May 22, 1956 J. A. MAXWELL 2,746,142

METHOD OF MAKING A BRAKE SHOE

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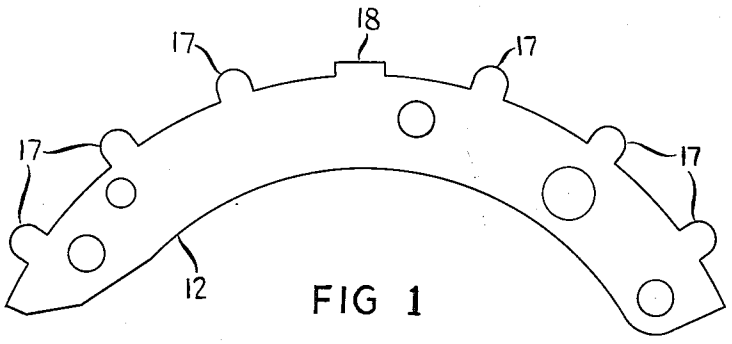


FIG 1

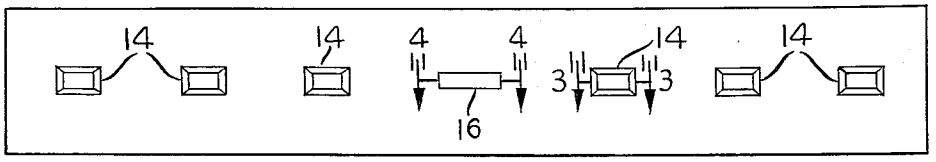


FIG 2

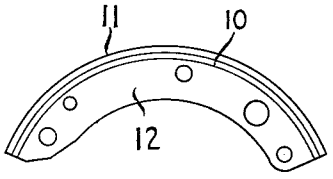


FIG 5

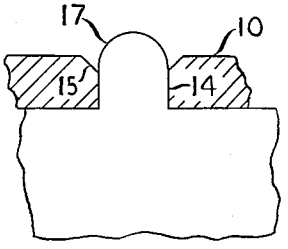


FIG 3

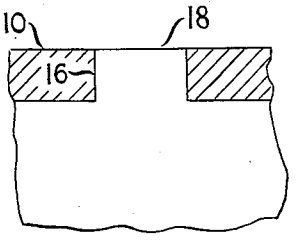


FIG 4

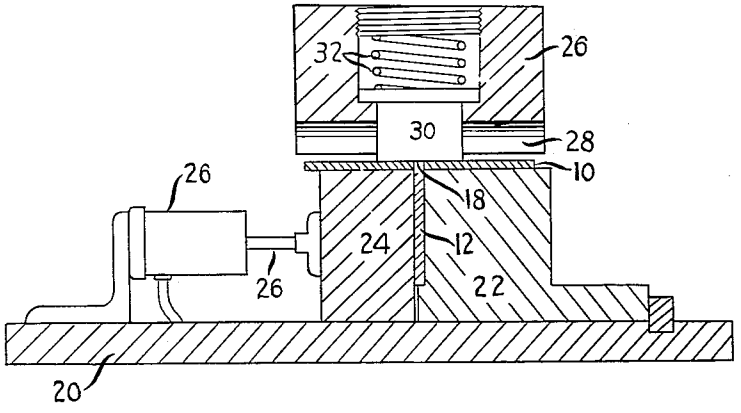


FIG 6

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METHOD OF MAKING A BRAKE SHOE

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3 Claims. (Cl. 29—522)

This invention relates to a method of making brake shoes for an internal expanding automobile brake.

The shoe is built up of a curved outer band carrying the brake lining, which is reinforced preferably by a single stiffening member or web with projections thereon passing through slots in the band and riveted or welded thereto.

Brake shoes of this general nature have been built for many years, one form of which is shown in Patent No. 1,818,090, granted August 11, 1931, to J. W. Peterson. A difficulty in this type of construction is to form the band and web in true right angle relationship and maintain the perfect circular arc of the band. When the band is pressed as shown in the Peterson patent there is always a certain amount of spring-back which differs with slight differences in the steel used. As the band is placed on the web to be welded thereto, it is necessary to re-form the band slightly by the pressure of the welding machine, and this often forms high spots or ridges which result in uneven surface on the brake band, in addition to that caused from slight misalignment from the true right angle relationship as explained above. These imperfections have been so difficult to control that many companies have gone into the more expensive process of forming by rolling the brake shoes from T-irons and then restriking them until they form a perfect arc. This has been found to be a prime requirement in the bonded brakes used today, since the bonding material, while producing a perfect bond, has no tensile strength of its own and therefore has to be kept as thin as possible. Thus, it is desirable to keep the maximum thickness of the bonding material at .007 inch. To do this it is necessary to keep the band within a tolerance of .002" both in its circular formation and in its angularity with the web.

