Title: A MAGNETICALLY OPERATED VALVE AND A VACUUM PLATE MADE OF SUCH VALVES

Abstract: A magnetic valve that especially useful for vacuum tables is disclosed. The provided magnetic valve includes a cell that is separated into first sub-cells and a second sub-cell, wherein the separation is done by separation low wall. Said low wall enables passage between the first and second sub-cells in the high part of the cell and disable passage between the first and second sub-cells in the low part of the cell. The magnetic valve includes also at least one inlet located in the upper wall of the cell or in the sidewalls of the cell and an outlet located in the bottom of the second sub-cells. An iron ball, located inside the cell and capable to pass from the first sub-cell to the second cell in the high part of the cell and vise versa, wherein the iron ball is capable to seal the outlet while locating in the second sub-cell. Moreover, the magnetic valve includes a slider that is capable to slide on the upper side of the cell, wherein the slider is made of magnet and operative for sliding on the first sub-cell and pulls the iron ball up, continue to slide while dragging the iron ball over the separation low wall into the second sub-cell, continue to slide over the cell, leaving the iron ball to fall into the second sub-cell and sealing the outlet and sliding back and inversely opens the outlet.
A MAGNETICALLY OPERATED VALVE AND A VACUUM PLATE MADE OF SUCH VALVES

FIELD OF THE INVENTION

The present invention relates to the field of valves. More specifically, the present invention relates to a valve that is operated by a magnetic power.

BACKGROUND OF THE INVENTION

There are many kinds of known valves, which usually differ by the sealing method and the operation method. One of the well-known valves is the ball valve. In such a valve, a ball is lying on the outlet and the pressure on the ball pushes it to seals the outlet and the inverse pressure moves up the ball and opens the valve.
The present invention is useful in vacuum tables. A vacuum table has a vacuum box with holes in it. The "holes" are pulling down the object above it with the vacuum pressure, and this pressure on the object is based on the surface area of the holes in contact with the object being held.

When the object is smaller than the table's surface, the non-covered holes remain open and vacuum energy is wasted. To save this energy a simple valve with a simple operation is needed to enable closing at least part of the non-covered holes of the vacuum table.

Therefore, it would be advantageous to have a magnetic-valve that is simple and inexpensive and easily operated by sliding a magnet.

SUMMARY OF THE INVENTION

The present invention is a magnetic valve, especially useful for vacuum tables.
According to the teachings of the present invention there is provided a magnetic valve that comprised of:

a) a cell, this cell is separated into first sub-cells and a second sub-cell, wherein the separation is done by separation low wall, the low wall enables passage between the first and second sub-cells in the high part of the cell and disable passage between the first and second sub-cells in the low part of the cell;

b) at least one inlet located in the upper wall of the cell or in the sidewalls of the cell;

c) an outlet located in the bottom of the second sub-cells;

d) an iron ball, located inside the cell and capable to pass from the first sub-cell to the second cell in the high part of the cell and vice versa, wherein the iron ball is capable to seal the outlet while locating in the second sub-cell; and

e) a slider that is capable to slide on the upper side of the cell, wherein the slider is made of magnet and operative for:

i) sliding on the first sub-cell and pulls the iron ball up;

ii) continue to slide while dragging the iron ball over the separation low wall into the second sub-cell;
iii) continue to slide over the cell, leaving the iron ball to fall into
the second sub-cell and sealing the outlet; and

iv) sliding back and inversely opens the outlet.

According to further features in the described preferred embodiment of the present invention the magnetic valve is provided, wherein the iron ball is made of magnet and the slider is made of iron.

According to another a preferred embodiment of the present invention, the magnetic valve is provided wherein both the iron ball and the slider are made of magnets or any other magnetic or ferromagnetic material.

According to another a preferred embodiment of the present invention, the magnetic valve is provided, wherein the magnetic-valve is used as a vacuum valve.

In another preferred embodiment, the magnetic valve is provided, wherein the slider is an electromagnet.
According to yet another aspect of the present invention there is provided a vacuum plate, wherein this vacuum plate is made of a matrix of magnetic-valves as defined in the present invention, wherein the slider is a strip shaped slider that capable to slip over the surface of the vacuum plate and seals the magnetic-valves that the slider is passed over, and vise versa.

According to another a preferred embodiment of the present invention, the vacuum plate is provided wherein the slider is made of a plurality of electromagnets and further includes a controller to control said electromagnets in order to control vacuum areas on the plate by controlling the opening and closing each magnetic-valves during the passage of the slider.

The present invention successfully addresses the shortcomings of the existing technologies by providing a magnetic valve and vacuum plate of the present invention that are simple, reliable and inexpensive.
BRIEF DESCRIPTION OF THE FIGURES

The invention is herein described, by way of example only, with reference to the accompanying drawings. With specific reference now to the drawings in detail, it is stressed that the particulars shown are by way of example and for purposes of illustrative discussion of the preferred embodiments of the present invention only, and are presented in the cause of providing what is believed to be the most useful and readily understood description of the principles and conceptual aspects of the invention. In this regard, no attempt is made to show structural details of the invention in more detail than is necessary for a fundamental understanding of the invention, the description taken with the drawings making apparent to those skilled in the art how the several forms of the invention may be embodied in practice.

