G. W. GARMAN.

SUCTION PRODUCING APPARATUS.

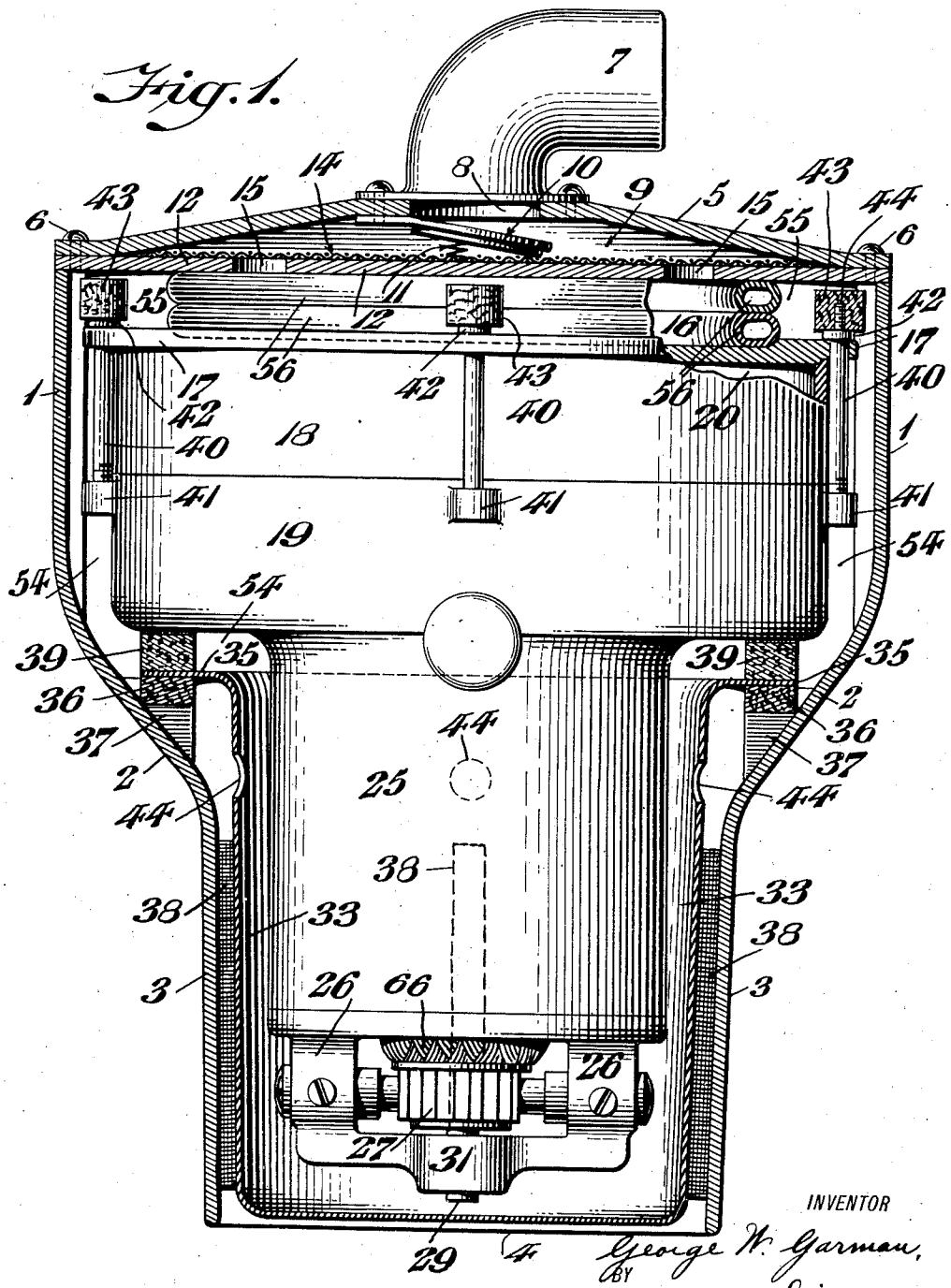
APPLICATION FILED APR. 5, 1919.

1,320,224.

Patented Oct. 28, 1919.

3 SHEETS—SHEET 1.

Fig. 1.



