Oct. 24, 1961 R. J. BENYA ET AL 3,005,259

METHOD OF MAKING BRAKE DRUMS

Filed Nov. 24, 1958 3 Sheets-Sheet 1

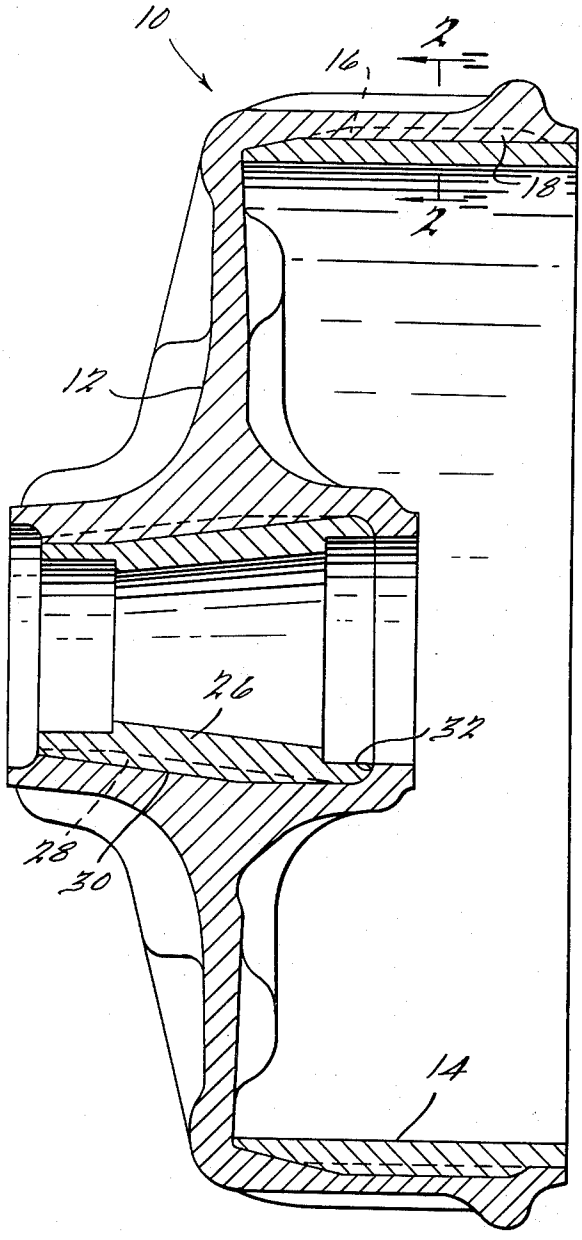

FIG. 1.

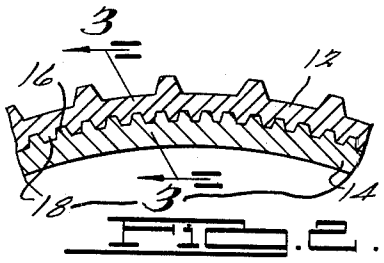

FIG. 2.

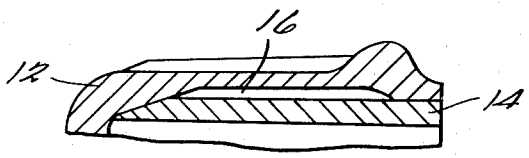

FIG. 3.

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Oct. 24, 1961 R. J. BENYA ET AL 3,005,259

METHOD OF MAKING BRAKE DRUMS

Filed Nov. 24, 1958 3 Sheets-Sheet 2

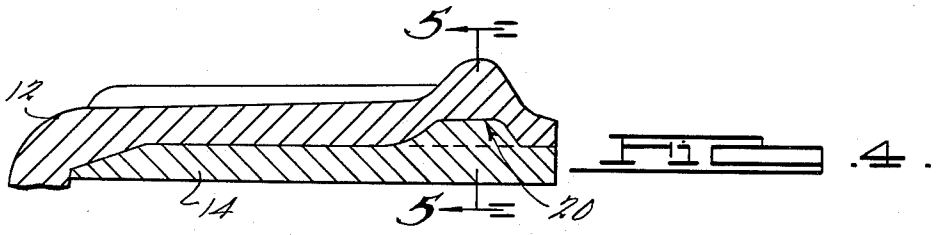

FIG. 4.

