Jan. 2, 1940. E. VITS 2,185,655

FURNACE FOR THE CONTINUOUS ANNEALING OF BANDS, SHEETS, AND WIRES

Filed Dec. 14, 1936

Fig. 1.

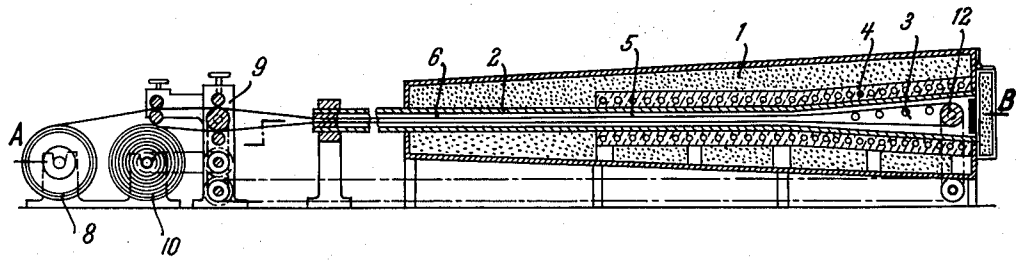


Fig. 2.

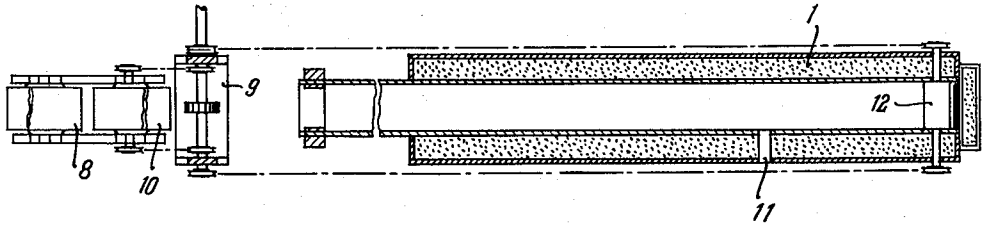
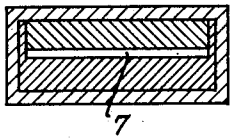


Fig. 3.



Inventor
EMIL VITS
by Carl A. Hellmann,
Attorney.

Patented Jan. 2, 1940 2,185,655

UNITED STATES PATENT OFFICE

2,185,655

FURNACE FOR THE CONTINUOUS ANNEALING OF BANDS, SHEETS, AND WIRES

Emil Vits, Dusseldorf, Germany

Application December 14, 1936, Serial No. 115,858
In Germany January 16, 1936

1 Claim. (Cl. 266—3)

This invention relates to a furnace for annealing or hardening, in particular for bright annealing strips, sheets, wires and the like which are passed through the furnace continuously. The fundamental idea of the invention is to employ for annealing the work a furnace in which the direction of travel of the work or material to be annealed is reversed in the furnace, so that the work leaves the furnace from the same end at which it enters. The furnace is so constructed and the work is guided through the furnace in such way that the work travelling in one direction does not come into contact in the actual annealing chamber with that travelling in the opposite direction, so that all surfaces of the work are exposed to the heat radiated in the annealing chamber. At the entrance end of the furnace, when bands for example are being annealed, the two parts of the band which travel one above the other are guided as closely together as possible, so that the entering part of the band becomes heated as it enters the furnace by the part of the band which is leaving the furnace and, at the same time, the said part of the band which is leaving the furnace becomes cooled, in order to increase the mutual cooling and heating of the parts of the band entering and leaving the furnace. The muffle which acts as the annealing chamber is preferably prolonged at the inlet end of the furnace so that the work becomes preheated to some extent before it enters the actual annealing chamber. By this means, the work leaving the furnace can be simultaneously cooled down to such an extent that it is only just warm. A device for changing the direction of travel of the work is disposed in the annealing chamber at the closed end of the furnace remote from the entry end, which device preferably consists of one or more rollers which may be driven. The rollers are made of heat resistant material and provision should be made to ensure that they do not scratch the work. The rollers can, if necessary, be provided with guides for the work which passes round them. The opening for entry of the work into the furnace and through which the work travelling in the reverse direction also leaves the furnace is so designed that the annealing chamber can be closed as nearly airtightly as possible. In order to prevent access of air to the annealing chamber, a protective gas at a pressure higher than atmospheric pressure is conducted into and maintained in the annealing chamber. Then some of such gas will always escape into the atmosphere through the inlet opening and thereby prevent the entry of external air into the annealing chamber. The consumption of the protective gas employed is only trifling. The furnace can be heated in known manner by gas or other sources of heat such as electric current, oil, coal and the like. The devices for unwinding and winding the work are arranged at the entrance end of the furnace and provided with suitable driving means.

