

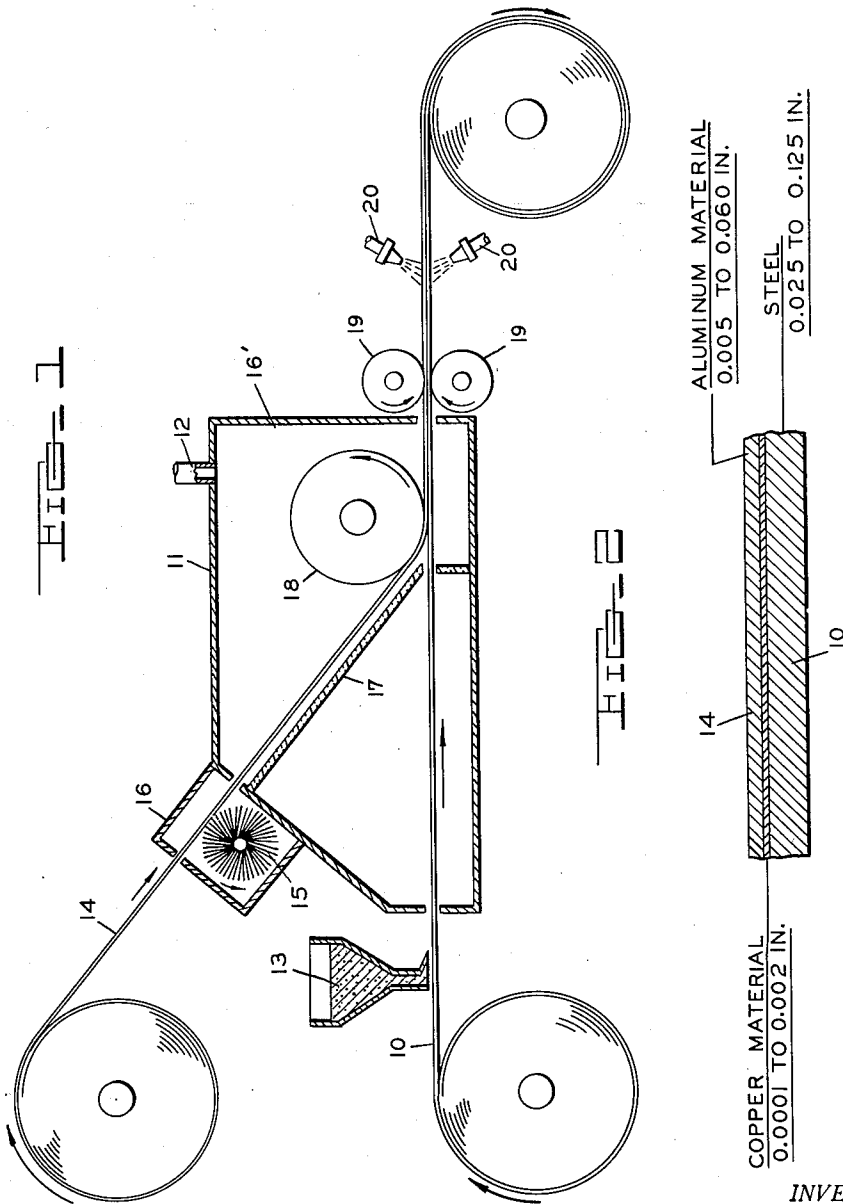
Feb. 21, 1956

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2,735,170

METHOD OF PRODUCING A MULTILAYER STRIP

Filed Sept. 14, 1948



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2,735,170

METHOD OF PRODUCING A MULTILAYER STRIP

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Application September 14, 1948, Serial No. 49,216

1 Claim. (Cl. 29—488)

This invention relates to a multi-layer strip composed essentially of a steel strip to which a strip of aluminum or aluminum alloy is bonded by an intermediate layer of copper or copper alloy. This strip is designed essentially to be fabricated into journal bearings of the interchangeable type as used for automotive engines and similar purposes. However, the strip can be used wherever a composite strip having the properties of the strip covered herein would be useful.

One process for producing the strip consists essentially in depositing a thin layer of copper powder on a strip of steel, passing the strip through a furnace until the copper reaches its melting point, then bringing a strip of aluminum material into contact with the molten layer of copper and holding these strips in contact until the copper layer forms a bond between the steel and aluminum strips. The strips are kept in a suitable protective atmosphere while they are at elevated temperatures.

These and other objects and advantages of the invention will become apparent as the description proceeds.

In the drawings, Fig. 1 is a schematic diagram illustrating a presently-preferred arrangement of mechanism for carrying out the process.