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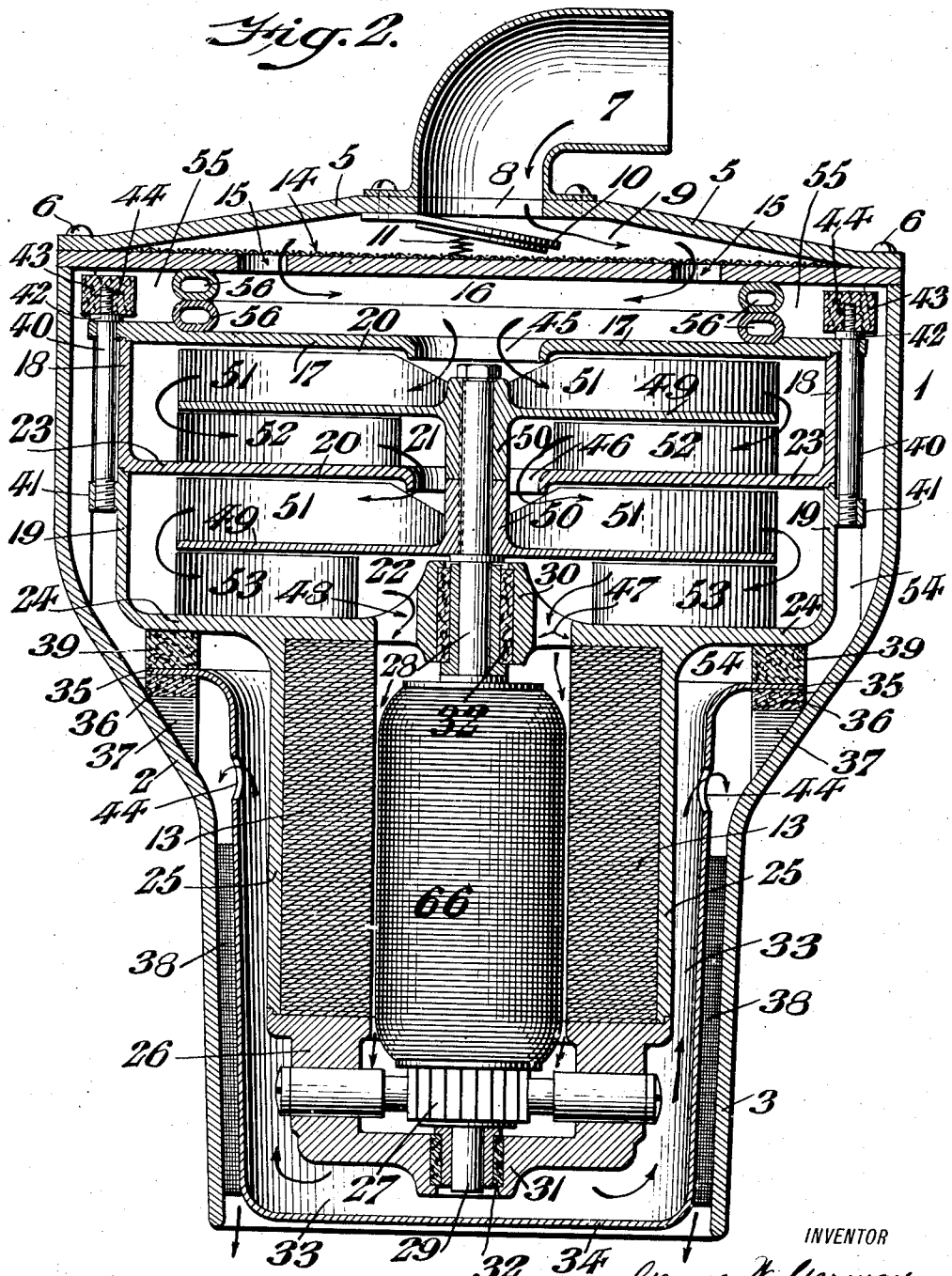
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3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 3.

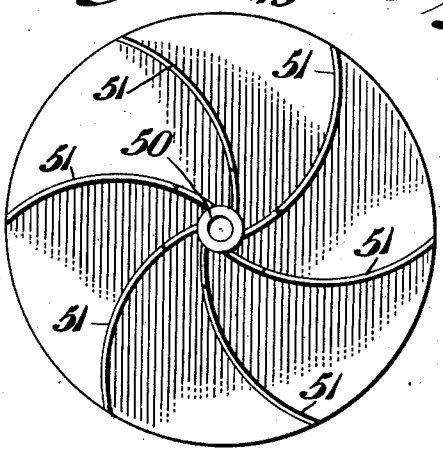


Fig. 4.

