

GAS DISCHARGE ARRANGEMENT FOR A REFRIGERATION COMPRESSOR

Field of the Invention

The present invention refers to a discharge arrangement to be applied to a refrigeration hermetic compressor of the type which comprises, in the interior of a shell, a motor-compressor assembly presenting a piston which reciprocates in the interior of a cylinder defined in a cylinder crankcase and which is closed, at one end, by a cylinder cap inside which a discharge chamber is defined. The gas discharge of the compressor is provided with a discharge tube, presenting an inlet end affixed to the cylinder cap and open to the discharge chamber, and an opposite outlet end, open to a gas outlet tube provided in an orifice of the hermetic shell. The discharge tube provides a fluid communication between the discharge chamber and the high pressure side of a refrigeration system to which the compressor is connected.

Background of the Invention

Vapor compression machines, such as refrigeration compressors of the type used in refrigeration systems, carry out the compression of a refrigerant gas in a compression unit, internal to a shell, conducting pressurized gas to a high-pressure side of the refrigeration system to which the compressor is coupled. Such compressors generally include, in the interior of the shell, a motor-compressor assembly having a cylinder crankcase which defines a cylinder, inside which a piston is axially displaced, by actuation of a rotary or linear electric motor.

The cylinder has an open end, through which the piston is housed, and an opposite end closed by a valve plate, against which is seated a cylinder cap. The valve plate is constructed to operate jointly with at least one discharge valve turned to the interior of the discharge chamber.

The gas compressed in the cylinder is conducted to the

an inlet end, hermetically coupled to the cylinder cap, and an opposite end, hermetically affixed to a gas outlet tube, generally mounted in an orifice provided in the shell of the compressor.

In the known solutions, in which the discharge tube is metallic, the connection of said discharge tube with the cylinder cap and with the gas outlet tube is obtained by welding, direct brazing, or by fitting it to an intermediate body (Brazilian document PI0300607-7 and US document 2004/0052661) mounted in the cylinder cap.

In the constructive solution described and illustrated in US2010/0226805A1, the mounting of the outlet end of the metallic discharge tube in the interior of the gas outlet tube is made with the aid of a connector in the form of a tubular sleeve, constructed in plastic material and situated between the discharge tube and the gas outlet tube.

In the solutions in which the discharge tube is made of plastic material, the connection to the cylinder cap is achieved, for example, by fitting the inlet end of the plastic discharge tube around a tubular nozzle, projecting from the cylinder cap. However, the retention of the plastic discharge tube to the tubular nozzle may be achieved with the aid of several means, as, for example, by adhesive, with or without the provision of a retaining ring surrounding, simultaneously, the inlet end of the plastic discharge tube and the tubular nozzle of the cylinder cap.

A known mounting arrangement of the outlet end of the plastic discharge tube in the metallic gas outlet tube of the hermetic shell is described and illustrated in document WO2007/011247A2 and comprises the provision of a metallic gas outlet tube projecting to the inside and to the outside of the hermetic shell, in order to have its outer end welded to the high pressure tube of the refrigeration system to which the compressor is coupled.

dimensioned to tightly receive an outlet end portion of the plastic discharge tube, which outlet end portion is disposed along the interior of the whole extension of the gas outlet tube. The tight fitting of the plastic discharge tube in the interior of the metallic gas outlet tube, jointly with the longitudinal extension of said telescopic fitting, already provides a sealing between the two tubular extensions, said sealing being complemented by at least one inward radial deformation of the metallic gas outlet tube against the plastic discharge tube.

In said known compressor constructions, there are some problems which need to be solved by means of an adequate physical arrangement of the discharge system, including the discharge tube and its connections with the cylinder cap and with the shell.

The use of a discharge tube in metallic material presents some known problems, such as: the transmission of vibration from the compression mechanism to the hermetic shell; the transmission of gas compression noise to the hermetic shell; the resistance to shipping and operating conditions, in order to avoid ruptures of the discharge tube by fatigue; and also the restrictions to the passage of gas and heat transfer from the compressed gas to the interior of the hermetic shell.

Besides the problems presented above, in the conventional solutions for connecting the metallic discharge tube to the parts of cylinder cap and shell of the compressor, it may also occur failures in the insulation of the compressor motor, resulting in electrical current leakage in the latter, which leakage has the discharge tube as one of the ways to flow, reaching the compressor shell and any metallic structure associated with the latter.