I prefer to blank out the band flat and simultaneously punch therein a series of spaced rectangular slots. The web is formed with rounded projections which, when the band is bent around to circular shape, snugly fit into these slots, but are of sufficient length to project above the surface of the band. To accommodate the excess of metal the slots in the band are coined out on each side to form a frusto-conical depression or chamber for a part of their depth. In the forming die for the band provision is made for firmly clamping the web in position. The flat band is located relative to the web by means of a centrally located rectangular projection or tongue on the web and a centrally located slot in the band, the length of said tongue being substantially the same as the thickness of the band. As the press ram descends the band is firmly clamped to the stationary die by a yielding piston or pressure pad carried by the movable die and contacting the locating means above mentioned. By further movement of the die the band is formed around the web and finally the projections are deformed so as to fill out the coined depressions so that the band is firmly cold riveted to the web and no spring-back results on the upstroke of the press releasing the pressure on the band. The projections are then subjected to a welding operation of the general type of spot welding. However, due to the previous cold riveting process, whereby the projections on the web are brought into intimate and firm contact with the slots in the band, there is not much flow of melted metal. Instead, the heat and pressure of the spot welding has the effect of changing the previously described cold riveting to a hot riveting process, whereby the projection conforms to all the intimate details of the slot, and on cooling down shrinks, thus forming a very tight and close joint with the band.

The above and other objects and features of the invention will be apparent from the following description of one illustrative embodiment shown in the accompanying drawings, in which:

Fig. 1 is a side view of the web.

Fig. 2 is a plan view of the band.

Fig. 3 is a sectional view along lines 3—3 of Fig. 2.

Fig. 4 is a sectional view along lines 4—4 of Fig. 2.

Fig. 5 shows a side view of the completed brake shoe.

Fig. 6 is a view partly in section showing mechanism for forming the band and securing it to the web.

It is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

The completed shoe, shown in Fig. 5 consists principally of an arcuate band **10** to which the lining **11** is bonded. Web **12** is riveted to the inner face of the band **10** by the method hereinafter outlined, and not only reinforces the band, but has holes formed therein for the connection of the various actuating members of the brake. Since the number and spacing of these holes varies with different makes of cars and form no part of this invention, they are not further described herein.

In the manufacture of the present brake shoe, the band **10** is blanked out to size and simultaneously a series of rectangular slots **14** are formed therein. As shown in Fig. 3, the upper portion of each of these holes is coined out during the punching operation to form a chamfer **15** which is preferably extended all the way around the slot, although if desired it may be confined to the two ends. In the center of the band is punched out a rectangular slot **16**, shown in Figs. 2 and 4, the purpose of which will be outlined later.

The web **12** is blanked out as shown in Fig. 1, with rounded rectangular projections **17** spaced around the circular periphery so as to enter slots **14** when band **10** is formed therearound. Centrally located on web **12** is a tongue **18**, which snugly fits into slot **16** in the band. It will be noted in Figs. 3 and 4 that the projections **17** are of sufficient length to project above the upper surface of the band **10** when they enter holes **14**, but that the upper edge of tongue **18** is substantially flush with the upper surface thereof.

An important feature of this process is the simultaneous bending of band **10** to the form shown in Fig. 5 and the cold pressing of the extending portions of projections **17** until they tightly fill the slots **14** and the chamfers **15**. In order to accomplish this, the apparatus shown in Fig. 6 is used, which comprises a base **20** supporting an abutment **22** fixed thereto, and a slidable abutment **24** designed to be moved toward and away from the fixed abutment by any suitable means such as an air cylinder **26**, the piston of which is connected to abutment **24** by piston rod **26**. By this arrangement, the web **12** may be retained fixedly in position while the band **10** is applied thereto. The upper surfaces of abut-

ments 22 and 24 are convex so as to constitute the stationary die member of the die set.