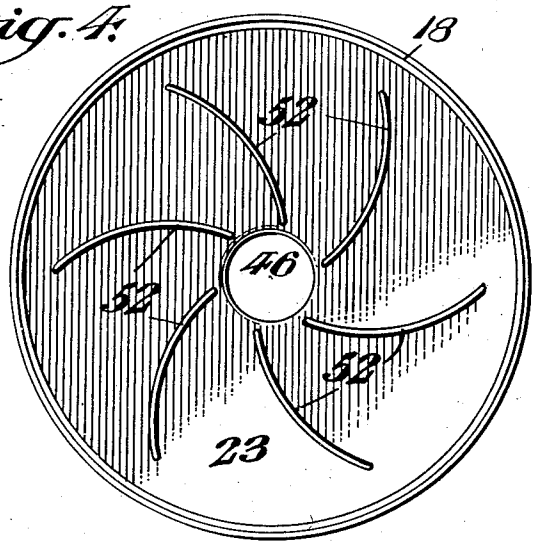


Fig. 5.

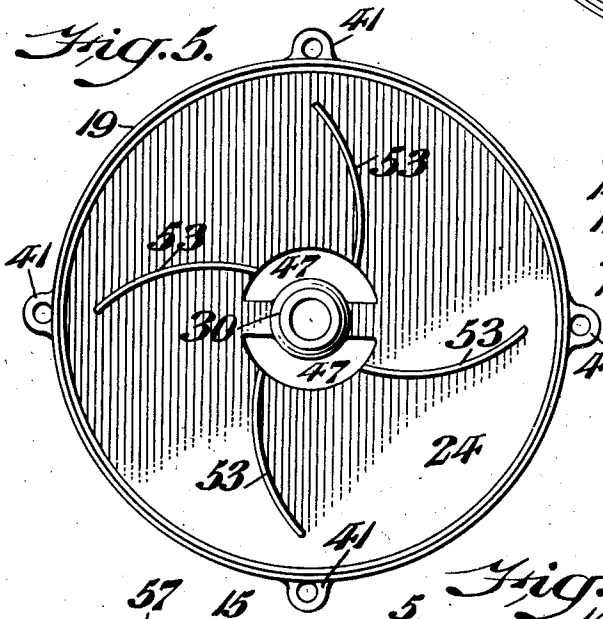


Fig. 6.

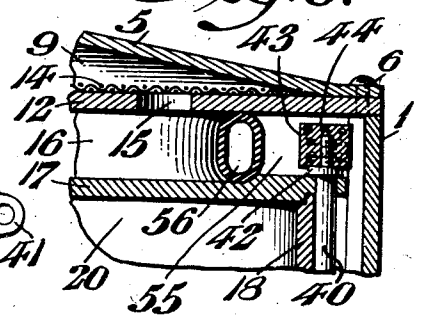
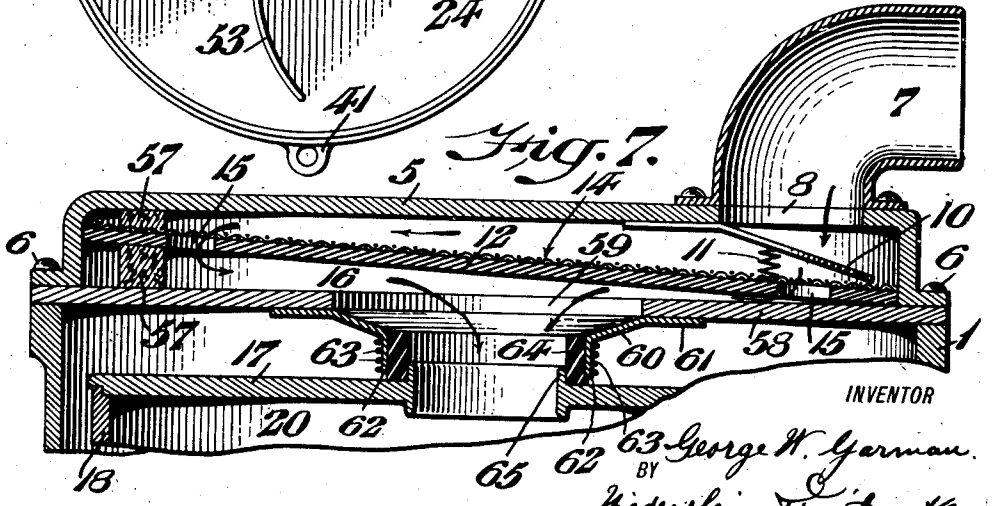


