Feb. 12, 1935. E. A. NELSON 1,990,746

BRAKE DRUM

Filed March 17, 1931 3 Sheets-Sheet 1

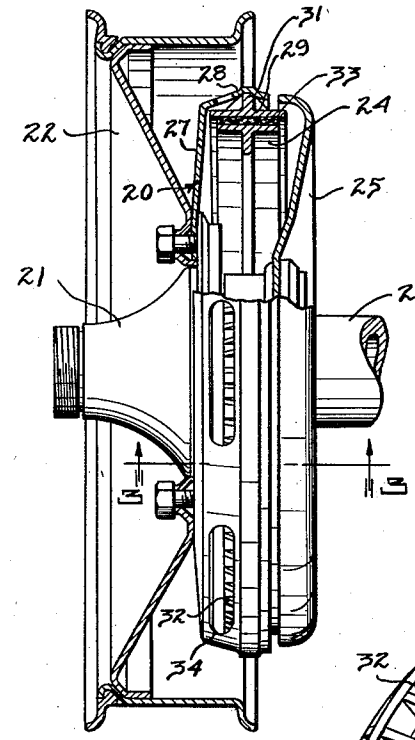


Fig. 1.

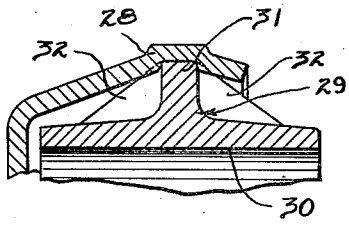
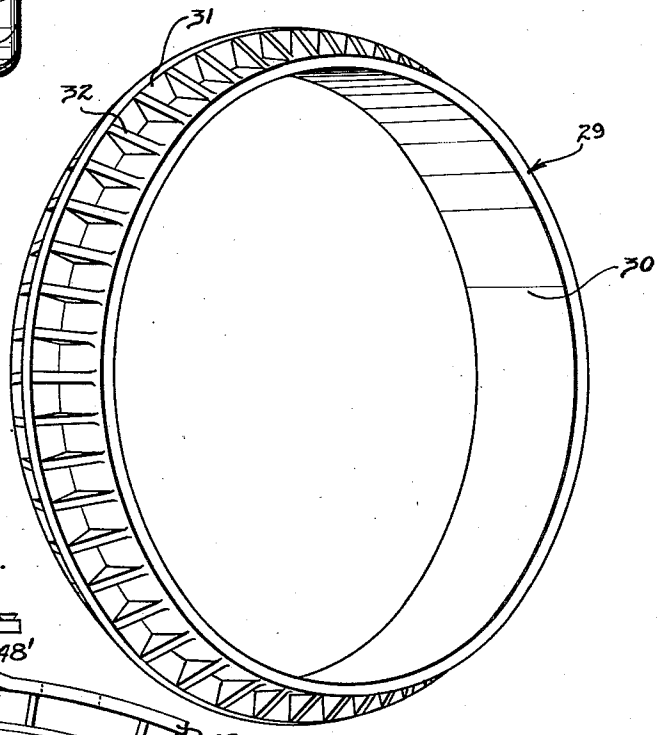


Fig. 3.

Fig. 2.



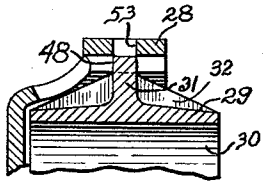


Fig. 1a.

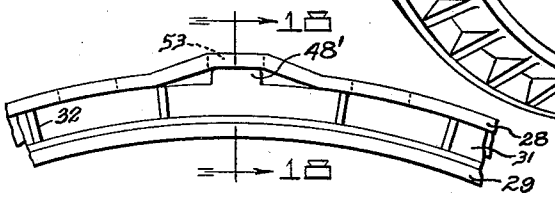


Fig. 1z.

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BRAKE DRUM

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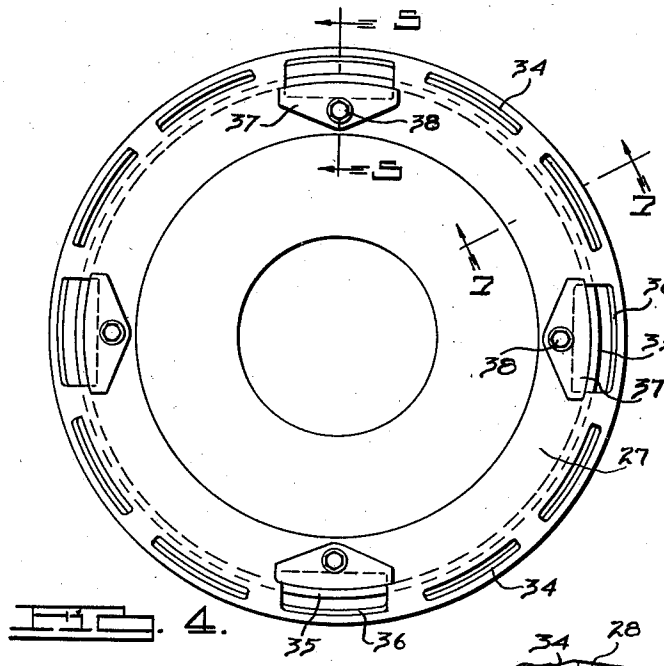


FIG. 4.