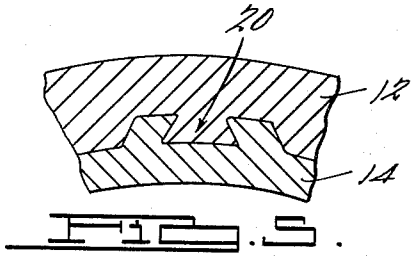

FIG. 5.

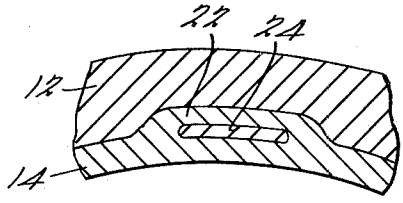

FIG. 6.

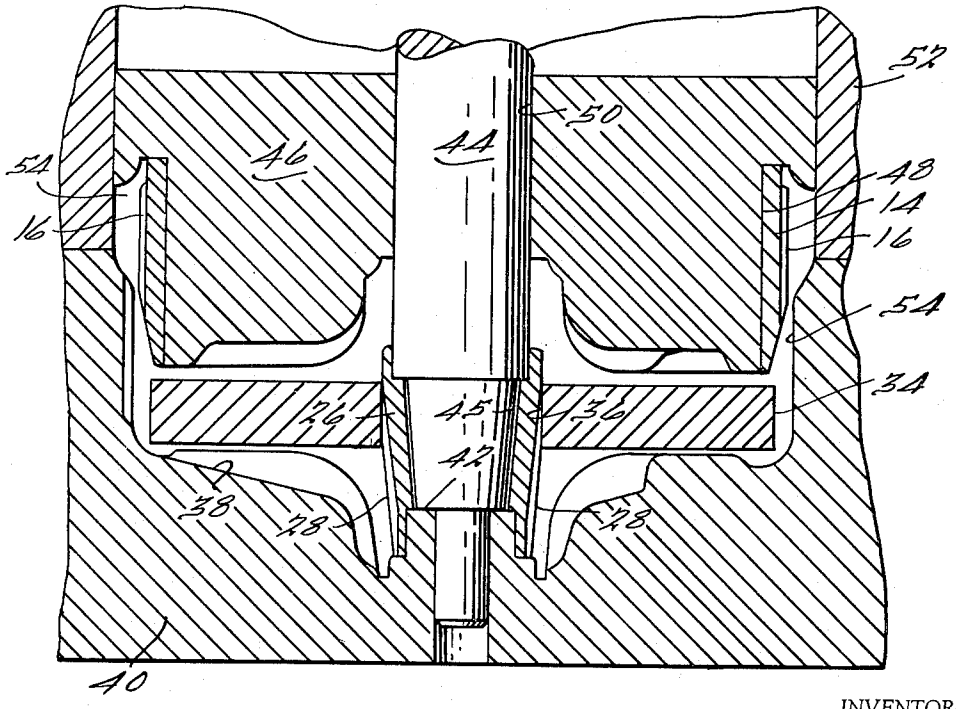

FIG. 7.

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Oct. 24, 1961 R. J. BENYA ET AL 3,005,259

