ramic material, refractory or ceramic lined in its inner part towards the burner axis.

The outlet cone 11 is formed of refractory or ceramic material.

The refractory material used is preferably of the aluminous type containing chromium and/or zirconium, and it generally contains, as percent by weight, about 10% chromium and about 4% zirconium.

The outletting front section or front section of ejector 1 is the plane that comprises the perimetral edges of tubes 1a toward the outlet cone 11.

Fig 1a illustrates a more preferred embodiment of the burner according to the present invention, further comprising the following parts: an adduction flange 3 of the comburent, an annular feeding drum 4 of the comburent, adduction flanges 6 of the fuel to the injector system 5.
In Fig. 1a muffle 9 and jacket (mantle) 10 form the case 20 of Fig. 1 (not represented in Fig. 1a).

The muffle 9 and the annular feeding drum 4 are preferably circularly and longitudinally positioned around the burner longitudinal axis (not represented in Fig. 1a).

Preferably the suction intakes 7 are delimited externally by muffle 9. Generally muffle 9 is fixed (joined to the boiler wall) and allows to disconnect the burner from the boiler.

The jacket 10 and the muffle 9 are made of the same materials indicated for the case 20.

The adduction flanges 6 are positioned externally with respect to the back wall of case 20 of the burner and are in communication with the fuel injection system 5.

Flange 3 provides the comburent inlet into the annular feeding drum 4, the latter being connected with the comburent annular distribution chamber 13 through the radial ducts 14, as shown in Fig. 2.

By circular longitudinal arrangement of a burner component it is meant that the component has a shape substantially similar to that of a cylindrical shell having the longitudi-

CLAIMS

1. A burner wherein a MILD combustion takes place, comprising a system for sucking recycling flue gases directly from a combustion chamber by means of an ejector fed with a comburent, a heat exchange system suitable for heat exchange between the recycling flue gases and the comburent, systems for injecting a fuel directly into the recycling flue gases, the latter comprising or not comprising the comburent, and formation of a mixture of fuel-recycling flue gases-comburent in the zone around an outlet of the ejector and following introduction of the mixture into the combustion chamber,
wherein the burner comprises:
an annular duct, comprised in the sucking system of the recycling flue gases, a transit chamber,
a fuel injection system upstream the ejector and
a fuel injection system downstream of the outletting front section of the ejector,
the ejector formed of tubes which are parallel in their outletting parts, and
an outlet cone of the burner.

2. The burner according to claim 1 comprising the annular duct; the heat exchange system suitable for heat exchange between the recycling flue gases and the comburent, coaxial to the annular duct; the fuel injection system upstream the ejector and the fuel injection system downstream of the outletting front section of the ejector, positioned both inside and outside ~~a~~ the transit chamber and coaxial to the outletting parts of the tubes forming the ejector; with formation in a zone around the front section of the outletting parts of the tubes forming the ejector of the mixture of fuel-recycling flue gases-comburent and following introduction of the mixture into the combustion chamber.

3. The burner according to claim 1 wherein the annular duct, the heat exchange system between the recycling

flue gases and the comburent and the transit chamber are coaxial with respect to the longitudinal burner axis.

4. The burner according to claim 3 comprising:
suction intakes for sucking the recycling flue gas from the combustion chamber; the annular duct; a comburent annular distribution chamber; radial ducts; the transit chamber; the fuel injection system upstream the ejector and the fuel injection system downstream of the outletting front section of the ejector; the ejector; the outlet cone; a case;
wherein the annular duct, in communication through the suction intakes with the combustion chamber, delimits externally and posteriorly the comburent annular distribution chamber;
the comburent annular distribution chamber is anteriorly in communication with ejector and posteriorly with the radial ducts and delimits externally the transit chamber;
the transit chamber is anteriorly delimited by the outletting front section of the ejector and posteriorly by the wall formed by the case;
the outletting front section of the ejector is perpendicular with respect to the comburent annular distribution chamber that anteriorly is in contact with the outlet cone;
the fuel injection system upstream the ejector is positioned on a back wall of the case of the burner;
wherein the recycling flue gases, directly sucked from the combustion chamber through suction intakes, flow through the annular duct, heat the comburent flowing in countercurrent into the comburent annular distribution chamber, enter the transit chamber and, driven by the depression created by the comburent outletting the front section of the ejector, they mix downstream the outletting front section of the ejector with the comburent, being the comburent the entraining fluid and the

recycling flue gases the entrained fluid,
the fuel being directly injected into the recycling flue gases by the fuel injection system upstream the ejector and/or by the fuel injection system downstream of the outletting front section of the ejector into the comburent-recycle-flue gas mixture, in the latter case the recycle flue gases contain already the fuel when the fuel injection system upstream the ejector is also used.