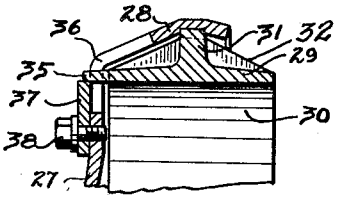


FIG. 5.

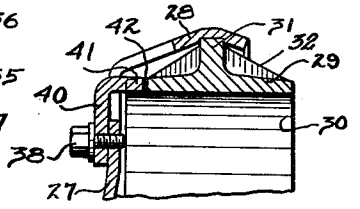


FIG. 6.

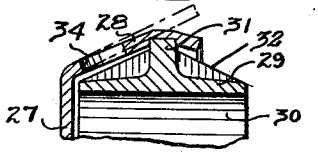


FIG. 7.

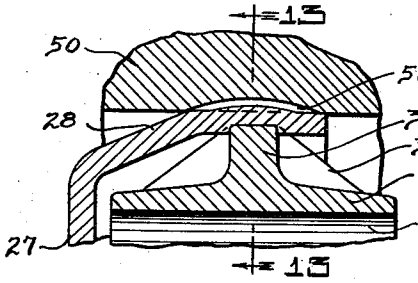


FIG. 12.

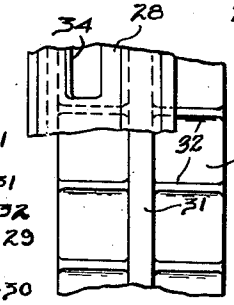


FIG. 10.

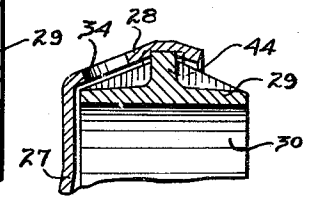


FIG. 8.

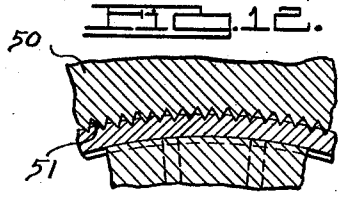


FIG. 13.

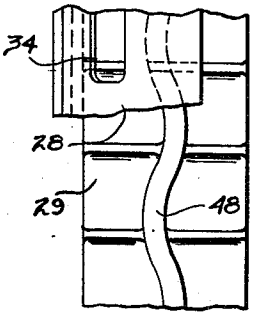


FIG. 11.

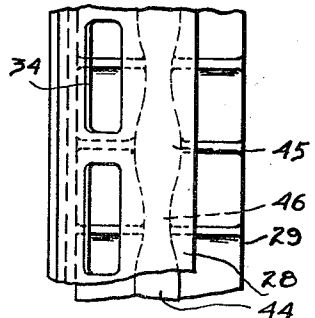


FIG. 9.

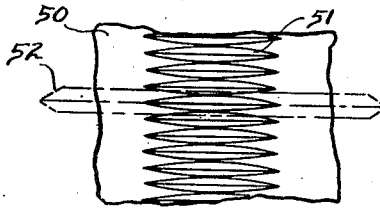


FIG. 14.

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BRAKE DRUM

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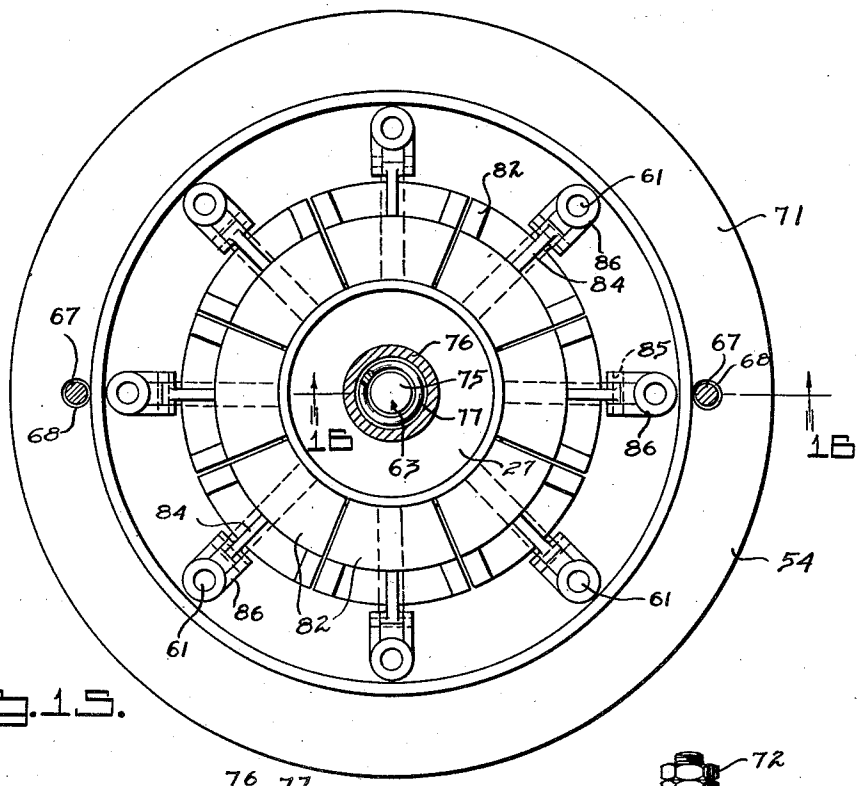