In order to solve the problems mentioned above and related to the use of a metallic discharge tube, the latter is usually provided with an internal diameter

presents a long length with several curves and straight portions, in order to minimize both the transmission of vibration to the shell and the possibility of occurring breakage due to fatigue.

Besides requiring a higher amount of material and having a complex assembly, said solution is not capable to avoid the problem of noise being transmitted to the shell during gas compression, which normally requires the use of dampening elements mounted on the tube, as well as the problem of heat being transmitted from the compressed gas to the interior of the shell, unless some type of thermal insulation is provided on the metallic discharge tube, which increases even more the cost of such known solution.

Aiming at solving the problems of providing a discharge tube in metallic material, a known solution has been proposed, which uses a flexible discharge tube, in a material of low thermal conductivity, for example, a polymeric plastic material (WO2007/011247A2).

While solving all the issues related to the metallic discharge tube, said prior art solution of using a polymeric flexible discharge tube further presents some drawbacks regarding the necessary provision of over-injected additional elements and of retaining rings which, besides presenting a difficult and costly assembly, allow failures to occur upon fixation and sealing to the gas outlet tube and to the cylinder cap, as well as failures of structural resistance, impairing the discharge tightness.

Summary of the Invention

As a function of the disadvantages of the previous solutions, it is the object of the present invention to provide a gas discharge arrangement in a refrigeration compressor, which is capable of providing a reliable and resistant connection of a discharge tube, in a flexible material, of low thermal conductivity and not

the shell of the compressor, said connection presenting a simple construction and practical installation, which may be adapted to different compressor constructions, substantially reducing the transmission, to the hermetic shell, of vibrations of the compression mechanism and noise of the gas compression.

The objective above is achieved by means of a gas discharge arrangement to be applied to a refrigeration compressor of the type which comprises: a shell carrying a gas outlet tube and housing a gas compression mechanism including a cylinder and a cylinder cap, which internally defines a gas discharge chamber and has a gas outlet; and a discharge tube in a flexible plastic material having an inlet end, coupled to the gas outlet, and an outlet end coupled to the gas outlet tube.

According to the present invention, at least one of the parts defined by the inlet end and by the outlet end of the discharge tube is connected to a discharge part, defined in any one of the gas outlet and the gas outlet tube, by a tubular-shaped connecting element, having: a fixation portion, to be affixed in the interior of the respective discharge part; an engaging portion to be fitted, with interference, in the interior of one end of the discharge tube and carrying a superficial indexing means, which produces a corresponding radial deformation in the discharge tube; and at least one gripping means, superficially provided between the indexing means and the fixation portion; and a retaining ring, disposed around the end of the discharge tube and radially compressing said discharge tube, in order to spike, in the latter, the gripping means of the engaging portion of the connecting element.

The present invention provides a discharge arrangement having a connection for a discharge tube presenting, as one of its advantages, the fact of being easy to assemble. The construction defined above, allows, by

improve the connections of the discharge tube in a flexible plastic material, to at least one of the discharge parts defined by the cylinder cap and by the shell of the compressor.

Considering that the arrangement of the present invention also uses a discharge tube made of a non-electrically conductive plastic material, it does not impair the thermal and electrical insulation of the motor-compressor assembly in relation to the hermetic shell, avoiding heat transfer and the risk of electric current passing from the motor-compressor assembly to the shell, through the discharge tube.

Said construction further allows for an optimized dimensioning, not only of the discharge tube, but also of each connecting element, with less load loss upon pumping the refrigerant fluid.

The present arrangement also does not affect the benefits regarding reduction of the noise transmitted to the shell, without the need of requiring additional dampening components, due the discharge tube being constructed in a flexible plastic material.

Brief Description of the Drawings

The invention will be described below, with reference being made to the appended drawings, given by way of example of one way of carrying out the invention and in which:

Figure 1 represents an exploded perspective view of a cylinder cap and of the respective connecting element, both constructed according to the arrangement of the present invention;

Figure 2 represents a perspective view similar to that of figure 1, but with the connecting element being mounted to the cylinder cap;

Figure 3 represents cross-sectional view of the assembly illustrated in figure 2, said section being taken according to line III-III in said figure;

hermetic shell of a compressor, carrying a gas outlet tube in which is applied a respective connecting element; Figure 5 represents a perspective view of the connecting element of the arrangement of the present invention;

Figure 6 represents a longitudinal sectional view of the connecting element of figure 5, with its engaging portion being fitted and housed in the interior of an adjacent end of the discharge tube, by using a first embodiment of the retaining ring;

Figure 6A represents a partial perspective view of the retaining ring of figure 6, in a diametrically sectioned condition;

Figure 7 represents a longitudinal sectional view of the connecting element of figure 5, with its engaging portion being fitted and housed in the interior of an adjacent end of the discharge tube, by using a second embodiment of the retaining ring; and

Figure 7A represents a partial perspective view of the retaining ring of figure 7, in a diametrically sectioned condition.