Fig. 7.



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UNITED STATES PATENT OFFICE.

GEORGE W. GARMAN, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO ELECTORA MANUFACTURING COMPANY, A CORPORATION OF DELAWARE.

SUCTION-PRODUCING APPARATUS.

1,320,224. Specification of Letters Patent. Patented Oct. 28, 1919.

Application filed April 5, 1919. Serial No. 287,777.

To all whom it may concern:

Be it known that I, GEORGE W. GARMAN, a citizen of the United States, residing at Philadelphia, county of Philadelphia, State of Pennsylvania, have invented a new and useful Suction-Producing Apparatus, of which the following is a specification.

This invention relates to the general class of suction-producing devices in which are embodied rotary fans, and particularly to rotary mechanisms adapted to create such a vacuum as is used in connection with automatic or player pianos of various types.

In apparatus employed in connection with player pianos for the purpose of creating the vacuum necessary to actuate the various hammers, expression devices, automatics, and other elemental devices which are usual in these instruments, it is, of course, essential to deaden the sounds of the vibration occasioned by the operation of the devices which create the vacuum, without limiting the rapidity of their action or vacuum-creating power,—it being of the essence of the satisfactory commercial operation of these suction devices that all metallic sounds necessarily created by their physical operation should be deadened and practically eliminated.

The many advantages resulting from overcoming the objections which have heretofore been inherent in the various commercially known and operated suction-producing devices used in the player piano industry, are largely secured by my present apparatus, the organization of which enables me to cheapen the construction, simplify the assemblage of parts, add to the effective capacity, and at the same time and in so doing dispense with the mass of sound deadening material heretofore frequently employed in devices of this character.

The objects of my invention being essentially the foregoing, for the purpose of illustrating it I have shown in the accompanying drawings a certain type and embodiment of it which is at present preferred by me because in practice it has given most satisfactory and reliable results.

It is to be understood, however, that the various instrumentalities and components in which even this preferred form of my invention is illustrated and hereinafter described as embodied, can be variously modified, and that my invention is not therefore limited to the precise arrangement and organization of the instrumentalities which are typified in the construction shown and hereinafter described.

In the accompanying drawings:—

Figure 1 represents, in side elevation and partly in section, a suction-producing apparatus embodying a preferred form of my invention.

Fig. 2 represents the same apparatus in central, vertical section throughout, except as to the armature and commutator of the motor.

Fig. 3 represents a top plan view of either one of the fan chambers when, as in my present organization two of such chambers are preferably employed.

Fig. 4 represents a plan of the upper of the two vane chambers represented in the typical embodiment of Figs. 1 and 2.

Fig. 5 similary represents a plan of said lower of the two vane chambers.

Fig. 6 represents a fragmentary, sectional detail of a modified form of tubular rubber gasket which I employ between the baffle disk and the cover plate of the casing of the fan chambers and the vane chambers, and

Fig. 7 represents a modified form of baffle chamber and adjuncts.

Similar numerals of reference indicate corresponding parts.

Referring to the drawings,

1 designates a container preferably cast, for inclosing all of the operative and assembled parts which my invention embodies.

This container at its upper portion is cylindric and about midway of its length is contracted as at 2, and below its contracted portion extended in cylindrical form as 3 and terminated in an open bottom 4.

5 designates a lid or cap, preferably of conical form, which is secured, conveniently, by retaining screws 6 to the upper, open, circumferential edges of the upper portion of the container.

Into this lid, and preferably although not necessarily central of it, opens an intake 7, the inner orifice 8 of which opens into a

baffle chamber 9, which is adapted to be closed by a valve 10, preferably controlled by a spring 11.