The flat band is placed on the stationary die member with tongue 18 of the web extending into slot 16 of the band. The upper, movable, die member 26 is then lowered so as to form the band and rivet the projections 17. Die member 26 is provided with a concave working surface 28, from which projects a plunger or pressure pad 30 which is urged downwardly by a compression spring 32. Pad 30 contacts the surface of band 10 before the start of the forming operation and clamps the band centrally over tongue 18 and slot 16 to firmly hold it in place during the operation. Obviously other locating means known to the art, such as a fixture, could be used, but this tongue and slot arrangement is far simpler and more efficient.

As the upper die member 26 comes down, the pressure pad 30 firmly clamps the band in position on tongue 18, and further downward movement wraps the band around the lower die member and the web, causing projections 17 to enter slots 14. The final movement of the upper die member flattens out the projections 17, cold riveting the band firmly to the web.

It will be seen that by this method the band (assuming that the dies are accurately made) is formed to a truly cylindrical form, and is held to truly right-angle relation to the web, and while so formed and held is permanently secured to the web in such manner as to prevent spring-back or other deformation due to variations in the properties of the metal, or to other causes.

The shoe is then removed from the press and each rivet or cold-upset projection is heated to at least red heat and pressure applied thereto to cause the upset portion of the metal to soften and to fill its nest more intimately. This operation may be successfully performed in a spot welding machine in which the shoe is grounded and the electrode contacts the upset projection. It will be understood that in spite of being performed in a spot welding machine this operation is in fact a hot-upsetting operation. The metal of the cold-upset projection is heated and softened and therefore a relatively light pressure exerted thereon by the electrode is sufficient to cause sufficient plastic deformation thereof to cause the metal to fill the nest very intimately. Heating of the shoe in the process of such an operation is limited to the upset portion of the projection, and such heating does not affect the curvature of the band member as is the case in conventional methods where heating of the band may be such as to affect its curvature. It will be also understood that heating of the cold-upset portions of the projections relieves the internal stress produced therein by the cold-upsetting and improves the metallurgical structure of the metal.

If desired, rectangular hardened steel inserts may be placed in the upper die member, of the same size and shape as the slots 14 at the top. These inserts may be spring pressed so as to contact the projections 17 prior to the mating of the dies, and may be arranged to bottom in the slots when their faces are almost flush with the upper die member, to coin the rivet projections into the slots

at a level equal to or even very slightly below the level of the outer band surface.

By the process and apparatus above described, applicant has produced a fabricated brake shoe of two parts, namely the web and the band, which meets the exacting requirements of modern bonded brake lining.

While a particular brake shoe, and the particular steps in its manufacture, have been described in detail, it is not my intention to limit the scope of the invention other than by the terms of the appended claims.

I claim:

1. A method of manufacturing a brake shoe having T cross section, said method comprising stamping out a flat arcuate piece to provide the web member with a plurality of projections on its outer periphery, providing a flat strip of metal for the band member, said strip being provided with a corresponding plurality of openings adapted to receive said projections when the strip is bent, holding the web member, placing the band member on said web member perpendicularly thereto, bending the band member to arcuate form between two die members, and cold riveting the projections in said openings while the band member is so held between said die sections in its arcuate shape into which it is finally brought by said sections for bending.

2. The method defined in claim 1, with the projections having length greater than the thickness of the band member material and the openings provided in the band member being chambered on the outer side thereof.

3. A method of manufacturing a brake shoe having T cross section, said method comprising stamping out an arcuate piece to provide the web member with a plurality of projections on its outer periphery, providing a flat strip of metal for the band member, said strip being provided with a corresponding plurality of openings adapted to receive said projections when the strip is bent, holding the web member, placing the band member on said web member perpendicularly thereto, bending the band member to arcuate form between two die members, and cold riveting the projections in said openings while the band member is so held in its arcuate shape and heating the riveted projections to at least red heat and exerting pressure thereon to spread them in their respective nests provided by the openings in the band member.

References Cited in the file of this patent

UNITED STATES PATENTS

1,792,224	Johnson	Feb. 10, 1931
1,818,090	Peterson	Aug. 11, 1931
1,826,283	Mooers	Oct. 6, 1931
1,864,929	Peterson	June 28, 1932
1,876,140	Gallup	Sept. 6, 1932
1,925,363	Apple	Sept. 3, 1933
2,041,461	Floyd et al.	May 19, 1936
2,076,541	Bowers	Apr. 13, 1937
2,140,727	Williams	Dec. 20, 1938
2,284,485	Farr et al.	May 26, 1942
2,541,253	House	Feb. 13, 1951