Description of the Invention

The present invention will be described below with respect to a refrigeration compressor of the reciprocating hermetic type, which comprises a hermetic shell 1, carrying a gas outlet tube 1a and housing a motor-compressor assembly (not illustrated), which comprises a gas compression mechanism including a cylinder crankcase 2 (partially illustrated in figure 3), which defines a cylinder 3 inside which is axially displaced a piston (not illustrated), by actuation of a rotary or linear electric motor (also not illustrated). The cylinder crankcase 2 may be constructed in any adequate metallic alloy, well known in the state of the art.

The cylinder 3 has an open end, inside which the piston is lodged, and an opposite end (illustrated in figure 3),

generally metallic cylinder cap 10. The valve plate 4 is constructed in metallic alloy, so as to operate jointly with at least one suction valve, not illustrated, turned to the interior of the cylinder 3, and with at least one discharge valve, which may take the form of a single sheet 5 incorporating a plurality of flexible metallic blades, not illustrated, each operating associated with a respective discharge orifice (not illustrated) of the valve plate 4.

The valve plate 4 is seated on the cylinder crankcase 1 by means of an annular sealing gasket, it being further provided another annular gasket 7 disposed between the cylinder cap and the adjacent face of the valve plate 4. The cylinder cap 10 is seated against one face of the valve plate 4, opposite to that seated against the cylinder crankcase 2. The cylinder cap 10 defines, internally, with the adjacent face of the valve plate 4, a gas discharge chamber 11, which maintains a selective fluid communication with the cylinder 3, through the discharge orifices, upon the opening of the discharge valve, and a constant fluid communication with a discharge side of a refrigeration system to which the compressor is associated, through a discharge tube 20, which communicates said discharge chamber 11 to the gas outlet tube 1a hermetically affixed through the shell 1 of the compressor, and thence, to the outside of the latter. The gas outlet tube 1a generally connects the discharge side of the refrigeration compressor to a discharge line of a refrigeration system to which the refrigeration compressor is operatively associated.

The discharge tube 20 is obtained in a plastic and flexible material, not thermally conductive, preferably in a polymeric material such as, for example, a PTFE polymer (polytetrafluoroethylene). Said polymeric material presents a coefficient of thermal conductivity much lower than that of the metallic alloys, imparting to

coefficient, allowing reducing its length, which reduces the load loss upon pumping the refrigerant gas.

The cylinder cap 10 takes the form of a cup, with its open base seated on the valve plate 4 and defining a gas inlet 12 in fluid communication with the discharge orifice(s), and a gas outlet 13, to which is coupled the discharge tube 20.

The discharge tube 20 has an inlet end 21, coupled to the gas outlet 13 of the cylinder cap 10, and an outlet end 22 coupled to the gas outlet tube 1a of the shell 1.

In the illustrated construction, the cylinder cap 10 is provided with an end wall 14, opposite to its open base and to the valve plate 4 and in which is provided the gas outlet 13. However, it should be understood that said gas outlet 13 may be provided laterally in the cylinder cap 10, and that such positioning of the gas outlet 13 is not limited to the construction illustrated.

In the particular illustrated construction, the cylinder cap 10 further presents a channel 16, provided in the end wall 14 and which is disposed orthogonally to the gas outlet 13 of the cylinder cap 10. In said particular illustrated construction, the end wall 14 presents a lowered portion 17, to the interior of which the channel 16 is opened through the gas outlet 13,

In the illustrated construction, the outlet nozzle 13 of the cylinder cap 10 is configured to receive and secure, in its interior and by any adequate means, such as, for example, threading, gluing, or brazing, a connecting element 30, having a tubular body projecting outwards from the outlet nozzle 13, to be coupled to the adjacent inlet end 21 of the discharge tube 20.

The illustrated connecting element 30 is formed in a single piece, for example, in a metallic material. Nevertheless, it should be understood that the present invention may be carried out with a connecting element made of a plurality of pieces produced separately and

According to the present invention, at least one of the inlet end 21 and outlet end 22 of the discharge tube 20 is connected to a discharge part, defined by the gas outlet 13 of the cylinder cap 10 or by the gas outlet tube 1a of the shell 1, through a respective connecting element 30.

