of applications.

DISCLOSURE OF INVENTION

~~The main object~~ Embodiments of the present invention ~~is therefore~~ seek to provide a starting valve which, in a vacuum system, may prevent~~s~~ the operating machine working in conditions of excessive overload with consequent energy saving, or working at values below those relative to the optimum process operating conditions.

~~A further object~~ Embodiments of the present invention also seek~~is~~ to provide a vacuum system comprising at least one above-mentioned starting valve.

According to an aspect of the present invention, there is provided a starting valve for a fluid operating machine working in a vacuum system; a starting valve wherein there are provided: a valve body, which is provided with at least one opening to let a gas in; and an actuating piston, which is splined on a stem, which is free to slide in guide means; said actuating piston defining a chamber together with a portion of said valve body; said actuating piston being subject to the action of a deformable diaphragm, wherein a calibrated throttling hole in series with a through hole are provided, which longitudinally extend through said stem; said holes establishing a fluid connection between said chamber and a fluid-dynamic line of said vacuum system; and wherein the starting valve comprises, furthermore, a shutter, which is also splined on said stem; said shutter being suited to close a gas passage opening as a function of the pressure difference existing between said chamber and said fluid-dynamic line; starting valve wherein said calibrated throttling hole and said through hole establish a fluid communication between the space enclosed by a connection and a space defined by a covering element positioned in the upper part of said valve body; and in that said space and said chamber are in fluid communication between each other by means of an air passage orifice.

According to embodiments of the present invention, therefore, a starting valve and a vacuum system which integrates such valve are provided according to the respective independent claims or any of the claims depending directly or indirectly on the independent claims.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the present invention, some preferred embodiments are now described, purely by way of non-limiting examples and with reference to the accompanying drawings, in which:

- figure 1 illustrates a longitudinal section of a starting valve produced according to the teachings of the present invention;

- figure 2 shows a first configuration of a vacuum system comprising a starting valve of the type illustrated in figure 1;

- figure 3 illustrates a second configuration of a vacuum system comprising a starting valve of the type illustrated in figure 1 ;

- figure 4 shows a third configuration of a vacuum system

CLAIMS

1. A starting valve ~~(100)~~ for a fluid operating machine ~~(200)~~ working in a vacuum system ~~(1000)~~;

a starting valve ~~(100)~~ **wherein** there are provided:

- a valve body ~~(10)~~, which is provided with at least one opening ~~(17)~~ to let a gas in; and
- an actuating piston ~~(13)~~, which is splined on a stem ~~(16)~~, which is free to slide in guide means ~~(18A)~~; said

actuating piston ~~(13)~~ defining a chamber ~~(30)~~ together with a portion of said valve body ~~(10)~~; said actuating piston ~~(13)~~ being subject to the action of a deformable diaphragm ~~(15)~~, **wherein** a calibrated throttling hole ~~(16B)~~ in series with a through hole ~~(16A)~~ are provided, which longitudinally extend through said stem ~~(16)~~; said holes ~~(16A, 16B)~~ establishing a fluid connection between said chamber ~~(30)~~ and a fluid-dynamic line ~~(500)~~ of said vacuum system ~~(1000)~~;

and wherein the starting valve ~~(100)~~ comprises, furthermore, a shutter ~~(20)~~, which is also splined on said stem ~~(16)~~; said shutter ~~(20)~~ being suited to close a gas passage opening ~~(10B)~~ as a function of the pressure difference existing between said chamber ~~(30)~~ and said fluid-dynamic line ~~(500)~~;

starting valve ~~characterised in that~~ wherein said calibrated throttling hole ~~(16B)~~ and said through hole ~~(16A)~~ establish a fluid communication between the space enclosed by a connection ~~(25)~~ and a space ~~(22)~~ defined by a covering element ~~(23)~~ positioned in the upper part of said valve body ~~(10)~~;

and ~~in that~~wherein said space ~~(22)~~ and said chamber ~~(30)~~ are in fluid communication between each other by means of an air passage orifice ~~(24)~~.

2. Starting valve ~~(100)~~, according to claim 1, ~~characterised in that~~ wherein said through hole ~~(16A)~~ has a diameter greater than or equal to 1 mm (in particular 2 mm), while the calibrated throttling hole ~~(16B)~~ has a diameter ranging from 0.10 mm to 3 mm (in particular 0.20 mm).

3. Starting valve ~~(100)~~, according to any of the preceding claims, ~~characterised in that~~ wherein said shutter ~~(20)~~ is subject to elastic forces generated by an elastic element ~~(40)~~.

4. A starting valve ~~(100)~~, according to any of the preceding claims, ~~characterised in that~~wherein said shutter ~~(20)~~ is advantageously shaped as a cup-shaped body and comprises a bottom ~~(20A)~~, to which a cylindrical collar ~~(20B)~~ is integral, which is provided with a plurality of through openings ~~(20C)~~.

5. A starting valve ~~(100)~~, according to claim 4, ~~characterised in that~~ wherein said openings ~~(20C)~~ have different shapes and sizes (triangle, half-circle, square, rectangle, etc.), so that the passage area of the air flow increases more or less progressively as a function of the movement of said stem ~~(16)~~.

6. A starting valve ~~(100)~~, according to claim 5, ~~characterised in that~~ wherein the upper end of said stem ~~(16)~~ may freely slide in said space ~~(22)~~ .

7. A starting valve ~~(100)~~, according to claim 6, ~~characterised in that~~ wherein the upper end of said stem ~~(16)~~ is fixed to a ring nut ~~(35)~~, which is used to limit the opening of the starting valve ~~(100)~~ itself.

8. A starting valve ~~(100)~~, according to any of the previous claims, ~~characterised in that~~ wherein it comprises fluid connection means ~~(601, 608, 609)~~ for the connection to a control device ~~(600)~~, which reacts to the vacuum variations by directly varying the flow of atmospheric air to said chamber ~~(30)~~.

9. A vacuum system ~~(1000)~~ comprising at least one starting valve ~~(100)~~ according to any of the claims from 1 to 8.