E. K. MÜLLER.

ELECTROMAGNETIC BLOWER.

APPLICATION FILED APR. 14, 1917.

1,249,654.

Patented Dec. 11, 1917.

2 SHEETS—SHEET 1.

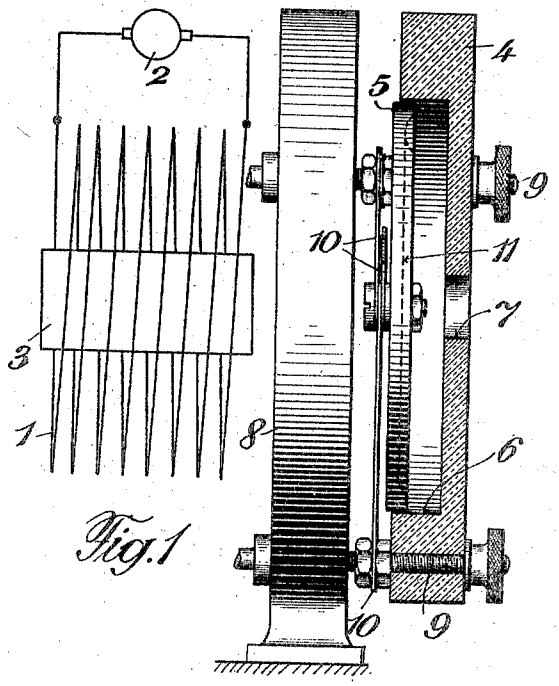


Fig. 1

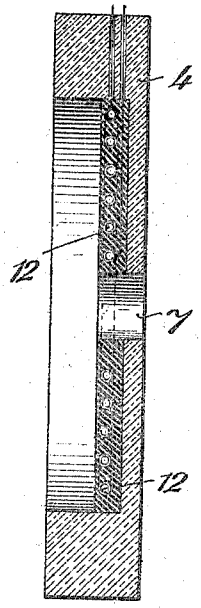


Fig. 3

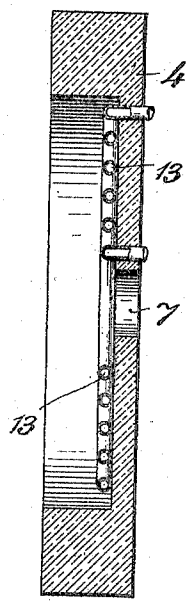


Fig. 4

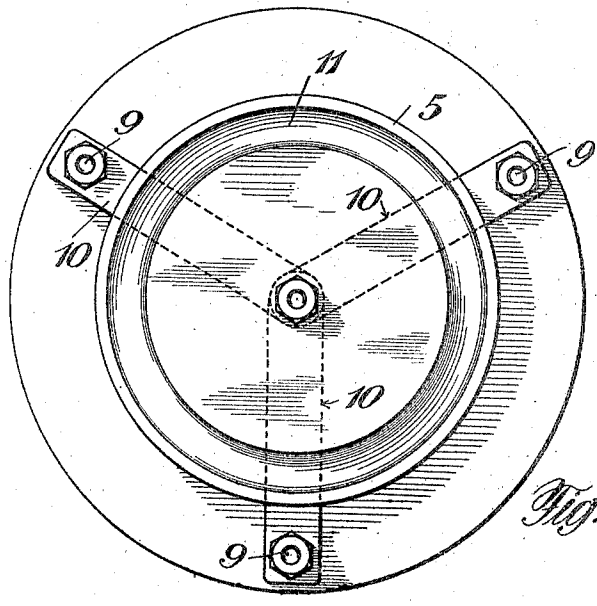


Fig. 2

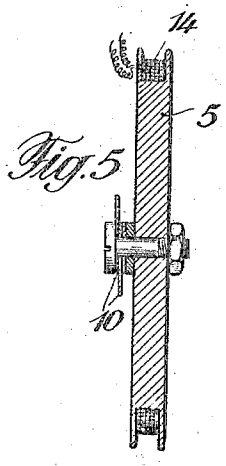


Fig. 5

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2 SHEETS—SHEET 2.

