April 4, 1961 T. C. SODDY 2,978,073

BIMETAL BRAKE DRUM

Filed April 1, 1957

FIG. 1.

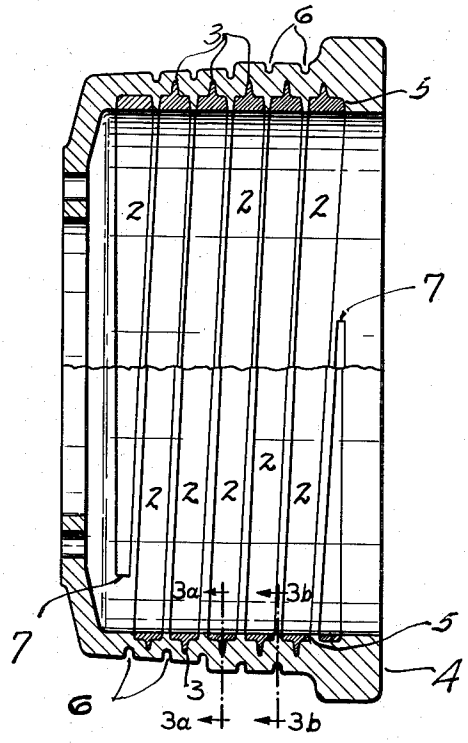


FIG. 2.

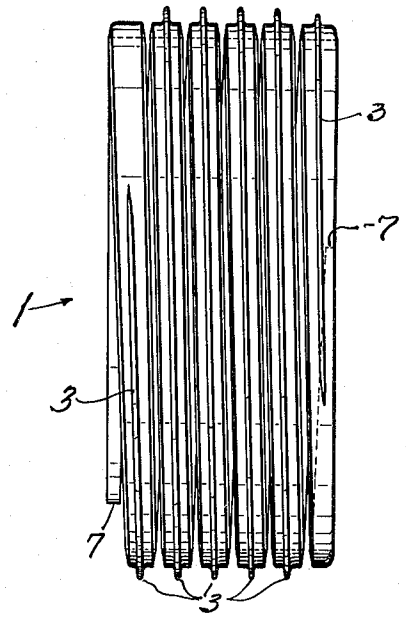


FIG. 4. FIG. 5. FIG. 6.

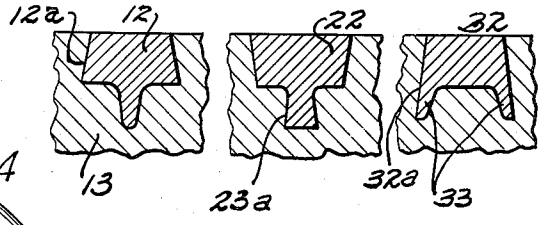


FIG. 3.

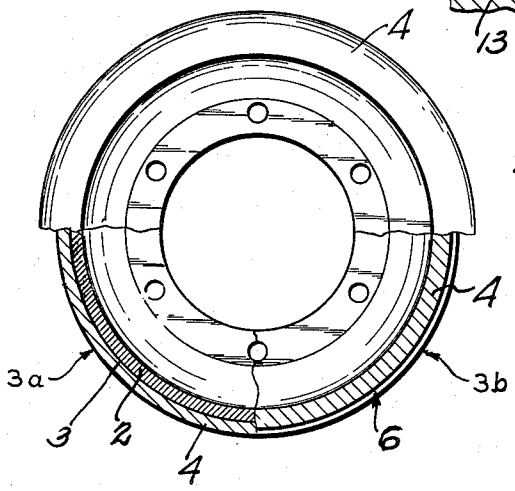
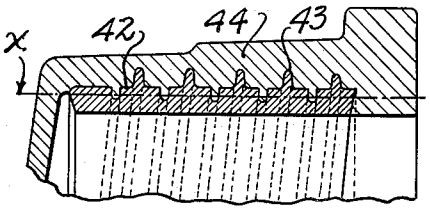


FIG. 7.



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BIMETAL BRAKE DRUM

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6 Claims. (Cl. 188—218)

The invention relates to brake drums, and particularly to drums of the type used on vehicles in which a shoe-contacting liner having a high coefficient of friction and high wear resistance, such as iron or steel, is embedded in a relatively heavy housing of a lighter metal having higher heat conducting characteristics, such as aluminum or an alloy thereof.