METHOD OF MAKING BRAKE DRUMS

Filed Nov. 24, 1958 3 Sheets-Sheet 3

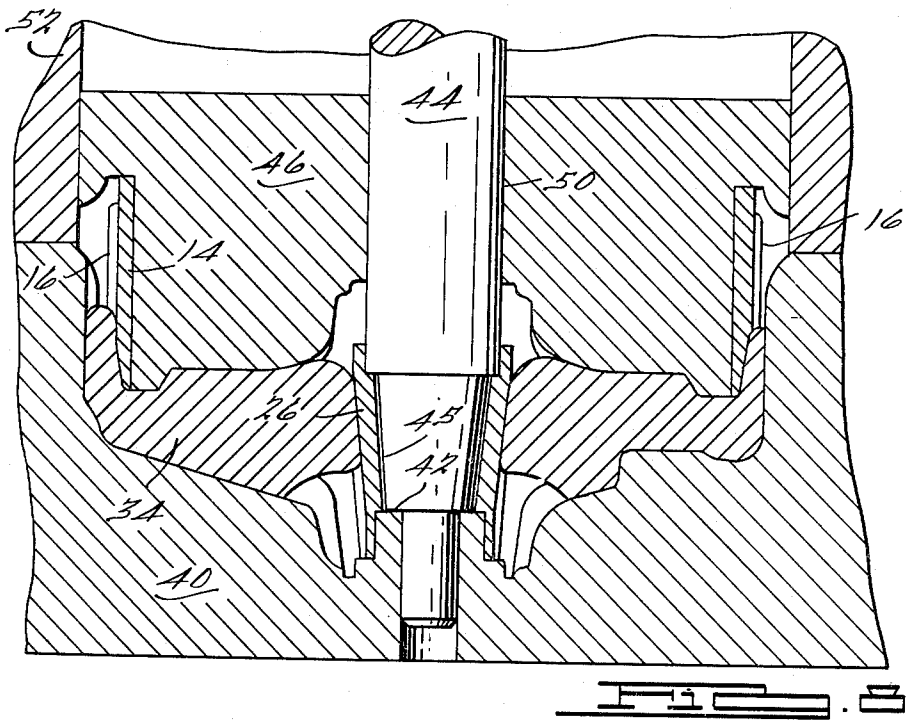

Fig. 8.

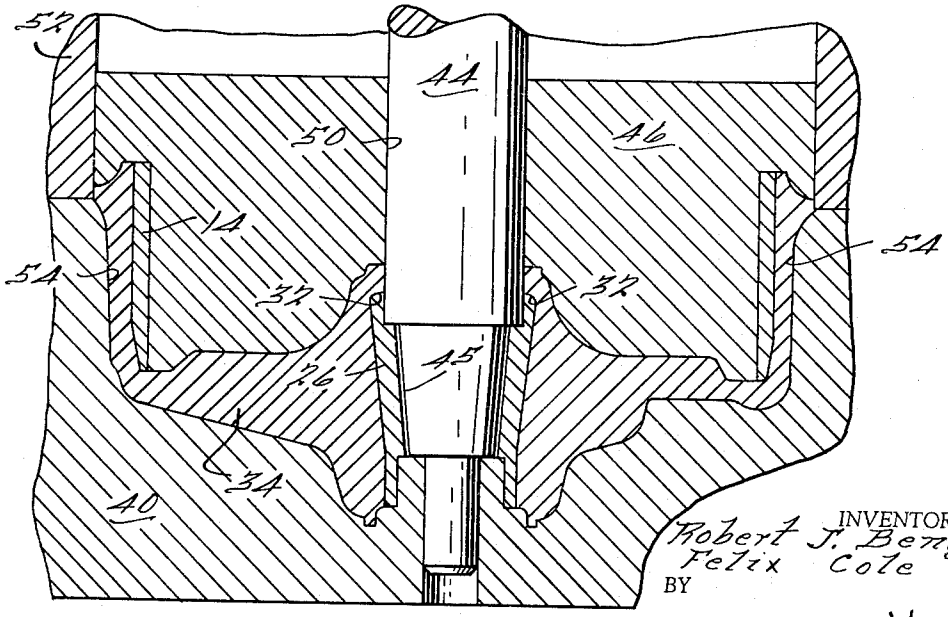

Fig. 9.

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METHOD OF MAKING BRAKE DRUMS

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6 Claims. (Cl. 29—505)

This invention relates to lined brake drums and in particular to a method of making the same in a single press operation by impact extrusion.

In making brake drums and in particular aluminum brake drums having cast iron liners, a production problem exists in attaching the liner to the aluminum drum body. Some prior methods cast the aluminum body around the liner, but, this method is rather tedious and may often result in a loose connection between the body and the liner due to different coefficients of expansion of the aluminum and the cast iron. Methods which mechanically attach the liner to the body are also tedious and expensive due to the number of operations necessary to make a sturdy attachment.

It is a major object therefore of this invention to provide a single step die forming method for forming and attaching an aluminum brake drum body to a cast iron liner.

In this method, a substantially disc shaped aluminum blank initially frictionally secured to a hub is placed along with the hub in the cavity of a lower die, and a cast iron liner is initially frictionally secured onto an upper die which fits into the lower die. The dies are then brought together to impact extrude the cold aluminum disc into the cavities formed by the dies and into intimate contact with the hub and the liner. The direction and force of the flowed or extruded aluminum is sufficient to form a compression contact joint between it and the hub and liner.