Fig. 6

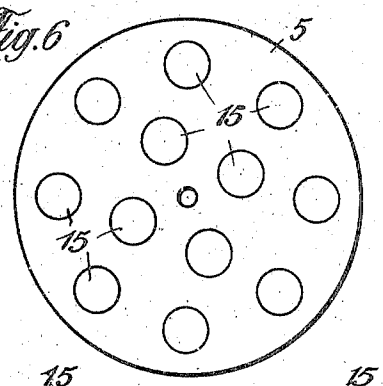


Fig. 7

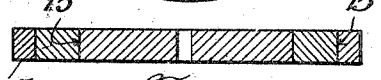


Fig. 8

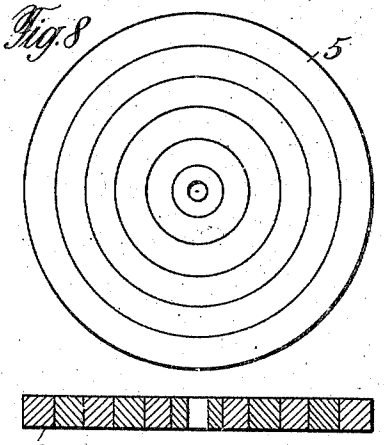


Fig. 9

Fig. 10

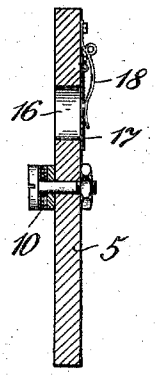


Fig. 12

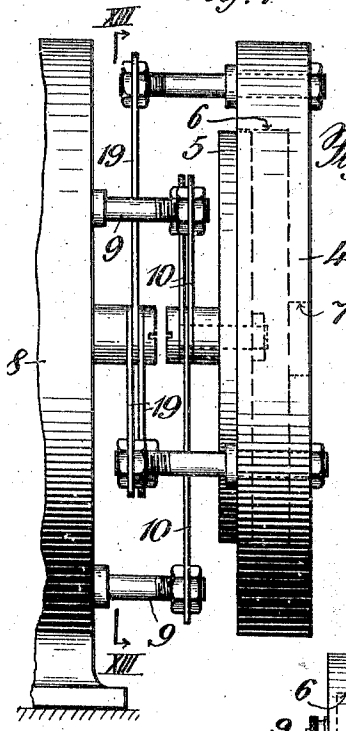


Fig. 13

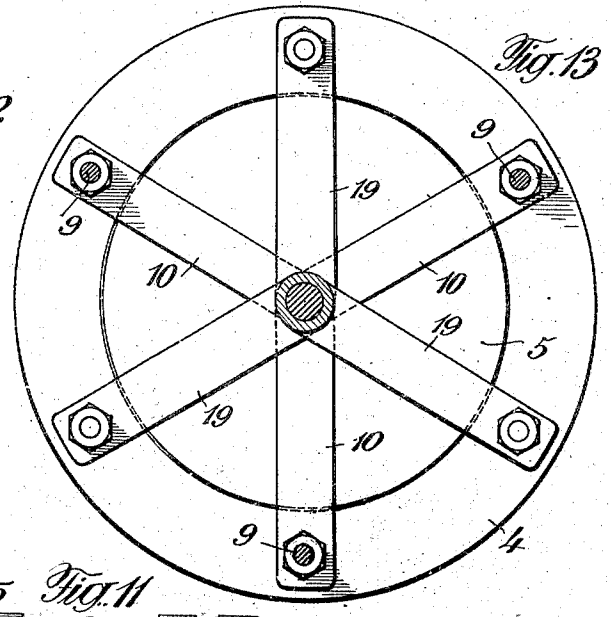
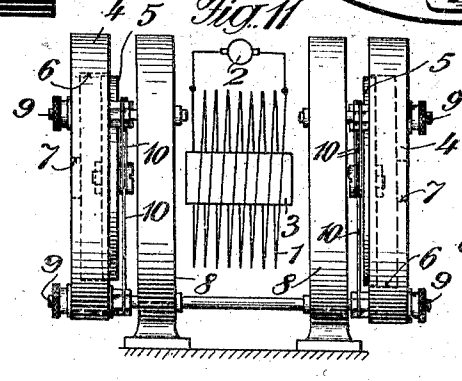


Fig. 11



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UNITED STATES PATENT OFFICE.

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ELECTROMAGNETIC BLOWER.

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To all whom it may concern:

Be it known that I, EUGEN KONRAD MÜLLER, a citizen of the Republic of Switzerland, residing at Kilchberg, Canton of Zurich, Switzerland, have invented certain new and useful Improvements in Electromagnetic Blowers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

This invention relates to an electromagnetic blower for the production of a pulsating air current.