12 designates a baffle disk, preferably of card board, between which and the lid 5 is, as stated, the baffle chamber 9. This baffle disk is of a diameter preferably equal to the diameter of the upper, outer edges of the upper walls of the container. It serves to break the vibration between the body and the lid of the container.

Lying upon the upper surface of the baffle disk 12, and shellacked or otherwise adherently fastened thereto, is a cheese-cloth or kindred dust-proof fabric 14 which prevents the passage of particles of dust through air orifices 15 in the baffle disk.

A desired plurality of these air passages are formed and spaced sufficiently far in from the periphery of the baffle disk 12 to cause them to open within an air chamber 16 which is formed between the cover plate 17 of the fan and vane chambers and said baffle disk, by the interposition of either a plurality of two or more,—or one as in the construction of Fig. 6,—circular and tubular rubber gaskets 56, which in the assemblage of the parts are compressed sufficiently to make said air chamber 16 air tight.

In the organization under discussion, an upper cylindric casing 18, closed above by the cover plate 17, is superposed upon a lower cylindric casing 19,—both of which casings are inclosed within the upper portion of the container,—and respectively inclose each an upper fan chamber both designated 20, and a lower vane chamber 21 and 22.

The upper casing 18 has a bottom plate 23 which constitutes in a sense the cover plate of the lower casing 19, the bottom plate 24 of which latter is formed with a cylindric downwardly extending motor-field frame or housing 25, which terminates in a carrying frame 26 which supports the commutator 27, and in conjunction with the housing 25 forms a means of support for the field 13 of the motor, the vertically disposed armature of which is designated 66, and the vertical armature shaft as to its upper extension designated 28 and to its lower extension 29.

In the assemblage of the parts thus far described, the armature shaft 28—29 is mounted for rotation in an upper bearing 30 formed centrally and as a part of the bottom plate 24 of the lower casing 19 and in a lower bearing 31 formed in the housing 26.

These bearings which are each of the same construction, form the subject-matter of a separate application for patent executed and filed by me contemporaneously with this application, and need not therefore, be herein described except to say that they each embody a cork bushing which I have designated 32, and which secure the accurate self-alinement of the shaft to permit of armature revolutions at very high speeds.

In the mounting of the motor as an entirety together with the upper and lower casings which constitute in effect an integral casing and respectively contain the fan chambers and the vane chambers, I introduce within the container a cup-shaped bottomed cup muffler 33, preferably formed of spun sheet metal, with its walls vertical; its bottom 34 flat and its open upper portion formed with a circumferential, radially and outwardly extending horizontal flange 35, which is adapted in the assemblage of the parts to rest upon a plurality of supporting blocks of cork 36, or kindred material, which in turn rest upon internally extending shoulders 37, integral with or attached to the contracted portion of the container.

It will thus be understood that the cup muffler 33 incases the motor field housing 25, the carrying frame 26 for the commutator, and the commutator, and extends down to about level with the open bottom 4 of the container.

The accurate alinement of the cup muffler relatively to its contained motor and to the surrounding open bottom of the container is effected by the interposition of a plurality of vertically disposed strips 38, of wool felt, or its equivalent, inserted between its own outer wall and the inner wall of the lower cylindric portion 3 of the container itself.

39 designates a plurality of resting blocks or cushions of cork or kindred compressible and resilient material, which are superposed upon the horizontal flange 35 of the cup muffler immediately over the lower blocks 36 which rest upon the shoulders 37 of the container;—such number of these resting blocks as will correspond to the number of the shoulders, being employed.

Upon these resting blocks 39 is superposed and rests the bottom plate 24 of the lower casing 19, so that, as a result, both the casing and the motor as entireties rest and are supported in cushioned relationship, so to speak, upon the shoulders concentrically within the container and clear of its internal walls.

40 designates a plurality of connecting rods or bolts, at their lower ends in preferably threaded connection with lugs 41 upon the outer wall of the lower casing 19, and at their upper ends passing through apertures in the extended outer rim of the cover plate 17, beyond and above which they are formed with heads 42 which, in the tightening action, bear down upon the cover plate when the two casings are locked together by the rotation of the rods.

