Nov. 8, 1932. J. C. BRADLEY 1,886,631

CONTINUOUS ELECTRIC STRIP ANNEALING FURNACE

Filed Feb. 15, 1930

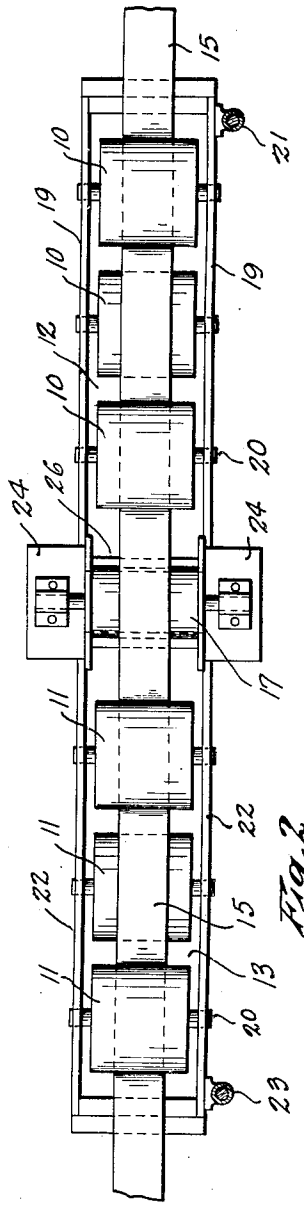


Fig. 2.

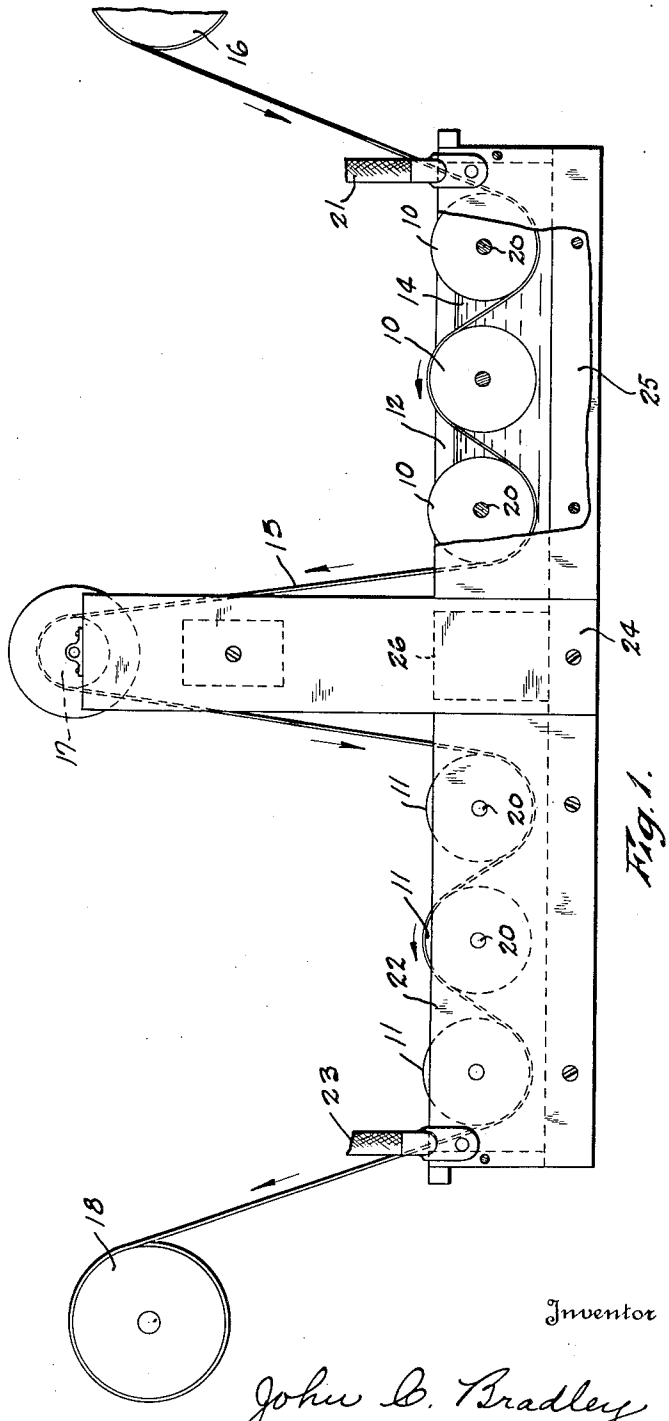


Fig. 1.

Inventor

John C. Bradley

By Wooster & Davis

Attorneys.