The blower according to this invention comprises a piston moving in a magnetic field of varying strength, said piston being either attracted or repelled by the electromagnetic influence. This piston is suspended in a resilient manner and it works in a cylinder open at one end and provided at the opposite end with an outlet opening for the air. Experience has shown, that it is advantageous to regulate the vibrations of the magnetic field to the number of natural oscillations of the resiliently suspended piston in such a manner, that their combination gives the highest efficiency with regard to the produced air current.

This invention will now be more particularly described with reference to the accompanying drawings, which illustrate several constructional examples of the invention.

In these drawings:

Figure 1 is a side view partly in section of a first embodiment.

Fig. 2 is a front view of a detail of this embodiment.

Figs. 3 to 10 show modifications of details of this embodiment.

Fig. 11 shows an embodiment for the production of a double effect.

Fig. 12 shows a further embodiment in which the cylinder as well as the piston are arranged in a movable manner and

Fig. 13 is a section on the line XIII—XIII of Fig. 12.

In carrying the invention into effect as shown in Figs. 1 and 2 I provide a magnet coil 1 connected to a source of current 2, which generates a waving current of varying intensity. This current may be either alternating current or continuous current. 3 denotes a laminated core surrounded by the magnet coil 1 and made of a paramagnetic material. A cylinder 4 disposed in front of coil 1 is arranged coaxially to the latter. The distance between cylinder 4 and coil 1 remains constant and this cylinder is secured to a stationary part 8 by means of three adjusting screws 9. I prefer to choose for this cylinder 4 a material, which is not influenced by the magnetism. Such a material is, for instance, marble. The rear side of the cylinder 4 is provided with a recess 6 for the piston 5 while an aperture or opening 7 for the outlet of the air is arranged in the middle of the front side of this cylinder. The piston 5 is disk-shaped and it consists of a magnetic material, so that it may be either attracted or repelled by the magnetic influence generated by the coil 1. The connection of this piston to the part 8 is such, that said piston is capable of carrying out an oscillating movement. For this purpose I connect the ends of three springs 10, each two of which inclose an angle of 120°, which project beyond the piston 5 to the adjusting bolts 9, while the other ends of said springs are connected to the middle of the rear side of piston 5. The diameter of piston 5 is only a little smaller than the diameter of the recess 6, so that only a small play is provided between the rim of the piston and the periphery of recess 6. The piston is mounted in such a manner, that only a small portion of it comes to lie outside cylinder 4. The end face of this piston 5 lying in the cylinder 4 is provided with an annular groove 11.

As soon as a current of varying strength and of a wavy character flows through coil 1, a waving magnetic field is generated, the strength of which varies in the same manner as the strength of the current. The core 3 of paramagnetic material, which is not absolutely necessary for the working of the apparatus, but which has been found to be of great advantage, prevents a dissipation of the magnetic lines of force. The piston 5 lying in the generated magnetic field is now attracted, the springs 10 being thereby tensioned. This attraction depends on the strength of the magnetic field; it increases with an increase of the strength of said field and it decreases when the strength of the magnetic field decreases. Upon disappearance of the magnetic field the tensioned springs 10 move the piston 5 back into its

original position. When the change of the magnetic field is effected in a quick manner the oscillation carried out by the piston 5 ensues in a corresponding quick manner and even a springing in the opposite direction then takes place. When the current generated by the source 2 is, for instance, an alternating current of 100 periods, the piston 5 is forced to move in accordance with these periods, so that it carries out a corresponding number of strokes in the cylinder 4. Upon an attraction of the piston by the magnetic field air is sucked into the recess 6 of cylinder 4, said air being again expelled through the opening 7 upon the return movement of the piston. Owing to the great number of strokes carried out in the unit of time, the produced air impulses succeed one another in such a rapid manner that a continuous pulsating air current is obtained. The effect of the blower may be varied in a convenient manner by changing by means of the springs, the natural number of oscillations of the piston 5 and the number of oscillations of the magnetic field is so combined with the number of oscillations of the piston, suspended at three points in a resilient manner, that a maximum of efficiency is obtained. In the embodiment shown in Figs. 1 and 2 the aperture 7 forms the inlet as well as the outlet for the air sucked into the cylinder 4.

In consequence of the wavy character of the magnetic field the piston 5 shown will be heated owing to the hysteresis which takes place, and it transmits this heat to the air in the cylinder 4, so that the pulsating current flowing out through the opening 7 is warm.

An automatic heating of the air may be prevented when the piston made of a diamagnetic metal is subdivided in a suitable manner. Any desired temperature may be given to the air in the cylinder 4 by arranging in the latter heating coils 12 (Fig. 3) or cooling pipes 13 (Fig. 4).