Above their heads the bolts are extended

and preferably threaded to hold in place cork cushions 43, which more or less completely fill the open area between the cover plate 17 and the baffle disk 12, and serve to effect a balanced vertical cushioning action, so to speak, between the casings and the motor as an assembled whole, and the resting blocks 39 and 36 and the shoulders 37 upon which the entire structure within the container rests.

The upper casing 18 which rests upon and is fitted to the lower casing 19 so that the two casings are in effect one, is inclosed by the cover plate 17 which centrally and alinedly with the motor shaft is formed with a circular throat 45,—while the bottom plate 23 of said upper casing is formed with a counterpart throat 46.

The lower casing 19 which is inclosed above by the bottom plate 23 of the upper casing 18, is itself formed with a bottom plate 24 which I have termed the base plate, from which, as already explained, depends, integrally or attachedly, the motor housing 25.

This base plate is also centrally formed with a throat 47—see Fig. 5—which opens into the hollow interior of the cylindriform field of the motor.

The upper bearing 30 of the armature shaft is concentrically disposed within the circumscribing area of the throat 47, and is supported upon brackets 48, or kindred supports integral with or attached to the base plate 24, and spanning the throat 47.

The fan chambers, each of which is designated 20, are counterpart chambers within the casings 18 and 19, and each located above a rotary blade-supporting disk 49 springing, each, from a hub 50 keyed upon the upper part 28 of and rotatable with the armature shaft.

Each disk 49 carries a series of vertically-erected fan blades 51,—see Fig. 3,—which preferably have a corresponding curvature and in the organization under discussion are six in number. The upper blades are inclosed above by the cover plate 17 of the upper casing and the lower blades by the bottom plate 23 of said casing.

As will be observed from Fig. 2, the blade-supporting disks 49 and the fan blades 51 which extend directly from the hubs 50 outwardly to the perimeter of the disks,—all fall short of extending to the inner walls of their respective inclosing casing, so that a circumferential air space extends around them within their casing.

The vane chambers which I have designated, respectively, the upper as 21 and the lower as 22, are preferably counterpart when considered as chamber areas, and differ only in the preferred number of vanes, of which those in the upper chamber are six and designated 52, while those in the lower chamber are four and designated 53.

The upper vane chamber 21, as will be understood from Fig. 2, is formed between the under surface of the upper blade-supporting disk 49 and the upper surface of the bottom plate 23 of the upper casing 18,—while the lower vane chamber 22 is formed between the under surface of the lower blade-supporting disk 49 and the upper surface of the base plate 24 of the lower casing 19.

The upper vanes 52 extend from the edge of the throat 46 to a distance equal to and matching with the perimeter of the upper disk 49, while the lower vanes 53 extend from beyond the throat 47 to a distance equal to and matching with the perimeter of the lower disk 49.

In the operation of the apparatus, the passage of the air is in the direction of the arrows shown in Fig. 2,—in and through the intake 7,—through the baffle chamber 9,—the air orifices 15,—the air chamber 16, the throat 45,—the upper fan chamber 20,—the circumferential air space within the upper casing 18,—the upper vane chamber 21,—the throat 46,—the lower fan chamber also designated 20,—the circumferential air space within the lower casing 19,—the lower vane chamber 22.—the throat 47,—and thence to within the field magnets.

When, however, the air drawn out of the lower vane chamber 22 through the throat 47, and passing around the armature in the circumferential air area between it and the inner walls of the field, passes through the open areas surrounding the carrying frame 26 for the commutator, it passes into the bottom part of the cup muffler 33 and thence flows upward and outward from the inside of the cup muffler partly through the apertures 44 in its upper walls, and, also, above flange 35, and fills into the interior cylindric air area 54 between the external walls of the upper and lower casings 18 and 19 and the interior walls of the upper portion of the container, and also fills into the circumferential air area 55 between the interior walls of said upper portion of the container, part of the outer upper surface of the cover plate 17, part of the outer under surface of the baffle disk 12, and against the outer walls of the tubular gaskets 56, by which it is, so to speak, stopped and thereby prevented from entering the air chamber 16.

Under the influence of the suction blast of the fan blades the air is, therefore, compelled to return and to pass backward and downward within and through the air areas externally bounded by the inner walls of the contracted portion 2 and the cylindric por-

tion 3 of the container and the outer walls of the cup muffler 33,—so as to be forcibly expelled through the open bottom 4 of the container around and externally of the cup muffler.

