series of pneumatics mounted side by side on said bar, each having a groove in its side edges, screws extending through such grooves between each pneumatic and the next and engaging said pneumatic and bar for holding the former to the latter, and passages from said channel to the interiors of said pneumatics.

6. In an apparatus of the character set forth, a pneumatic comprising a body having two recesses therein located one above the other, flexible diaphragms of unequal areas in said recesses, a lever fulcrumed on said body and connected at one arm to such larger diaphragm in such upper recess and by the other arm to such smaller diaphragm in such lower recess, an air passage from said upper recess to the exterior of said body adapted to be connected to a bridge-aperture, a vacuum passage leading from such lower recess, a contracted bleeder passage connecting said recesses, a cleaning passage leading from such upper recess to the exterior of said body, and a removable plug for said cleaning passage, the latter, said bleeder passage, and said vacuum passage arranged in axial alinement each with the others.

7. The pneumatic described comprising a single rectangular plate of metal, having a recess of large area in its upper portion and a recess of smaller area in its lower portion, flexible diaphragms of unequal areas corresponding each to its recess and secured in the latter, a lever fulcrumed on said body between said recesses and having one arm connected to such larger upper diaphragm and the other arm connected to such smaller lower diaphragm.

8. The pneumatic described comprising a single rectangular plate of metal, having a recess of large area in its upper portion and a recess of smaller area in its lower portion, an annular rabbet formed on the margin of each recess, flexible diaphragms received in such rabbets, a ring in each rabbet for holding its diaphragm to its recess, a lever fulcrumed on said body between said recesses and having one arm connected to said larger upper diaphragm and the other arm connected to such smaller lower diaphragm, an air passage formed in said body and leading from said upper recess and adapted to

be connected to a bridge-aperture, a vacuum passage formed in said body and leading from said lower recess and under partial vacuum, and a bleeder passage formed in said body and connecting said recesses.

9. The pneumatic described comprising a single rectangular plate of metal, having a recess of large area in its upper portion and a recess of smaller area in its lower portion, an annular rabbet formed on the margin of each recess, flexible diaphragms received in such rabbets, a ring in each rabbet for holding its diaphragm to its recess, a lever fulcrumed on said body between said recesses and having one arm connected to said larger upper diaphragm and the other arm connected to such smaller lower diaphragm, an air passage formed in said body and leading from said upper recess and adapted to be connected to a bridge-aperture, a vacuum passage formed in said body and leading from said lower recess and under partial vacuum, a bleeder passage formed in said body and connecting said recesses, and a cleaning passage formed in said body in axial alinement with said bleeder passage and said vacuum passage.

In testimony that I claim the invention above set forth I affix my signature.

NUNEZ CLARENCE FERRIS.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."