Since in the new furnace the work to be annealed changes its direction of travel in the furnace the actual annealing chamber can be considerably shorter than in the known furnaces in which the work to be annealed is passed through the furnace in one direction only. The consumption of heat in the new furnace is also considerably less than in the known furnaces. Further, a number of sheets, bands or the like can be conducted one beside another through the furnace. The reversing device is then constructed in such a manner as to ensure each strip being separately guided. The work which leaves the furnace is bright annealed.

A constructional embodiment of a furnace for annealing strip or band-like material is illustrated by way of example in the accompanying drawing, in which:

Figure 1 is a longitudinal section through the furnace.

Figure 2 is a section through the furnace on the line A—B of Figure 1, and

Figure 3 is a cross section on a larger scale of the opening which serves as the inlet to and outlet from the furnace.

Referring to the drawing, the annealing furnace consists of the furnace 1 having an annealing muffle 2, the height of the actual annealing chamber 3 of which increases towards the completely closed "hot" end of the furnace. In the example illustrated the furnace is electrically heated. The heating elements 4 are arranged closely together around the actual annealing chamber in order to produce the strongest heating there. There are fewer heating elements in the central zone 5 of the furnace, while at the inlet end 6 there are none at all. In order to cool the band as it leaves the furnace by the radiation of heat from it, the muffle 2 is prolonged beyond the inlet end of the furnace 1. At the end of the expanded annealing chamber 3 there is arranged a guide roll 12 which is preferably driven and the diameter of which depends on the thickness of the work to be annealed. At the inlet end of the muffle a narrow

rectangular slit 7 (Figure 3) is provided for the entry and exit of the work to be annealed.

The band to be annealed which is unwound from the reel 8 passes through the feeding apparatus 9 and enters the annealing muffle 2 through the slit 7. It passes over and around the guide roll 12 and returns to the inlet of the annealing muffle 2 and thence to the winding reel 10. Owing to the gradual increase in height of the annealing chamber at the closed end of the furnace 1 and the large diameter of the roll 12, the returning portion of the band does not come into contact in the enlarged portion of the annealing chamber with the entering portion of the band thus allowing free circulation of gases so that an intense heating of both parts of the band is ensured. After leaving the annealing chamber 3 the returning band approaches nearer to the entering band. Scratching of the bands owing to their sliding one over the other need not be feared as long as no dirt enters between the bands and the bands themselves have no rough or raised places. A flow of protecting gas at a pressure which is higher than atmospheric pressure is introduced through the passage 11 into the muffle 2, starting before the beginning of the annealing operation, in order to maintain an inert atmosphere therein during the annealing.

The introduction of a special protective gas into the annealing chamber can be dispensed with if the work entering the furnace is wetted with oil or oil is dropped on to it or coal dust, silicon carbide, naphthalene or anthracene residues are introduced into the furnace.

While a preferred embodiment of the invention has been disclosed in the present specification, it will be understood that alterations and modifications of various kinds may be made therein without departing from the spirit of the invention, that is, the present specification is to be considered in an illustrative and not in a limiting sense. The scope of the invention is defined solely by the following claim.

I claim:

A horizontal furnace for the continuous annealing of a continuous length of flexible material, said furnace having a relatively long substantially horizontal preliminary heat exchange portion which is vertically narrow, said portion having a single opening at one end to receive and discharge the material, a relatively short heating muffle, means for heating the muffle, said muffle being closed at one end and opening into the heat exchange portion at its other end, a roll rotatably mounted within the muffle adjacent its closed end, to receive the material under treatment and reverse its travel, and means for feeding the material through said heat exchange portion and through said muffle, said means including a device for rotating said roll, the ingoing and outgoing runs of said material being maintained at a relatively small spacing from one another while traversing said heat exchange portion, by reason of its vertical narrowness.

EMIL VITS.