BELL FURNACE FOR ANNEALING TREATMENT OF METAL SHEETS

6 Claims, 5 Drawing Figs.

ABSTRACT: A bell furnace for annealing treatment of metal sheets in superimposed rolls has a first outer hood, a second inner hood for protection of the sheet rolls, a cylindrical annular space between the first outer hood and the second inner hood and an upper collecting chamber and a lower collecting chamber within the inner hood. There is disposed a plurality of vertical tubes circumferentially arranged about the sheet rolls externally of the second hood for the passage in ascending stage of the entire protective gas capacity from the lower collecting chamber to the upper collecting chamber; a diffuser is located within the lower collecting chamber and beneath the central bore of the sheet rolls for establishing a fluid circulation within the inner hood and the tubes arranged in the space between the inner and outer hoods.
BELL FURNACE FOR ANNEALING TREATMENT OF METAL SHEETS

The present invention relates to a bell furnace for annealing treatment of metal sheets in superimposed rolls. Said type of conventional furnaces comprises a chamber defined by a protective hood, in which the rolls to be processed are arranged on one another and spaced apart from one another by annular convectors; at the base of the chamber, a central impeller and a radial diffuser force the protective gas into the side space between the rolls and hood; the gas moves back to the impeller through the convectors and central zone of the chamber.

The heat exchange between the burden and outside is established through the protective hood surface only and the cooling is by a forced air or water stream sweeping the outer surface of the hood.

As a result, heat exchanges in such type of furnaces are unsatisfactory.

It should be noted that an improvement in heat exchanges, particularly in cooling operation, is basically significant in order to increase the hour output of such furnaces.

To this end, furnaces of conventional design have been developed, but in which cooling is drastically integrated by an assembly of finned tubes accommodated within the diffuser, through which pressurized water is passing. While having improved heat exchanges, such furnaces involve however structural complications and operating disadvantages due to water provision below the processing chamber.

According to a further embodiment, the protective gas or a portion thereof is circulated and cooled within an external heat exchanger. Even in this case, structural complications and operating disadvantages are encountered, due to problems in providing accurate sealings for pipes conveying the gas outside the furnace.

Further disadvantages, which are common to all of the above-mentioned types of furnaces, are provided by differential rates by which the gas sweeps along the heat exchange surfaces and uneven distribution of flow volumes through the convectors.

In order to avoid the latter disadvantages, furnaces have been developed wherein the protective hood is internally provided with a second cylindrical wall: the gas is caused to move up within the gap thus formed by a constant speed to the top of the burden, from where it moves back to the impeller with improved evenness through the convectors.

However, also in the latter type of furnaces, the heat exchange surfaces are still inadequate and strictly bound to the hood size, since, as apparent, the gap cannot be unduly wide.

Therefore, the object of the present invention is to provide a furnace for sheet-annealing treatment which, while having the advantages of the latter-mentioned type, will overcome the disadvantages thereof, as offering the possibility of increasing as desired the heat exchange surface, during the designing phase.

This is achieved by the furnace according to the present invention, characterized in that its protective hood carries a plurality of tubes fast therewith for passing the entire capacity of the protective gas from the diffuser in moving-up stage.

The accompanying drawing schematically shows by way of example an embodiment of the furnace according to the present invention, and more particularly:

FIG. 1 is a vertical section of the furnace;
FIG. 2 is a cross section of the furnace;
FIG. 3 is a view similar to FIG. 1, but showing the outer hood of the furnace as replaced by a cooling hood;
FIG. 4 is a sectional view of a structural detail at the bottom of the protective hood; and
FIG. 5 is a sectional view of a structural detail at the top of the protective hood.

Referring to the drawing, it will be seen that the furnace according to the present invention comprises a conventional outer hood 9, within which the protective hood 1 is located and defines the processing chamber 1a. At the bottom of said chamber 1a a radial diffuser 2 is located and centrally of which there is an impeller 3 controlled in a known manner.

Within chamber 1a there are arranged the sheet rolls 4 to be processed, said rolls being superimposed to one another and spaced apart by annular convectors 5, each of which comprises, annular discs which are internally hollow and provided with a plurality of holes, so as to allow for protective gas passage, as better explained below.

At the bottom a plurality of tubes 7 exit from a single annular collecting chamber 6, at which said diffuser 2 terminates and at the bottom being closed by a conventional sandtight sealing 12; this sandtight sealing may be replaced by a dry sealing.

Tubes 7 are parallel to the axis for chamber 1a and at the top open on the upper portion of said chamber 1a through sections 7a bent over at right angles to tubes 7.

It will be understood that tubes 7 may have any pattern and section as well.

Each of tubes 7 preferably comprises an expansion joint, such as the resilient joint 13 shown in FIG. 5. Alternatively, said joint may be formed on hood 1.

As from FIG. 4, hood 1 bears on the upper plate of diffuser 2 through an annular disc 8, at the top also defining the annular collecting chamber 6.

This disc assures an internal sealing between chambers 6 and 1a.

As from a comparison between FIGS. 1 and 3, in heating stage, the furnace is surrounded by the outer hood 9, on which the burners are applied, in FIG. 1 the axes for such burners being designated by AB. In cooling stage instead, the outer hood 9 is lifted and replaced by the cooling hood 10 carrying a fan 11 at the top.

The operation of the furnace according to the present invention is as follows:

The gas, as forced by the impeller 3, travels through diffuser 2 and ascends through tubes 7 remaining outside of hood 1, entering it again at the top of the burden. Along tubes 7 the gas retains its speed at a constant rate and said tubes substantially increase the heat exchange surface. This exchange occurs in heating stage between the gas and furnes moving in the direction of arrows F within hood 9 and, in cooling stage, between the gas and air drawn by fan 11 and moving within hood 10 in the direction of arrows A.

More particularly, in heating stage, the gas absorbs the flame heat through the surface of tubes 7 and hood 1 and transfers it to the burden 4, being rationally allotted between the several convectors 5.

In cooling stage, the protective gas removes heat in the burden and transfers it to the cooling air substantially through the surface of tubes 7.

From the foregoing description, it is apparent that the furnace according to the present invention enables the advantages as set forth at the beginning of the disclosure to be achieved.

Finally, the furnace according to the present invention allows a substantial reduction in processing times, particularly in cooling stage, with a corresponding substantial increase in hour output.

Changes and modifications can be made to the furnace according to the present invention without departing for this from the covering field of the invention.

What is claimed is:

1. A bell furnace for annealing treatment of metal sheets in superimposed rolls, comprising in combination: a first outer hood, a second inner hood for protection of the sheet rolls; a cylindrical annular space between the first outer hood and the second inner hood; an upper collecting chamber and a lower collecting chamber within said inner hood; a plurality of vertical tubes circumferentially arranged about the sheet rolls externally of said second hood for the passage in ascending stage of the entire protective gas capacity from the lower collecting
3. A furnace according to claim 1, wherein said lower collecting chamber comprises an expansion joint disposed within said space.

4. A furnace according to claim 1, wherein an expansion joint is disposed within said space and mounted for communication between one end of each tube and the wall of said second inner hood.

5. A furnace according to claim 1, wherein said outer hood is removably mounted for cooling and is made of sheet as said inner hood and at the top thereof a fan is carried for generating an air circulation externally of said tubes.

6. A furnace according to claim 1, wherein said outer hood is removably mounted and constitutes a heating hood.