Brake drums of this type are intended to obtain the friction-resistance wear qualities of a ferrous metal with the light weight and high heat-conductive properties of aluminum, magnesium or other metals low in the scale of specific gravity. In drums of this type as previously constructed, the housing of light metal has been cast around inserts of ferrous metal, but the high heat dissipation during heavy braking, which must be absorbed by the drum since the brake shoe is usually made of a heat insulator material, causes a fading or drop in the coefficient of friction between the drum and the brake shoe because of the lowering of the tensile strength of the drum as the temperature rises. The use of a housing or muff, formed of aluminum, for the iron liner has been proposed because aluminum has approximately two and one-third times the coefficient of heat transfer relative to iron, but to utilize the characteristics of the aluminum housing, it is essential that there be maintained an extended close contact between the iron and aluminum components and that the iron elements cannot work loose from the aluminum housing elements. Attempts to maintain such close contact have not been satisfactorily effected because of the different coefficients of expansion of the iron and aluminum parts. Also, there is a tendency of the drum to ovate, which results in uneven load concentration on the brake shoes and therefore an undue rise in temperature.

The present invention relates to overcoming the disadvantages previously encountered, and consists primarily in providing a continuous helix of ferrous metal for contact with the brake shoes and substantially embedding the helix convolutions, which are spaced apart, in the aluminum or other light metal muff or housing throughout the length of the helix for substantially the full depth of the convolutions.

Illustrative embodiments of the invention are shown in the accompanying drawings, in which:

Figure 1 is a vertical longitudinal section through a bimetal drum embodying one form of the invention; the upper portion of the figure shows the drum as it comes from the mold, and the lower portion of the figure shows the drum after a portion of its inner periphery has been machined away to produce a thinner and smoother liner.

Figure 2 is a side elevation of the ferrous metal helical liner before it is incorporated in the drum housing as shown in Figure 1.

Figure 3 is in part a right hand elevation of the drum shown in Figure 1, and in part (indicated by the arrow 3*a*) a section on line 3*a*—3*a* of Figure 1; and in part (indicated by the arrow 3*b*) a section on line 3*b*—3*b* of Figure 1.

Figure 4 is a detail cross section through a portion of a liner helix, and the adjacent housing metal, illustrating another form of helix.

Figure 5 is a similar section illustrating a third form of helix.

Figure 6 is a similar section illustrating a fourth form of helix.

Figure 7 is a section corresponding to the upper portion of Figure 1, but illustrating another form of liner casting about which the housing metal has been cast.

The helix **1** (Figures 1–3) comprises a plurality of convolutions **2** normally spaced apart and extending substantially throughout the length of the drum and forming the major portion of the inner periphery of the drum. Preferably, each convolution has a relatively narrow rib **3** projecting from its outer periphery and extending substantially continuously of the helix.

The helix is formed of ferrous metal, and a preferred form of the helix is a gray iron casting which may be cast as shown. Also, the helix strip could be formed initially of a continuous rolled section and subsequently curved about a mandrel to form the helix.

The housing **4** is formed of aluminum, magnesium or other metal of substantially lower specific gravity and higher heat conductivity than iron, preferably below 3 in the scale of specific gravity. The housing is cast about the helix, and preferably is molecularly bonded thereto. One method of bonding is by dipping the helix into a molten bath of iron-aluminum alloy before the housing metal is poured, as described in Whitfield et al. Patent No. 2,396,730. Irrespective of the bonding, the aluminum is in close contact with the outer periphery of the helix and with the annular faces **5** of the helix, and is between successive convolutions of the helix and thus contributes to the rapid dissipation of heat and avoids the building up of high temperatures which reduce the frictional characteristics of the iron which would permit the brake shoes to slip over the liner and thereby increase the temperature and lower the tensile strength of the drum. Additional dissipation of heat without undue weakening of the drum is obtained by providing a substantially continuous groove **6** in the housing intermediate the convolutions of the helix. The ends of the helix, at **7**, abut the cast metal of the housing. These abutting ends and the inclination of the convolutions anchor the lining against any rotary shifting within the housing even though the bond should fail. Accordingly the iron insert cannot work loose from the housing metal and decrease the dissipation of frictional heat from the lining. Ribs **3** increase the radiant surface approximately one hundred percent, and similarly increase the interfacial bond between the iron and aluminum. Due to the helix design, the forces applied to the interfacial bond are distributed by combined stresses through tension, compression shear and torsion through the entire length of the helix, and the difference in the coefficient of expansion between the liner and housing is more effectively distributed because of the shape of the cross section of the liner. The provision of ribs **3** also reinforces the drum transversely and better resists the ovating of the drum under heavy loads. The helix provides for frictional contact with the shoes throughout their length and thus avoids cutting or grooving of the shoes.