The connecting element 30 presents a fixation portion 31, to be affixed in the interior of the respective discharge part defined by the gas outlet 13 of the cylinder cap 10, or by the gas outlet tube 1a of the shell 1, and an engaging portion 32 to be fitted, with interference, in the interior of one end of the discharge tube 20 adjacent to one of the parts of gas outlet 13 of the cylinder cap 10 and gas outlet tube 1a of the shell 1.

The engaging portion 32 of the connecting element 30 carries a superficial indexing means 33, which produces a corresponding radial deformation 20a in the discharge tube 20, and at least one gripping means 34, superficially disposed between the superficial indexing means 33 and the fixation portion 31.

In order to maintain one end of the discharge tube 20 mounted to an adjacent connecting element 30, the arrangement of the present invention further comprises a retaining ring 40, provided around the end of the discharge tube 20 mounted to a connecting element 30, said retaining ring 40 radially compressing the end of the discharge tube 20, so as to spike, in said discharge tube end, the gripping means 34 of the engaging portion 32 of the connecting element 30.

The retaining ring 40 may be obtained in any material and present any construction which allows it, when mounted around a respective end of the discharge tube 20 already coupled to a respective connecting element 30, to radially compress said end of the discharge tube against the engaging portion of the connecting element, pressing the gripping means 34 against the wall of the discharge

retaining ring 40 is metallic.

The superficial indexing means 33 is provided in the tubular body of the connecting element 30, in a position spaced away from the fixation portion 31, projecting radially outwardly from the engaging portion 32.

In the first embodiment illustrated in figures 6 and 6A, the retaining ring 40 presents a radial extension dimensioned for allowing it to be axially retained, in one direction, by the radial deformation 20a of the end of the discharge tube 20 and, in an opposite direction, by the fixation portion 31. In such construction, the retaining ring 40 is axially retained between the radial deformation 20a of the adjacent end of the discharge tube 20 and the fixation portion 31 of said connecting element 30.

Thus, the retaining ring 40 has its opposite end edges 40a, 40b respectively seated against the radial deformation 20a and against the fixation portion 31 of the connecting element 30.

In the illustrated constructive form, the superficial indexing means 33 is defined by a circumferential rib 33a having a cross section in the form of a convex arc.

Also as illustrated in figures 6 and 6A, the retaining ring 40 may incorporate, externally, a stop element B generally defined by a circumferential shoulder 41, against which may be seated a tool (not illustrated) for inserting the retaining ring 40 around the portion of the discharge tube 20 surrounding the engaging portion 32 of the connecting element 30. In said construction, the inner face of the retaining ring 40 need not be compulsorily provided with any superficial accident to cooperate with the radial deformation 20a in the discharge tube 20.

In a second embodiment, illustrated in figures 7 and 7A, the retaining ring 40 presents an axial extension dimensioned so as to allow the latter to extend beyond

superficial indexing means 33. In this case, the retaining ring 40 should be internally provided with a circumferential groove 42 configured for housing, in its interior, the radial deformation 20a of the adjacent end of the discharge tube 20. In this construction, only the end edge 40b of the retaining ring 40 is axially locked upon its seating against the fixation portion 31 of the connecting element 30. The opposite end edge 40a of the retaining ring 40 remains free, not being seated against any retaining means. The axial locking of the retaining ring 40, in the direction of the fixation portion 31 away from the connecting element 30, is obtained by the radial deformation 20a of the discharge tube 20 being housed in the interior of the circumferential groove 42 of the retaining ring 40. It should be understood that the cooperation between the radial deformation 20a and the circumferential groove 42 may be achieved so as to allow the relative axial locking, in both directions, between the retaining ring 40 and the discharge tube 20. In this case, the retaining ring 40 need not have its end edge 40b seated against the fixation portion 31 of the connecting element 30.

The retaining ring 40 illustrated in figures 7 and 7A may further incorporate, externally, the stop element B which may take the form of the already cited circumferential shoulder 41 against which may be seated a tool (not illustrated) for inserting the retaining ring 40 on the portion of the discharge tube 20 surrounding the engaging portion 32 of the connecting element 30.