Fig. 2 is a fragmentary cross-section of a finished strip or bearing made according to the invention.

The invention will be most readily understood from a description of the preferred process by which the strip can be formed, and hence this process will be explained first.

The process starts with a coil of steel strip, which may be any preferred steel, such as ordinary cold-rolled low-carbon steel, and which is indicated at 10 in the drawing. This strip of steel preferably has on one side a protective coating, such as ordinary commercial tin plating or copper plating, in order to protect the surface of the steel which is to be subsequently treated. In the case of tin plating the tin will be a negligible factor in the finished product because of the thinness of the plating.

The strip 10 is passed through a heating furnace 11 which is provided with an inlet 12 through which a suitable protective atmosphere, such as a reducing or non-oxidizing atmosphere, is introduced into the furnace.

At a suitable point, preferably ahead of the place where the strip enters the furnace, a thin layer of powdered copper material is applied to the upper side of the strip, as from the hopper 13. The term "copper material" as used herein means a commercial grade of copper or a suitable copper alloy.

As the steel strip bearing the copper powder passes into the furnace, it enters a high-temperature zone which is maintained at a temperature in excess of the melting point of copper, and is maintained in this zone for a time and at a temperature sufficient to melt the copper and preferably to preheat it above its melting point.

After the copper has reached this temperature, a strip of aluminum material is brought into contact with the copper layer. This material may be any aluminum material which will have the desired bearing properties in

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the finished bearing. It may be aluminum or an alloy of aluminum. A particularly suitable material is a commercial alloy consisting of 2.5% magnesium, balance aluminum, rolled into sheet and cut into strips.

This aluminum strip, indicated at 14 in the drawing, before entering the furnace is preferably brought into contact with a high-speed revolving wire brush 15 which will abrade and clean, thereby creating an oxide-free condition on the surface of the aluminum strip which is to be brought into contact with the copper layer. This abrading operation may also be performed in a protective atmosphere, if desired. In the drawing the box 16 is in communication with the furnace 11 so as to permit the protective atmosphere to leak from the furnace into box 16, and the provision of box 16 prevents the brushings from becoming incorporated in the finished strip. Since the aluminum strip is relatively thin, it cannot be heated to the temperature required for melting the copper powder on the steel strip and therefore it is passed through low-temperature chamber 16' which is separated by an insulated baffle 17 from the high-temperature chamber of the furnace.

After the copper coating on the steel strip has reached a molten condition the aluminum strip is pressed into contact with the molten copper layer by reason of passing under the idler roller 18, which exerts downward pressure on the taut steel strip. The rolls 19 pull the strip through the furnace and also serve to compact the aluminum, to press down any irregularities in the intermediate copper layer, and to give the completed multi-layer strip the desired over-all thickness.

As the strip emerges from the furnace, it may be quenched, as by the water sprays 20. Obviously, any other suitable means can be provided for cooling the strip and this may be done either ahead of or behind the rolls 19, with or without the use of protective atmosphere.

The multi-layer strip could of course be produced in other ways. For example, the copper may be applied in the molten state to the steel strip just prior to the addition of the aluminum strip.

The thickness of the steel strip will usually be from 0.025 in. to 0.125 in., while the thickness of the aluminum strip will usually be from 0.005 in. to 0.060 in. The copper layer will be approximately 0.0001 in. to 0.002 in. thick.

The multi-layer strip produced by the above method may be fabricated into journal bearings by any preferred process, such as the processes now in use for forming bearings from strip material. In many cases they will consist of semi-circular bearing halves suitable for use as main and connecting-rod bearings for automotive engines.

A bearing made from the multi-layer strip described above has many desirable qualities, since the wrought aluminum, which has good bearing properties, is firmly bonded by the copper to the strong steel backing. Since copper has a coefficient of thermal expansion lying between those of steel and aluminum, it will serve to minimize stresses that might arise from changes in temperature.

The many advantages of this bearing, and of the efficient process for producing it, will be fully understood by those familiar with the art.

I claim:

The process of producing a multi-layer strip which comprises: taking a strip of commercial copper-plated steel, of approximately 0.025 to 0.125 inch thick, depositing on the copper-coated side of the steel a thin layer of copper powder, heating the strip in a non-oxidizing atmosphere to a temperature sufficient to melt the copper powder; heating a strip of wrought aluminum material in a non-oxidizing atmosphere to a temperature

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below the melting point of the aluminum material; bringing the heated aluminum strip into contact with the heated copper layer; and thereafter holding the two strips in contact with each other for a time and at a temperature sufficient to metallurgically bond them together, while maintaining them in a non-oxidizing atmosphere.

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