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ROTATING PISTON MACHINE



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Field of Invention:

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The present invention relates to a machine with the revolving piston, which encloses workspaces with alternately changing volume such as: compressors, pumps, or engines where the piston is arranged inside
10 the cylinder formed by two sidewalls and the curved covering, the curve of which is a geometrical locality of the piston cusps arised during its revolving motion around two revolving axes, whereas a conducting ring embedded on the sidewall or rotary in the sidewall or
15 also in a sliding way against a supporting shaft is connected with the piston embedded on the supporting shaft either in a sliding way normal to its axis or rotary through the supporting eccentric connected to the supporting shaft.

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Background to the Invention:

There are known arrangements where the piston holds a simple revolving motion. It is eccentrically placed
25 inside the circular covering equipped by the extension seals, which fill changing distances between the piston and the circular covering and concurrently enclose changing workspaces between the piston and the cylinder covering. This arrangement does not tolerate high
30 pressure or temperature therefore it can only be used as a blower. Furthermore, there are known arrangements where the piston holds one compound revolving motion i.e. rolling motion (by rolling a bigger circle, for



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example the central circle of the inside tooth-wheel,
over an immobile smaller circle for example the central
circle of the tooth-wheel with an internal gearing, by
means of the tooth-wheels). The diameters ratio of both
5 circles quantifies the number of the piston cusps, which
follows the same curve and also the same number of
workspaces enclosed by the piston. If the ratio is 2:1,
the piston has two cusps and encloses two workspaces. If
the ratio is 3:2, the piston has three cusps and
10 encloses three workspaces etc. At the higher number than
two of the piston cusps, the covering curve has very
inconvenient shape for a combustion space and in
addition the biggest-the smallest volume ratio of the
workspace is principally restricted, which is the
15 disadvantage of this solution. Two cusps arrangement can
else provide more convenient combustion space and more
convenient the biggest-the smallest workspace ratio, but
also principally gives the adverse ratio of piston
surface encumbered by work pressure to the biggest
20 possible critical shaft diameter, which the piston is
embedded on. This arrangement is therefore not suitable
for engines, but only for blowers or pumps and low work
pressure compressors.

25 There is another known concept of the piston with two
cusps motion, where both of the cusps follow a curve
called conchoid. In this concept, the piston is embedded
in a sliding way on two parallel shafts normal to their
revolving axes. Herewith, the piston sliding motion
30 toward the individual shafts are mutually perpendicular.
One of these shafts acts as a supporting shaft and the
other as a conducting shaft; herewith both of them are
always embedded just in one sidewall. One of them is

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adapted in a tubular jig way, which passes through the other shaft, in order to embed both of them into both sidewalls.

5 According to other known concepts one of the shafts can be replaced by one or by number of pivots protruding from the sidewall, which the piston slides or revolves on. The supporting shaft, which the piston is embedded on, can also be replaced (in other concepts) by the
10 shaft with the crank pivot, which the piston is embedded on, herewith the conducting shaft, as mentioned above, is replaced by the pivots. These conchoid concepts also have common disadvantages such as, insufficient bearing capacity of the supporting shaft and an inaccurate
15 piston guide sensitive to wear. These construction concepts have not therefore been seen and stayed in the conception state even though they have been well known since the beginning of the 20th century.

20 Summary of the Invention:

The present invention seeks to eliminate the disadvantages of the current state of technology by a machine with the revolving piston embedded in the
25 cylinder. This machine is characterized by a piston, which is embedded on the supporting shaft either in a sliding way normal to the supporting shaft axis or rotary through the supporting eccentric connected to the supporting shaft. This piston is connected in a sliding
30 way to, at least, one conducting ring, which is embedded on the sidewall or rotary in the sidewall, or optionally in a sliding way towards the supporting shaft normally to its revolving axis. Another aspect of the present

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invention is that the conducting ring is on its front side indisposed from the piston, perpendicularly to its sliding connection with the piston, connected to the auxiliary glide, which is embedded in a revolving way on
5 the conducting eccentric set to the supporting shaft in a parallel way to the supporting eccentric and rotated by 180 degrees. Where two or more cylinders are arranged one next to the other, the auxiliary glide is formed by the adjacent cylinder piston; herewith the directions of
10 the conducting ring gliding connections towards the individual pistons are normal one to another. According to the last aspect, and of the present invention's significance is that spaces between the sliding elements e.g. sockets or nocks, eventually supporting sliding
15 element on one side and the gliding elements, with advantageous casing or groove on the other side are enclosed and equipped by the vents for inlet and outlet of the lubricant.