When the piston is made of a paramagnetic material, for instance iron, the movement of the piston is effected owing to an attraction of it, while when said piston is made of aluminium, copper or a similar non magnetic material it is repelled by the electromagnet. In both cases, a pumping action is, however, brought about, so that the air is forced out off the cylinder.

As shown in Fig. 5, I may also provide on the piston a wire coil 14, which may be connected to the same or to another source of current. In this case it is then possible to obtain a movement of the piston, due to an attraction or a repelling of the latter by means of a suitable arrangement of the parts.

According to the embodiment shown in Fig. 6 and in Fig. 7, which latter is a cross-section of Fig. 6, the blower-piston 5 is perforated. The holes 15 of this piston may be filled with a material, which is not influenced by the magnetism but which is permeable to magnetism, in order to obtain in front of the piston a partial simultaneous spreading out of the magnetic field, of which I may make use. Instead of having such perforations 15 the piston 5 may also be formed of a plurality of concentric rings (Figs. 8 and 9), which consist alternately of a material adapted to be influenced by magnetism and of a material which cannot be energized by magnetism but which is permeable to the latter.

It is not necessary to suck the air in from the front side through the opening 7; it may as well be sucked in from the rear side through the oscillating piston, or at the same time through both these parts. To this end I may provide in the piston 5 at least one opening 16 (Fig. 10) adapted to be closed by a member 17 and uncovering said opening when moved in a determinate direction. The actuation of this member may be effected, for instance, by means of air and a spring 18.

This member may be actuated, however, as well by a difference in the magnetic influence acting upon different parts. To this end the member 17 may be made, for instance, of a metal repelled by the magnetic field and the piston of a metal attracted by said field.

A double effect is attained when use is made of both end-faces of the electromagnet and when a blower, according to this invention, is arranged opposite each of said faces. Such a construction is shown in Fig. 11. In this case I may use the effect of each blower, separately or the effect of both pumps or blowers may be combined, for instance, in such a manner, that on one side a cold and on the other side a warm pulsating air-current is obtained. These currents may then be guided in suitable conduits to the place where use of these currents has to be made.

It has also to be noted, that the cylinder may also be made of a material, which is influenced by the magnetism, so that the piston and the cylinder are moved in the varying magnetic field apart and one into another for the purpose of attaining in this manner a pumping action. Such a construction is shown in Figs. 12 and 13. In this embodiment the cylinder 4 is resiliently suspended on the stationary part 8 by means of springs 19 in the same manner as the piston 5.

What I claim is:

1. An electromagnetic blower adapted to generate a pulsating air-current, comprising means for generating a magnetic field of varying strength, a cylinder open at one end and provided with an opening, a piston

adapted to be influenced by said magnetic field and working in said cylinder, a stationary member and means for resiliently suspending said piston on the latter.

2. An electromagnetic blower adapted to generate a pulsating air-current, comprising means for generating a magnetic field of varying strength, a cylinder open at one end and provided with an opening, a piston adapted to be influenced by said magnetic field and working in said cylinder, a stationary member, means for resiliently suspending said piston on the latter and means adapted to heat the air before it is forced out of the cylinder.

3. An electromagnetic blower adapted to generate a pulsating air-current, comprising means for generating a magnetic field of varying strength, a cylinder open at one end and provided with an opening, a piston adapted to be influenced by said magnetic field and working in said cylinder, said piston being made of a metal adapted to be heated in consequence of hysteresis, a stationary member, and means for suspending said piston on the latter.

4. An electromagnetic blower adapted to generate a pulsating air-current, comprising means for generating a magnetic field of varying strength, a cylinder provided with a recess and an opening in the front wall of the cylinder communicating with said recess, a piston adapted to be influenced by said magnetic field and working in said recess, a stationary member and springs connected at one end to the piston and at the other end to said member, the piston being thus suspended in a resilient manner on said member.

5. An electromagnetic blower adapted to generate a pulsating air-current, comprising means for generating a magnetic field of varying strength, a cylinder provided with a recess and an opening in the front wall of the cylinder communicating with said recess, a piston adapted to be influenced by said magnetic field and working in said recess, an opening in the piston adapted to communicate with the recess in the cylinder, a member adapted to cover the last mentioned opening and made of a diamagnetic material, the piston consisting of a paramagnetic material, so that said member may be actuated automatically by the electromagnetic influence, a stationary member, and means for resiliently suspending said piston on the latter.

In testimony that I claim the foregoing as my invention, I have signed my name.

EUGEN KONRAD MÜLLER.

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