In the figures:

Figure 1 illustrates a cross section of the magnetic valve, according to the present invention and illustrates its working method.

Figure 2 illustrates the vacuum plate, according to the present invention.
DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention is a magnetic valve and a vacuum plate that is using such valves.

The magnetic valve of the present invention is made of a cell that is separated into two sub-cells by low wall and an iron ball that is located in one of the sub-cells and can be moved from one sub-cell to another only when it is pulled up. In the bottom of one of the sub-cells there is an outlet and inlet, which can be locate in the upper wall or in the sidewalls of the cell. The iron ball seals the outlet when it is located in the sub-cell with the outlet and therefore the valve is closed, but it is open when the iron ball is located in the second sub-cell. The ball passes from one sub-cell to the second is done by a magnetic slider that pulls up the ball and move it over the separating wall.

The principles and operation of the magnetic valve according to the present invention may be better understood with reference to the drawing and the accompanying description.
Referring now to the drawing, Figure 1 illustrates a cross section of the magnetic valve, according to the present invention and illustrates its working method. In "A" part of figure 1 the valve is open, there is a cell 10 with two sub-cells "x" & "y", which are separated by a low wall 11. The cell has inlets 12 and outlet 13 and a passage 14 is possible through the valve. An iron ball 15 is located in the first sub-cell "x", a magnetic slider 16 is located in a position that is not affect the ball.

In part "B" of figure 1, the slider 16 is sliding on the cell 10. When the slider 16 slides over the ball 15, the slider 16 pulls up the ball 15 and drags it over the low wall 11 to the top of the second sub-cell "y".

In part "C" of figure 1, the slider 16 continues to slide out. The ball 15 is released and falls into the bottom of the second sub-cell "y" and the ball 15 seals the outlet 13. Now the valve is closed.
Figure 2 illustrates the vacuum plate, according to the present invention. The vacuum plate is made of a plurality of magnetic valves as described in the present invention. The inlets of the magnetic valves 12a & 12b are the holding-holes of the vacuum plate that holds an object by force of a vacuum coming via the outlets 13 of the magnetic valves. Obviously, the vacuum plate holds the object in the areas where the magnetic valves are open. The magnetic slider 16 was moved from left to right 17 and already slide over the left pars of inlets 12a. In this part of the vacuum plate the balls 15a was moved to the second sub-cells and seal the outlets and therefore there is no vacuum in the inlets 12a that are the holding holes of the left side. In the right side the balls 15b still in the first sub-cells and the outlets 13 are open and vacuum exists in the right side inlets 12b, which are the holding holes of this side.

Moving the slider 16 right 17 will close the magnetic valves that it passed on and the holding area of the vacuum plate will became
smaller. Moving the slider 16 left will open the closed magnetic valves –
by passing the balls 15a to the other sub-cells – and the holding area
will be larger.

The slider 16 can be built up of electromagnets, one for each line
of magnetic valves. In this embodiment a controller can open or close
each magnetic valve by controlling the electromagnets and enables any
combination of vacuum areas on the vacuum plate.

Although the invention has been described in conjunction with
specific embodiments thereof, it is evident that many alternatives,
 modifications and variations will be apparent to those skilled in the art,
 accordingly, it is intended to embrace all such alternatives, modifications
and variations that fall within the spirit and broad scope of the appended
claims.
WHAT IS CLAIMED IS:

1. A magnetic-valve comprising:
   a) a cell, said cell is separated into first sub-cells and a second sub-cell, wherein said separation is done by separation low wall, said low wall enables passage between said first and second sub-cells in the high part of said cell and disable passage between said first and second sub-cells in the low part of said cell;
   b) at least one inlet located in the upper wall of said cell or in the sidewalls of said cell;
   c) an outlet located in the bottom of said second sub-cells;
   d) an iron ball, located inside said cell and capable to pass from said first sub-cell to said second cell in the high part of said cell and vise versa, wherein said iron ball is capable to seal said outlet while locating in said second sub-cell; and
   e) a slider that is capable to slide on the upper side of said cell, wherein said slider is made of magnet and operative for:
      i) Sliding on said first sub-cell and pulls said iron ball up;
      ii) continue to slide while dragging said iron ball over said separation low wall into said second sub-cell;
iii) continue to slide over said cell, leaving said iron ball to fall into said second sub-cell and sealing said outlet; and

iv) sliding back and inversely opens said outlet.

2. The magnetic-valve of claim 1, wherein said iron ball is made of magnet and said slider is made of iron.

3. The magnetic-valve of claim 1, wherein both said iron ball and said slider are made of magnets.

4. The magnetic-valve of claim 1, wherein said magnetic-valve is used as a vacuum valve.

5. The magnetic-valve of claim 1, wherein said iron ball or said slider or both are made of any magnetic or ferromagnetic material.

6. The magnetic-valve of claim 1, wherein said slider is an electromagnet.
7. A vacuum plate, said vacuum plate is made of a matrix of magnetic-valves as defined in claim 1, wherein said slider is strip shaped that is capable to slip over the surface of said vacuum plate and seals the magnetic-valves that said slider is passed over, and vise versa.

8. The vacuum plate of claim 7, wherein said slider is made of a plurality of electromagnets and further includes a controller to control said electromagnets in order to control vacuum areas on the plate by controlling the opening and closing each of said magnetic-valves during the passage of said slider.