20 Detailed Description of the Drawings:

The present invention can be more readily understood by the Drawings, in which:
Fig. 1 is a schematic of the present invention;
25 Fig. 2 shows the main aspect of the conchoid design in accordance with the present invention;
Fig. 3 shows another embodiment of the present invention where the piston is conducted by the conducting rings and is further embedded on the supporting eccentric,
30 which is connected to the supporting shaft;
Fig. 4 and Fig. 5 show alternative schematics of the embodiments of the present invention; and

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Fig. 6 shows a sectional view of another variation of the present invention.

Detailed Description:

5 In Fig. 1, the piston 2 equipped by the slots 3 and 4, which form the sliding elements of the piston 2 is arranged in the curved casing 1. The slots 3, 4 settle the piston 2 on two conducting elements 5, 6, which are always fixed upon one of the shafts 71, 81 whose axes
10 are parallel. According to Fig. 2 the cylinder casing 1 is enclosed by the sidewalls 11, which shafts 71, 81 are rotary embedded on. Arrangements of the sliding elements 3, 4 and the conducting elements 5, 6 (at the opposite sides of the piston) and shafts 71, 81 is shown on the
15 Figs. 4 and 5. During the revolving of the pistons 71, 81, the fixed conducting element 5,6 (which furthermore revolves the piston through the particular sliding element, e.g. slot) concurrently revolves too. The piston also revolves around the axes 8, 7 through its
20 second sliding element 4, 3, second conducting element 6, 5 and second shaft 81, 71. If the cusps have the same distance from the centre of the piston 2, then both of them follow the same covering curve, which together with connection of both cusps forms two separated spaces.

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The concurrent revolving motion of the piston 2 around the parallel axes 7, 8 causes that during motion along the covering 1 one of the joins of the piston 2 and covering 1 departs, while the other join approaches the
30 covering 1. During revolving around 180 degrees, the space between one join of the piston cusp and the covering 1 amplifies from minimum to maximum while the space between the other joins diminishes from maximum to

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minimum. If the cylinder covering 1 and/or the cylinder
sidewalls 11 are equipped at one side by an inlet and at
the opposite side by an exhaust of the liquid or fluent
medium, then this medium begins by revolving of just one
5 of the shafts expels from the space between the covering
1 and the piston 2 at one side and sucks out of this
space at the other side. The machine then works as a
compressor or a pump. If the pressure medium is fed
through one side of the cylinder into the space between
10 covering 1 and piston 2 then the pressure on the surface
restricted by the join of the cusps and width of the
piston 1 causes force, which eludes the revolving axis 7
and causes a moment to this axis. This moment revolves
the shaft 71 and thereby also revolves the piston 2 and
15 the second shaft 81.

In one particular embodiment of the present invention,
just one of the shafts 71, 81 is used as a supporting
element embedded in the sidewalls 11, while the other is
20 replaced by the conducting ring 72, 82, which is also
rotary embedded in the sidewall 11 and which is also
equipped by the conducting element 51, 61 connected to
the sliding element 31, 41 in the cylinder 2. According
to another embodiment of the present invention, the
25 piston itself is rotary embedded, for example, through a
bearing on the supporting eccentric 10, which is
arranged on the supporting shaft 91 rotary embedded
primarily in both of the sidewalls 11. The supporting
shaft 91 passes through the conducting rings 72, 82 and
30 its axis lies on the plane formed by axes 7, 8 of the
conducting rings 72, 82 in the middle distance between
them. Eccentricity of the supporting eccentric 10 is
equal to the middle distance between axes 7, 8. Within

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the revolution of the piston 2 conducted by the
conducting rings 72, 82 the centre of the supporting
eccentric 10 moves along the same trajectory as the
centre of the piston 2. Piston 2 loading is then fully
5 transmitted by the supporting eccentric 10 and by the
supporting shaft 91, so the conducting rings 72, 82 are
not under the load of piston pressure. There can be
transmitted high piston pressures according to the
embodiment shown in Fig. 3 in accordance with the
10 present invention.

According to the present invention in the firstly
described aspect of the conducting shaft 71 adapted as a
supporting shaft, it is possible to embed the conducting
15 ring 72, 82 in the sidewall 11, or on the sidewall 11
and also simultaneously in a sliding way against the
conducting shaft 71 adapted as a supporting shaft. This
sliding design can also be made both on, or in the
sidewall 11 and together with this sidewall 11. In this
20 case, the supporting shaft 91 or the eccentric 10 can
not be used. Piston loading is then transmitted by the
sufficiently dimensioned and both sides embedded shaft
71. By variation of the distance between conducting ring
72, 82 axes and the conducting shaft 71 made as a
25 supporting shaft, there can be fluently, during a
machine run, changed both, the ratio of minimal-maximal
space between the cusps join and curved covering (and
thereby also the volume of the sucked and compressed
medium) and also the magnitude of the moment to the
30 revolving axis 7. With an assemblage of, at least, two
in this manner machines according to the present
invention can be arranged, for example, one as a pump
and a second as an engine powered by fluent or liquid

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medium, both the ratio of revolutions and the ratio of moments of both together connected machines fluently changes during shifting of the conducting ring 72, 82 against the shaft 81.