5. The burner according to claim 4 wherein the fuel is fed by the fuel injection system upstream the ejector.
6. The burner according to claim 5 wherein the fuel is a liquid fuel.
7. The burner according to any of claims 4-6 wherein outlet cone, the suction intakes, the annular duct and the comburent annular distribution chamber are positioned circumferentially and longitudinally around the burner longitudinal axis.
8. The burner according to any of claims 4-7 wherein the transit chamber and the ejector are positioned along the burner longitudinal axis.
9. The burner according to any of claims 4-8 wherein the tubes of the ejector comprise inlets connected to the comburent annular distribution chamber and radially positioned thereto, and the outletting parts of said tubes are parallel to the burner longitudinal axis with their outlets directed towards the outlet cone; said outletting parts of the tubes being positioned axially and circularly with respect to the burner longitudinal axis.
10. The burner according to any of claims 4-9 wherein the fuel injection system downstream of the outletting front section of the ejector is circularly positioned around the burner longitudinal axis and is placed at the end of tubes, parallel to the burner longitudinal axis, that from the back wall of the burner cross the transit chamber and the outletting front section of the

ejector.

11. The burner according to any of claims 4-10 wherein the fuel injection system upstream the ejector is on the back wall of the case of the burner and positioned on the burner longitudinal axis and circularly thereto.
12. The burner according to any of claims 4-10 wherein the case is refractory or ceramic lined in its inner part.
13. The burner according to any of claims 4-11 comprising an adduction flange, an annular feeding drum for the comburent, adduction flanges for the fuel to the fuel injection system upstream the ejector.
14. The burner according to any of claims 4-11 wherein the case is formed of a muffle and a jacket; the muffle and the annular feeding drum are circularly and longitudinally positioned around the burner longitudinal axis; the suction intakes are delimited externally by the muffle; the adduction flanges are positioned externally with respect to the back wall of the case of the burner, the flange providing the comburent inlet into the annular feeding drum connected to the fuel comburent annular distribution chamber through the radial ducts.
15. The burner according to any of claims 1-14 wherein a the comburent is selected from atmospheric air, enriched air, oxygen and technical oxygen.
16. The burner according to any of claims 1-15 wherein the fuels used are selected from liquid and/or gaseous, or solid fuels made liquid or gaseous under the operating conditions of the burner.
17. A process of operating the burner according to any of claims 1-16, wherein a MILD combustion takes place comprising:

    sucking of the recycling flue gases directly from the combustion chamber by means of the ejector,

    heating of the comburent by thermal exchange with the recycling flue gases,

direct injection of the fuel in the recycling flue gases by one or more injection systems,
formation of the fuel-recycling flue gas-comburent mixture,
introduction of the mixture into the combustion chamber.

18. The process according to claim 17 comprising the following steps:
a) sucking of the recycling flue gases from the combustion chamber by the ejector,
b) heat exchange between the recycling flue gases and the comburent,
c) injection of the fuel by means of the fuel injection system upstream the ejector and/or the fuel injection system downstream of the outletting front section of the ejector into the recycling flue gases inside and/or outside the transit chamber,
d) formation of the mixture fuel-recycling flue gases-comburent, the comburent being injected into the burner by the ejector,
e) inlet of the mixture into the combustion chamber.

19. The process according to claims 17-18 wherein the recycling flue gases enter the burner through the suction intakes and, sucked by a depression formed of the comburent outletting the ejector, they flow through the annular duct, heat by thermal exchange the comburent entering from the radial ducts and, flowing in countercurrent with respect to the recycling flue gases, they flow into the comburent annular distribution chamber, enter into the transit chamber and, downstream the ejector, they mix with the comburent; the fuel being directly injected into the recycling flue gases by the fuel injection system upstream the ejector and/or the fuel injection system downstream of the outletting front section of the ejector.

20. The process according to claims 17-19 wherein the fuel injection system upstream the ejector and/or the fuel

injection system downstream of the outletting front section of the ejector are used when a gaseous fuel is fed to the burner.

21. The process according to claims 17-19 wherein the fuel injection system upstream the ejector, optionally the fuel injection system downstream of the outletting front section of the ejector, are used when a liquid fuel is fed to the burner.
22. The process according to claims 17-19 wherein the fuel injection system upstream the ejector is used for the liquid fuel and the fuel injection system downstream of the outletting front section of the ejector for the gaseous fuel, when the liquid fuel and the gaseous fuel are simultaneously fed to the burner.
23. The process according to claims 17-22 wherein the oxygen amount in the flue gases (% by volume on the dry), is equal to or lower than 1.2% when using liquid fuels and lower than 0.4% when using gaseous fuels.
24. The process according to claims 17-23 wherein the flow rate ratio recycling flue gases/comburent, expressed as per cent by volume, ranges from 30% up to about 60%.
25. The process according to claims 17-24 wherein at the start of the burner operation the fuel is injected by the fuel injection system downstream of the outletting front section of the ejector; when the burner operates in steady conditions the fuel injection system upstream the ejector and/or the fuel injection system downstream of the outletting front section of the ejector is/are used.
26. Use of the burner according to claims 1-16 to operate industrial steam generators to produce process steam or electric power by using the process according to claims 17-25.