Another object is to provide a method for forming an aluminum brake drum body to a desired shape from a blank of cold aluminum by utilizing cooperating impact extrusion dies and to attach a cast iron liner to said aluminum body during said forming of the body.

Further objects and advantages will become apparent from the following description and drawings, in which:

FIGURE 1 represents a cross sectional view of a brake drum body and attached liner formed in accordance with this invention;

FIGURE 2 represents a view taken along line 2—2 of FIGURE 1 in the direction of the arrows;

FIGURE 3 represents a view taken along line 3—3 of FIGURE 2 in the direction of the arrows;

FIGURE 4 represents a variation in the keying structure of FIGURE 1;

FIGURE 5 represents a view taken along line 5—5 of FIGURE 4 in the direction of the arrows;

FIGURE 6 represents another variation of the keying structure;

FIGURE 7 represents an initial stage of the method of making the brake drum;

FIGURE 8 represents a second stage of the method; and

FIGURE 9 represents the last stage of the method.

Referring to FIGURE 1, a brake drum 10 is shown comprising an aluminum brake drum housing or body 12 and a cast iron liner 14 secured thereto by cooperating preformed keying ribs 16 on the liner 14 and keying ribs 18 formed by the present process on the body 12. The liner is further secured to the body by a compression contact joint as hereinafter explained.

As shown in FIGURES 4, 5, and 6, variations in the type of keying structure may be employed such as, for example, the inter-fitting wedge keying structure 20 of

FIGURES 4 and 5 and the keying projection 22 of FIGURE 6 having slot 24 therein through which slot the aluminum is extruded, as explained below.

A hub 26 having preformed splines 28 thereon is also secured to the body 12 by an impact extrusion joint with splines 30 formed by the present process on the body 12 inter-fitting with the splines 28 on the hub. The hub 26 is tapered and the body 12 has a formed over annular retaining shoulder 32 to further insure retention of the hub within the body 12.

Referring to FIGURE 7, which shows the first step in the cold impact extrusion process, an aluminum disc 34 of substantially the correct metal volume for making the drum body 12 and having an aperture 36 therein frictionally receives hub 26 in said aperture which hub is placed in a cavity 38 of a lower die member 40 and rests on shoulder 42 therein. A mandrel 44 is inserted into the bore 45 of hub 26 to provide a backup therefor and also to retain the hub 26 and the disc 34 in proper position in the lower die cavity 38. An upper die 46 having an annular recess 48 in the outer periphery thereof frictionally supports the liner 14 and holds said liner in the proper position with respect to hub 26 and disc 34. An outer shell 52 slidably receiving upper die 46 completes a cavity 54 into which the disc 34 will eventually be extruded or formed. This cavity 54 is designed to have the proper size with respect to disc 34 to be completely filled thereby and to cause said disc to be formed into very intimate compression contact with the liner 14 and the hub 26.

Referring to FIGURE 8, it is seen that movement of the upper die member 46 toward the lower die member 40 causes the aluminum disc 34 to flow or extrude into cavity 54 and into the aforesaid intimate contact with the liner 14 and the hub 26, and as shown in FIGURE 9 the extruded aluminum completely fills cavity 54 and is in complete compressive contact with the keying portions of both the liner 14 and the hub 26. It is also noted that in this single step impact extrusion process the hub retention shoulder 32 is automatically formed.

We claim:

1. A method of making a brake drum comprising the steps of frictionally inserting an annular hub of relatively hard metal in a centrally located aperture in a relatively soft aluminum disc, said hub having keying means on the outer surface thereof, holding a cast iron liner ring closely adjacent a side of said disc and concentrically surrounding said hub, said ring having keying means on an exterior surface thereof, enclosing said hub disc and liner ring with relatively movable die members, actuating at least one of said die member to cause compressing of said aluminum disc to flow the same radially inwardly about said hub outer surface and ends and radially outwardly around the exterior surface of the cast iron liner and into the key portions thereon to provide a mechanical interlock between the several components of the assembly.