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Regarding the supporting eccentric 10 and the supporting shaft 91, there is, according to the present invention, a connected function of both of the conducting rings so that ,the conducting ring 72, 82 is arranged just at one side of the piston 2 and adapted according to the Fig. 6 so that, aside from the conducting element 51, 61, arranged at the inclined cylinder side, it has, along the disinclined cylinder side, ancillary conducting element 52, 62, which the glide rotary set on the ancillary eccentric 15 is in the sliding way embedded in. This ancillary eccentric 15 has the same eccentricity as the supporting eccentric 10 and it is firmly arranged on the supporting shaft 91, which is rotated by 180° against the supporting eccentric 10. In this way, both of the conducting rings can be jointed into the one from both of the embedded sites. It is clearly seen that from manufacturing reasons, it is more convenient to place the jointed conducting ring on the place of the conducting ring 82 i.e., so the conducting element 61 would be embedded in the sliding element 41 of the piston 2, in a sliding way, perpendicularly to the line joining both of the pistons 2 cusps.

All machines with moving components have many places, which are necessary to lubricate or to cool. With the machine, according to the present invention, it is not necessary to use a separate pump, because it is possible to use, according to the present invention, changing

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spaces between some mutually moving parts (e.g. between sliding elements 3, 4, 31, 41, or optionally between the glide 14 and the conducting elements 5, 6, 51, 61, 52, 62 as a pump for a lubricating and/or cooling medium by means of closing these spaces at the sides so that they provide inlet and exhaust vents for the above mentioned medium. In this manner, not only the usual expensive and heavy pumps can be excluded, but this lubricating, or/and cooling medium can be during pumping inside the machine conducted through places to be cooled, or/and lubricated so that the consumption of these mediums is very small.

The present invention is, both according to the embodiments described above and in comparison to the known piston engines of the prior art, more convenient by its smaller size as compared to engines with sliding pistons, smaller weight and is totally balanceable. It is more powerful and less noisy compared to the toothed machines. The present invention also provides better force transmission and smaller lubricant consumption as compared to machines with the piston rolling by means of gears. The present invention also provides more accurate piston conduction and better force transmission comparing to other conchoidal machines and finally it also provides a possibility to smoothly change maximal volume of the workspace contrary to all other mentioned machines. With the machine, according to the present invention, there is no direct dependence of the piston diameter on the loaded area of the piston, which enables a utilization under high pressure e.g. in the case of combustion engines, or in the case of very high pressure at hydraulic pumps.

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Patent claims

1. A machine with a rotating piston, enclosing
workspaces with alternately changing volumes e.g.
5 compressors, pumps, or engines, where the piston is
embedded inside the cylinder formed by two sidewalls and
by curved covering, partly in a rotating way around two
parallel axis of rotation, which are normal to the
cylinder sides, partly in a sliding way in two
10 directions normal one to the other and also parallel to
the revolving axes,
characterized by
at least, by one conducting ring (72, 82) embedded on
the sidewall (11) or in the sidewall (11) in a rotating
15 way, possibly also in a sliding way against the
supporting shaft (91) normal to its revolving axis,
which is connected in a sliding way to the piston (2),
which is embedded on the supporting shaft (91) either in
a sliding way normal to the supporting shaft axis (91),
20 or rotary through the supporting eccentric (10)
connected to the supporting shaft (91).

2. A machine, according to the claim 1,
characterized in that
25 the conducting ring (72, 82) is on its side disinclined
from the piston (2) connected in a sliding way normally
to its sliding connection to the piston (2) with the
ancillary glide (14) rotary embedded on the conducting
eccentric (15), which is set to the supporting shaft
30 (91) in a parallel way to the supporting eccentric (10)
and is rotated by 180° against it.

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3. A machine, according to the claim 1 and 2,
characterized in that
the spaces among the sliding components (3, 4, 31, 41)
e.g. pivots, or lugs, optionally ancillary glide (14) on
5 one side and the conducting components (5, 6, 51, 61,
52, 62) e.g. casings, or slots on the other side are
enclosed and equipped by the vents for lubricant inlet
and outlet.

10 4. A machine according to the claim 2,
characterized in that
the ancillary glide (14) is at the arrangement of two,
or more cylinders one next to another constituted by the
piston (2) of the adjacent cylinder, where the
15 directions of the sliding connections of the conducting
rings (72, 82) with the individual pistons (2) are
normal one to another.