Although not illustrated, the retention of the discharge tube to the connecting element may be obtained by using a retaining ring extending beyond the connecting element region provided with the superficial indexing means 33, which could take the form of a recessed superficial accident, such as a circumferential recess in said connecting element, against which a portion of the

compression of the retaining ring. In this case, the retaining ring would be provided with an internal circumferential rib which would coincide with the deformation region of the discharge tube, obtained upon
5 being fitted in the circumferential recess of the connecting element.

A described hereinafter, the superficial indexing means 33, carried by the connecting element 30, guarantees the axial retention of the retaining ring 40, in the
10 direction away from the fixation portion 31 of the connecting element 30, maintaining the discharge tube 20 firmly affixed to the respective connecting element 30 close to the cylinder cap 10 and/or close to the outlet tube 1a of the shell 1.

5 The circumferential rib 33a must present a shape which avoids, upon fixation of the retaining ring 40 to the discharge tube 20, the occurrence of tensions on the discharge tube 20 during operational and handling conditions of the compressor. As a result, it should be
10 understood that the convex form is only one way of carrying out the invention, and, therefore, not considered as limitative.

Upon mounting the discharge tube 20 to each connecting element 30, one end of said discharge tube 20 is forced
5 to pass over the superficial indexing means 33 and, then, over the gripping means 34, said end being forced in said fitting until reaching the fixation portion 31 of the connecting element 30.

In said stage, the setting of the retaining ring 40
10 compresses the discharge tube 20 against the connecting element 30, axially retaining said discharge tube 20 to the connecting element 30 by mechanical interference of the gripping means 34 against an adjacent portion of the inner wall of the discharge tube 20.

5 The illustrated superficial indexing means 33 is dimensioned to provoke a corresponding deformation of the

said inner surface reproduces the shape of said superficial indexing means 33, producing the already mentioned radial deformation 20a. On the other hand, the gripping means 34 is defined so as to cause only a deformation in the inner surface of the discharge tube 20, said deformation not being propagated to the outer surface of the discharge tube 20.

The external radial deformation 20a in the discharge tube 20 defines an axial stop for the retaining ring 40, cooperating to prevent the latter, after mounted, from being axially displaced away from the fixation portion 31 of the connecting element 30 and outside from the engaging portion 32 of the latter.

In the illustrated construction, the gripping means 34 is in the form of a frusto-conical circumferential projection, with its smaller base 34a coinciding with the contour of the engaging portion 32 and with its larger base 34b defining an annular step projecting outwardly from the engaging portion 32 and turned to the fixation portion 31. As illustrated, the gripping means 34 may take the form of a continuous annular projection. However, it should be understood that said gripping means 34 may be defined by projections in the form of tooth circumferentially distributed in an annular arrangement, but spaced apart from each other, and that the connecting element 30 may also present a plurality of circumferential alignments of projections which define the gripping means 34.

The gripping means 34 defines a radial mechanical engagement which promotes an axial locking between the discharge tube 20 and the engaging portion 32 of the connecting element 30, for avoiding disconnection to occur between the parts of discharge tube 20 and connecting element 30.

The engaging portion 32 has a free end 32a, and an opposite end 32b joined to the fixation portion 31 and

from the contour of the engaging portion 32 and which is spaced away from the gripping means 34.

In the illustrated construction, the stop means 35 is defined by an annular flange affixed around the opposite end 32b of the engaging portion 32.

For any one of the constructions above, the superficial indexing means 33 is provided in the connecting element 30, in a position away from the free end 32a of the engaging portion 32.

According to the present invention, the fixation portion 31 of the connecting element 30 is cylindrical and affixed, by adhesive, to the respective discharge part, defined by the gas outlet 13 of the cylinder cap 10 or by the gas outlet tube 1a of the shell 1. However, it should be understood that the connecting element may be affixed to the parts of cylinder cap or gas outlet tube of the shell, through threading, welding, brazing, etc., said fixation means not being considered as limitative to the present invention.

Regarding the solution of affixing the connecting element 30 by threading to the part of cylinder cap 10 and/or gas outlet tube 1a of the shell 1, the fixation portion 31 of said connecting element 30 should present an external thread 30a to be affixed to a corresponding threaded portion provided in the respective discharge part, defined in any one of the gas outlet 13 of the cylinder cap 10 and the gas outlet tube 1a of the shell 1.

It should be understood that the discharge arrangement of the present invention may be carried out irrespective of the constructive particularities of the cylinder cap 10, positioning means, etc.

It should be further noted that the constructive variants described herein may be presented individually, in particular constructions, or also partially or totally combined to each other.