2. A method of making a brake drum from dissimilar materials comprising the steps of inserting a mandrel into the bore of a tubular hub member that is formed of a relatively hard material and has key means on the outer surface thereof, inserting said mandrel mounted hub through an apertured disc of relatively soft extrudible material so that portions of said hub extend outwardly from the opposite sides thereof, supporting said disc encircled, mandrel mounted hub in a first die member, supporting a brake drum liner ring of relatively hard material in a second die member so that it overlies said disc, said liner concentrically surrounding and being spaced radially from said hub to define an intermediate disc filled region therebetween, said liner having key means on the exterior surface thereof, urging said die

members toward each other and compressing the disc to flow the same radially inwardly about said hub outer surface and ends and radially outwardly around the exterior surface of the cast iron liner and into the key portions thereon to provide a mechanical interlock between the several components of the assembly.

3. A method of making a brake drum having an internal braking surface liner and a hub portion of a dissimilar harder material than the material forming the brake drum body portion comprising mounting a brake drum hub portion on a mandrel and then positioning said mandrel mounted hub in a centrally located aperture in a disc of extrudable material that forms the body portion of the brake drum, placing the assembled disc and hub in a first die member having a cavity that will permit impact extrusion of said disc to the final shape of the brake drum, arranging an annular braking surface liner that has key means on its exterior surface in said die cavity so that it extends concentrically about said hub and is positioned adjacent the outer periphery of said disc, and applying a second die member to said disc to impact extrude said disc, actuating at least one of said die members into said cavity to cause portions thereof to flow the same radially inwardly about said hub outer surface and ends and radially outwardly around the exterior surface of the cast iron liner and into the key portions thereon to provide a mechanical interlock between the several components of the assembly.

4. A method of making a brake drum having an internal braking surface liner and a hub portion of a dissimilar harder material than the brake drum body portion comprising concentrically mounting a brake drum hub portion in a centrally located aperture in a disc of extrudable material adapted to form the drum body portion, fixedly mounting the assembled disc and hub in a first die member cavity that will permit impact extrusion of said disc to the final shape of the brake drum body portion, arranging an annular braking surface liner in said first die cavity to extend concentrically about the hub portion and adjacent the outer periphery of said disc, and applying a second die member to said first die member and actuating at least one of the die members to cause them to impact extrude said disc into the cavity in said first die member to cause portions thereof to flow radially inwardly about the external surfaces of the hub portion and radially outwardly around the exterior surfaces of the liner, said axial flow of the disc material during impact extrusion thereof causing portions thereof to surround formations on the hub portion and liner so as to provide mechanical connections thereto that prevent relative movement between the connected brake drum portions.

5. A method of making an aluminum body brake drum having an internal braking surface liner and a

hub portion of a dissimilar harder material with said liner and hub each having keyway grooves on their external surfaces, comprising concentrically mounting the brake drum hub portion in an aperture in an aluminum disc adapted to be reshaped to provide the brake drum body portion, placing the concentrically assembled disc and hub in a first die member having a cavity that will permit impact extrusion of said aluminum disc to the final shape of the brake drum, concentrically arranging an annular braking surface liner around said hub in said die cavity adjacent the outer periphery of said aluminum disc, and applying a second die member to said first die member and actuating one of said die members so as to impact extrude said aluminum disc to cause portions thereof to flow radially inwardly about said hub outer surface and ends and radially outwardly around the exterior surface of the cast iron liner and into the key portions thereon to provide a mechanical interlock between the several components of the assembly.

6. A method of making a rotor having a rim and a hub portion of a dissimilar harder material than the rotor body portion comprising mounting the hub portion in a centrally located aperture in a disc of extrudable material adapted to be reshaped to form the rotor body portion, concentrically mounting the assembled disc and hub in a first die member cavity that will permit impact extrusion of said disc to the final shape of the rotor body portion, arranging an annular rim in said die cavity to extend concentrically about the hub portion adjacent the outer periphery of said disc, applying a second die member to said first die to close said die cavity, and actuating at least one of said die members so as to impact extrude said disc into the cavity in said first die member to cause portions thereof to flow radially inwardly about the external surfaces of the hub portion and radially outwardly around the exterior surfaces of the rim, said flow of the disc material during impact extrusion thereof causing portions thereof to surround formations on the hub portion and rim so as to provide mechanical connections thereto that prevent relative movement between the disc connected rotor portions.

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