Figure 4 illustrates a cross section of a helix strip **12** in which the sides **12***a* of the strip are inclined to the axis of the helix and housing **13**, and thus provide an additional locking means for the liner in the housing.

Figure 5 shows another cross section for a helix **22** in which the sides **23***a* of the rib **23** are inclined similar to the sides **12***a* shown in Figure 4.

Figure 6 shows another cross section for a helix **32** in which there is provided a pair of ribs **33** at the sides

of the helix, thus increasing the depth of the helix sides 32*a* which are inclined similar to the sides 12*a* of the helix shown in Figure 4.

Each form of helix shown in Figures 4, 5 and 6 would be restricted necessarily to rolled sections formed into a helix, because it is not feasible to make a casting with the draft shown as a result of the inclination of the sides of the helix to the helix axis.

Figure 7 illustrates a drum in which the helical liner is cast initially with the successive convolutions 42 united, at least adjacent the inner periphery of the casting. The housing 44 is then cast about the liner convolutions 42 and ribs 43 and the inner periphery of the bimetal drum is machined down to the line indicated at X, producing a finished product substantially like that shown in Figure 1. In this structure the initial casting of the liner is simpler than that shown in Figure 2. An even more simple structure would be to utilize a cylinder with strenght inner and outer sides and machine it down to the form shown in Figure 7. With such an arrangement, the initial liner could be either cast metal or forged metal.

Each of the structures described attains the objectives set forth in the introductory portion of the specification. The details may be varied other than as described without departing from the spirit of the invention and the exclusive use of those modifications coming within the scope of the claims is contemplated.

What is claimed is:

1. A bimetal brake drum comprising a rigid housing of a metal having high heat conductivity characteristics having a continuous peripheral circumferential wall, a helix of metal having an inner face, an outer face, and side faces, the coils of said helix being spaced apart lengthwise of the helix axis and wherein the outer face and at least a portion of said side faces are embedded fixedly within said housing wall, the said coils being maintained in spaced relationship by a continuous helical rib formed as an integral part of said housing wall extending between said coils, the said inner face of said helix forming a continuously circular brake-shoe contacting surface for the drum.

2. A bimetal brake drum comprising a rigid housing of a metal having high heat conductivity characteristics having a continuous peripheral circumferential wall, a helix of metal having an inner face, an outer face and side faces, the coils if said helix being spaced apart lengthwise of the helix axis and wherein the outer face and at least a portion of said side faces are embedded within said housing wall, the said coils being maintained in spaced relationship by a continuous helical rib formed as an integral part of said housing wall extending between said coils, said helix having an elongated helical rib on its outer periphery and wherein the outer periphery of said housing wall surrounding the helix is grooved helically intermediate the convolutions of said helical rib, the said inner face of said helix forming a continuously circular brake-shoe contacting surface for the drum.

3. A bimetal brake drum comprising a rigid housing of a metal having high heat conductivity characteristics having a continuous periphehal circumferential wall, a helix of metal having an inner face, an outer face, and side faces, said helix and housing having different coefficients of expansion, the coils of said helix being spaced apart lengthwise of the helix axis and wherein the outer face and at least a portion of said side faces are embedded within said housing wall, the said coils being maintained in spaced relationship by a continuous helical rib formed as an integral part of said housing wall extending between said coils, the said inner face of said helix forming a continuously circular brake-shoe contacting surface for the drum, and anchoring means formed as an integral part of said helix including surfaces inclined relative to the axis of the helix and housing and serving to anchor said helix to said housing wall.

4. A structure as defined in claim 3, wherein the anchoring means comprise the inclination of the sides of said helix to the axis of the helix and housing.

5. A structure as defined in claim 4, wherein the inclined sides of the helix extend beyond the inner face of said helix.

6. A structure as defined in claim 3, wherein the anchoring means comprises a rib having an outer face and side faces, the side faces of said rib being inclined to the axis of the helix and the housing.

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