The provision of the retaining ring between the fixation

superficial indexing means 33 avoids the concentration of tensions on the external part of the discharge tube 20, reducing the risk of fatigue and rupture of the discharge tube, resulting from the fact that the latter is caused to move by the operational displacement of the motor-compressor assembly in relation to the fixed hermetic shell. In the proposed construction, said tensions are more concentrated in the inner part of the discharge tube 20, when the latter is submitted to the movement resulting from the compressor operation.

CLAIMS

1- A gas discharge arrangement for a refrigeration compressor, which comprises: a shell (1) carrying a gas outlet tube (1a) and housing a gas compression mechanism including a cylinder (3) and a cylinder cap (10), which defines, internally, a gas discharge chamber (11) and has a gas outlet (13); and a discharge tube (20), in a flexible plastic material, having an inlet end (21), coupled to the gas outlet (13), and an outlet end (22) coupled to the gas outlet tube (1a), characterized in that at least one of the inlet end (21) and outlet end (22) of the discharge tube (20) is connected to a discharge part, defined in any one of the gas outlet (13) and the gas outlet tube (1a), by a tubular-shaped connecting element (30), having:

- a fixation portion (31), to be affixed in the interior of the respective discharge part (1a,13);
- an engaging portion (32) to be fitted, with interference, in the interior of one end of the discharge tube (20) and carrying a superficial indexing means (33), which produces a corresponding radial deformation (20a) in the discharge tube (20); and at least one gripping means (34), superficially disposed between the superficial indexing means (33) and the fixation portion (31); and
- a retaining ring (40), disposed around the end of the discharge tube (20) and radially compressing the latter in order that the gripping means (34) of the engaging portion (32) of the connecting element (30) be spiked in said discharge tube (20) .

2- The arrangement, according to claim 1, characterized in that the superficial indexing means (33) is spaced away from the fixation portion (31) and projects, radially outwardly from the engaging portion (32), the retaining ring (40) being axially retained, in at least one direction, by the radial deformation (20a) of the end

by the fixation portion (31).

3- The arrangement, according to claim 2, characterized in that the retaining ring (40) has opposite end edges (40a, 40b), which are respectively seated against the radial deformation (20a) of the end of the discharge tube (20) and against the fixation portion (31) of the connecting element (30).

4- The arrangement, according to claim 2, characterized in that the retaining ring (40) has an end edge (40b) axially seated and locked against the fixation portion (31) of the connecting element (30), and a free opposite end edge (40a), said retaining ring (40) being internally provided with a circumferential groove (42) housing and axially locking, in its interior, the radial deformation (20a) of the adjacent end of the discharge tube (20).

5- The arrangement, according to any one of claims 1 to 4, characterized in that the superficial indexing means (33) is defined by a circumferential rib (33a) with a cross section in convex arc.

6- The arrangement, according to any one of claims 1 to 5, characterized in that the gripping means (34) is in the form of a frusto-conical circumferential projection, with its smaller base (34a) coinciding with the contour of the engaging portion (32), and with its larger base (34b) defining an annular step projecting outward from the engaging portion (32) and turned to the fixation portion (31).

7- The arrangement, according to any one of claims 1 to 6, characterized in that the engaging portion (32) has a free end (32a) and an opposite end (32b) joined to the fixation portion (31) and carrying a stop means (35) radially projecting outwardly from the contour of the engaging portion (32), spaced away from the gripping means (34).

8- The arrangement, according to claim 7, characterized in that the stop means (35) is defined by an annular

engaging portion (32).

9- The arrangement, according to any one of claims 7 or 8, characterized in that the superficial indexing means (33) is spaced away from the free end (32a) of the engaging portion (32).

10- The arrangement, according to any one of claims 1 to 9, characterized in that the connecting element (30) is made in a single piece.

11- The arrangement, according to any one of claims 1 to 10, characterized in that the fixation portion (31) is cylindrical and affixed to the respective discharge part, defined in any one of the gas outlet (13) and the gas outlet tube (1a), by means of adhesive.

12- The arrangement, according to any one of claims 1 to 10, characterized in that the fixation portion (31) comprises an external thread to be affixed to the respective discharge part, defined in any one of the gas outlet (13) and the gas outlet tube (1a).

13- The arrangement, according to any one of claims 1 to 12, characterized in that the retaining ring (40) incorporates, externally, a stop element (B) defined by a circumferential shoulder (41), for allowing that a tool for insertion of the retaining ring (40) be seated on the portion of the tube (20) surrounding the engaging portion (32) of the connecting element (30).