In this passage, the returning air of course passes between the felt strips 38, which, as explained, are interposed between the outer walls of the cup muffler 33 and the inner walls of the cylindric lower portion 3 of the container, to stay and steady said muffler within the container.

In Fig. 6, I have illustrated a modification of the double tubular gaskets 56 illustrated in Figs. 1 and 2, by employing a single gasket instead of two. Of course the function of a single gasket, or, for the matter of that, the function of a plurality of gaskets exceeding two, is the same.

In Fig. 7, I have illustrated a modified form of the upper portion of the container, in which I have located the intake elbow 7 laterally instead of centrally of the lid 5 of the container;—instead of making the lid of more or less flattened conical form, have made it flat;—and have disposed the baffle disk 12 angularly instead of horizontally, so that the baffle chamber 9 and the air chamber 16 are somewhat differently shaped.

In making the last of these changes, I have dispensed with the tubular gasket and sustained the elevated end of the baffle disk between two cork blocks 57, and rested the lower end upon a supplemental baffle plate 58 formed with a central throat 59 connected with the throat 45 of the cover plate 17 by a flexible cloth connection 60 which, in a sense, is a flexible tube, the flattened peripheral edges 61 of which are shellacked to the baffle plate 58, and the vertical lower edges 62 of which are preferably fastened by a cord wrapping 63 to a rubber nipple 64 fitting fast to and surrounding the upwardly-extending flanges 65 of the throat 45.

Referring again to the operation of my apparatus and it being, of course, understood that the intake has been connected with the operative parts of a pneumatically-played instrument,—when the motor, which is connected with a suitable source of electric current either direct or alternating (not shown)—is put into operation, it will occasion the revolution of the fan blades and the drawing of the air from the instrument, in and throughout the entire apparatus, always in the direction indicated by the arrows, with the ultimate result that during the air's entire passage through, and until its ultimate expulsion from out the bottom of, the container, no sound will be occasioned because in no part of the apparatus is there any contact between the container itself and any moving metal part.

As a matter of fact, the casings and their blade, chambers and fan chambers, the motor field housing and the motor within it, and the bearings for the armature shaft, are all, as a concrete unitary structure, supported within the container, and free from metallic contact with any of its parts, by resting upon the cork resting blocks 39 which, through the flange of the cup muffler and the cork blocks 36, rest upon the shoulders 37, and, of course, are prevented from transmitting any sound of the revolving fan blades and armature to the container because of the sound deadening influence of said cork blocks.

Similarly, no vibration of or within the cup muffler can be transmitted outwardly through the walls of the contracted or lower portions of the container, because of the suspension of the cup muffler through its flange between the cork blocks referred to and upon the shoulders,—a further prevention of sound escape being insured by the felting strips 38 in their interposed relationship between the outer walls of the cup muffler and the inner walls of the bottom extension of the container.

In like manner, also, any assumed vertical vibratory movement of the fan casings and vane casings and of the motor, which might possibly occur, would be balanced, so to speak, between the cork blocks 36 and 39 below and the slightly compressible gaskets 56, above, without necessarily placing or depending upon the cork cushions 43.

In a word, the entire apparatus is proof against the expulsion from it of sound and also proof against the return of any sound backward through the intake.

It is a practical impossibility when the apparatus is in operation for any sound to either emanate from it or be conveyed to the playing instrument.

A further advantage of no slight moment results from the passage of the air through the circumferential chamber which surrounds the armature within the field, and naturally tends to prevent overheating of the motor.

In an application for patent executed and filed by me contemporaneously with this application, I have particularly explained and claimed a self-alining bearing which I have illustrated as used in connection with the armature shaft of this apparatus.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is: —

1. A suction-producing apparatus which comprises in combination:—a container inclosed at the top and open at the bottom:— an air inlet in the top of the container;—a casing within the container, the outer walls of which are spaced apart from the inner

walls of the container;—an apertured baffle plate between the top of the container and the top of the casing;—a compressible gasket interposed between the baffle plate and the top of the casing, which forms an air chamber between the baffle plate and the top of the casing;—a plurality of rotary fan blades within the upper portion of the casing;—a plurality of vanes also within the upper portion of the casing;—an electric motor within the lower portion of the casing, which rotates the fan blades;—and cushioning devices interposed between the inner walls of the container and the outer walls of the casing.