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UNITED STATES PATENT OFFICE

JOHN C. BRADLEY, OF WATERBURY, CONNECTICUT, ASSIGNOR TO THE AMERICAN BRASS COMPANY, OF WATERBURY, CONNECTICUT, A CORPORATION OF CONNECTICUT

CONTINUOUS ELECTRIC STRIP ANNEALING FURNACE

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This invention relates to a device for annealing strip metal, either flat or a wire by an electric current. A serious objection in electrical annealing devices where the metal strip being annealed is passed continuously between contacts is that when conducting a current of electricity from rollers or other contacts to or from a continuously moving strip of metal arcing occurs between the strip and the contacts at the points of contact. This arcing forms pits in the metal being annealed where the small electric arcs occur at points of contact. This is because these arcs burn the metal and form the pits and is a bad feature as it seriously mars and injures the metal.

I have overcome this arcing by providing a device in which an electrical conducting liquid is maintained continuously in contact with the engaging surfaces of the metal strip and the electrical contacts, thus maintaining at all times a good electrical contact or connection between the strip and the electrical contacts which does away with the arcing. This conducting liquid may be water or other conducting liquids, or water containing chemicals or suspended conducting solids such as finely divided graphite. This conducting liquid could be applied to the contacts and strips in various ways, such for instance, as a continuous stream of the liquid against the contact, or by running the strip being annealed in the liquid with the contacting surfaces between the strip and the electrical contacts below the surface of the liquid, and in other ways.

For the purpose of showing more clearly the principle of the invention, I have illustrated in the accompanying drawing one embodiment of a device constructed according to this invention. In this drawing

Fig. 1 is a side elevation of an annealing machine with one wall broken away to more clearly show the construction.

Fig. 2 is a top plan view thereof.

In the device shown, there are two sets of electrical conducting contacts, in the present embodiment rollers 10 and 11 placed in two containers 12 and 13 respectively carrying the electrical conducting liquid 14. There may be any desired number of rollers or other contacts. In the particular instance, there are three rollers in each set as this has been found to be very effective in properly guiding the strip indicated at 15 to be annealed, and to provide the desired electrical contacts. In the present case, the metal strip is led off a suitable coil 16 under the outer roller 10 over the intermediate roller under the inner roller and then passes over an intermediate guide 17 which may be a roller of any desired material after which it passes under the inner roller 11, over the intermediate roller 11 and under the outer roller to a drum or coiling device 18. The intermediate guide or roller 17 is raised above the contact rollers or other contacts so that the strip in passing from one set of rollers 10 passes out of the conducting liquid to prevent a short circuit between the two liquids, thus compelling the electrical current to pass through the portion of the strip 15 between the two sets of contacts 10 and 11. In this way, the liquid is not carried to any great extent on the strip after it leaves the contacts 10 and, therefore, current is not wasted in evaporating liquid before the temperature of the strip is brought to the annealing temperature. The conducting liquid in the two containers may be separated by a non-conducting wall.

In the present construction, the sides 19 of the container 12 are made of metal plates in which the roller contacts 10 are mounted to rotate on suitable electrical conducting shafts 20 and either one or both of the plates 19 are connected to a source of current supply, not shown, by means of a conductor lead 21. The rollers are preferably metal, such for example as brass, copper or any other suitable metal. Container 13 is also similarly constructed having electrically conducting side plates 22 connected to the other side of the supply circuit by a conductor or lead 23. The plates of the two containers are separated by insulating material 24 which may provide a support for the intermediate guide or roller 17 and the bottom wall 25 of the containers may be of insulating material such as wood. The strip or wire 15 is annealed by being heated by the

current passing therethrough between the contacts 10 and 11 and, of course, the speed at which the strip is passed through the device depends upon the material of the strip being annealed, its size and thickness, amount of current used, and the amount of annealing which it is desired to impart to the metal. Also the distance the strip has to pass between the sets of contacts 10 and 11 may be varied according to the current used, the speed of the strip, the nature of the material, thickness and width of the strip and the temperature desired. The conducting liquid on the outgoing contact can also be used as a quenching medium to cool the strip if desired. It is not necessary that the contacts be rollers, but the rollers are preferred as they are less likely to cause injury to the surface of the metal, and they also offer less resistance to the passage of the strip through the device. Electrical conducting liquid being in contact both with the strip and the electrical contacts as the metal moves to and from engagement with these contacts, arcing is prevented so that there is no injury to the surface of the metal being annealed.

Having thus set forth the nature of my invention, what is claimed is:

An annealing device for strip metal comprising a pair of liquid containers, a set of three rollers in each container, the two outer rollers of each set being electrical conducting rollers, means for passing the strip under the outer rollers and over the intermediate roller of each set, electrically conducting shafts for the rollers, a metallic bearing block for the rollers, means for connecting the leads from a source of current supply to the respective blocks to conduct current to the rollers to be transmitted by them directly to the strip, a non-metallic electrical conducting liquid in the containers to cover the contacting surfaces between the outer rollers and the strip, and a guide roller for the strip between the sets of rollers and located above them to remove the strip from the liquid as it passes from one set of rollers to the other.

In testimony whereof I affix my signature.

JOHN C. BRADLEY.