2. A suction-producing apparatus which comprises in combination:—a container inclosed at the top and open at the bottom;—an air inlet in the top of the container;—a casing within the container, the outer walls of which are spaced apart from the inner walls of the container;—an apertured baffle plate between the top of the container and the top of the casing;—a compressible gasket interposed between the baffle plate and the top of the casing, which forms an air chamber between the baffle plate and the top of the casing;—a plurality of rotary fan blades within the upper portion of the casing;—a plurality of vanes also within the upper portion of the casing;—an electric motor within the lower portion of the casing, which rotates the fan blades;—a muffler open at the top and closed at the bottom, and interposed between the lower portion of the casing and the lower portion of the container;—cushioning devices interposed between the inner walls of the container and the outer walls of the casing;—and cushioning devices interposed between the inner walls of the container and the outer walls of the muffler.

3. A suction-producing apparatus which comprises in combination:—a container inclosed at the top and open at the bottom;—an air inlet in the top of the container;—a casing within the container the outer walls of which are spaced apart from the inner walls of the container;—an apertured baffle plate between the top of the container and the top of the casing;—a baffle chamber between the top of the container and the baffle plate;—a compressible gasket interposed between the baffle plate and the top of the casing, which forms an air chamber between the baffle plate and the top of the casing;—a plurality of rotary fan blades within the upper portion of the casing;—a plurality of vanes also within the upper portion of the casing;—an electric motor within the lower portion of said casing, which rotates the fan blades;—a muffler open at the top and closed at the bottom, and interposed between the lower portion of the casing and the lower portion of the container;—cushioning devices interposed between the inner walls of the container and the outer walls of the casing;—and cushioning devices interposed between the inner walls of the container and the outer walls of the muffler.

4. A suction-producing apparatus of the class recited, in which are combined:—a container inclosed at the top and open at the bottom:—an air inlet in the top of the container;—a casing within the container, the outer walls of which are spaced apart from the inner walls of the container;—a plurality of rotary fan blades within the upper portion of the casing;—a plurality of vanes also within the upper portion of said casing;—an electric motor within the lower portion of the casing, which rotates the fan blades;—supporting devices within the container upon which the casing rests;—cushioning devices interposed between the inner walls of the container and the outer walls of the casing;—and cushioning devices between the supporting devices and both the inner walls of the container and the outer walls of the casing.

5. A suction-producing apparatus of the class recited, in which are combined;—a container inclosed at the top and open at the bottom;—an air inlet in the top of the container;—a casing within the container, the outer walls of which are spaced apart from the inner walls of the container:—a plurality of rotary fan blades within the upper portion of the casing;—a plurality of vanes also within the upper portion of the casing;—an electric motor within the lower portion of the casing, which rotates the fan blades;—a muffler open at the top and closed at the bottom, and interposed between the lower portion of the casing and the lower portion of the container;—supporting devices within the container upon which the casing rests;—cushioning devices interposed between the inner walls of the container and the outer walls of the casing;—and cushioning devices between the supporting devices and both the inner walls of the container and the outer walls of the casing.

6. A suction-producing apparatus which comprises in combination:—a container inclosed at the top and open at the bottom:—an air inlet in the top of the container;—a casing within the container, the outer walls of which are spaced apart from the inner walls of the container;—an apertured baffle plate between the top of the container and the top of the casing;—the apertures of which are covered by dust-impervious material;—a compressible gasket interposed between the baffle plate and the top of the casing which forms an air chamber between the baffle plate and the top of the casing;—a plurality of rotary fan blades within the

upper portion of the casing;—a plurality of vanes also within the upper portion of the casing;—an electric motor within the lower portion of the casing which rotates the fan blades;—a muffler open at the top and closed at the bottom, and interposed between the lower portion of the casing and the lower portion of the container;—cushioning devices interposed between the inner walls of the container and the outer walls of the casing;—and cushioning devices interposed between the inner walls of the container and the outer walls of the muffler.

In testimony whereof I have hereunto signed my name this 29th day of March, 1919.

GEORGE W. GARMAN.

In the presence of—
J. BONSALL TAYLOR,
CHAS. W. YOUNG.