Fig. 1.

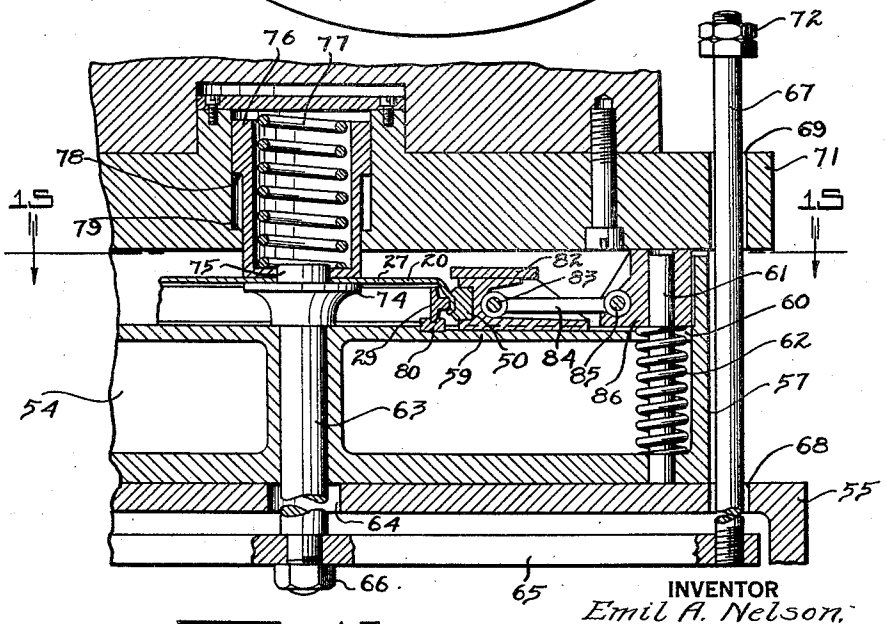


Fig. 1B.

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UNITED STATES PATENT OFFICE

1,990,746

BRAKE DRUM

Emil A. Nelson, Detroit, Mich.

Application March 17, 1931, Serial No. 523,301

14 Claims. (Cl. 188—218)

My invention relates to brake drums and particularly to a brake ring having such cross sectional contour relative to point of support that the bending moment of any point on the braking surface relative thereto, sufficient to effect the lateral deflection or distortion of the surface, is a constant and more particularly to the method of retaining a drum on a supporting member and to means for effecting the retention.

It has been the practice in the past, to employ a drum which comprised a flat supporting portion and a cylindrical flanged portion which constituted the braking surface. The flange was of constant thickness and was supported at one side in the nature of a cantilever suspension, which, under uniform loading, effected a greater deflection at the outer unsupported side. When a brake shoe was expanded against the inner surface of the drum the uniformly distributed pressure caused the flange to bend slightly at its outer end which increased the pressure between the reduced engaging area adjacent to the supporting portion of the drum. This increased pressure increased the heating of the drum and effected the uneven wearing of the brake lining. The heating of the drum effected further distortion of the flange as the side adjacent to the supporting portion of the drum, conducted heat more readily therefrom than the air, which was the only medium available for conducting heat from the outer side thereof. The distortion due to heat further decreased the amount of engagement between the drum and the brake shoe surface and effected an unreliable braking mechanism.

In practicing my invention, I provide a brake drum with a surface of such outer contour and in such relation to the web portion of the drum, that the pressure applied at any point in the surface of the drum is equally distributed thereacross and no lateral distortion of the suface ensues. The heating of the drum, likewise, is prevented from effecting an irregular expansion of the braking surface, because of the uniform conduction of the heat throughout the entire area of the surface, effected by a plurality of webs which interconnect the surface with the supporting portion thereof. The webs are integral with the outer surface of the brake drum for strengthening the drum laterally of its support and for conducting heat from all portions of the brake shoe engaging surface.

The drum is provided with a centrally disposed peripheral flange over which a cylindrical flange of a supporting member is pressed. Means are provided for retaining the flanges against relative rotation, which may be effected by separate members for locking the two flanges together or the flanges themselves may be so shaped as to constitute a locking engagement with each other when pressed into firm fixed relation.

Accordingly, one object of my invention is to provide a brake drum for a rotatable member which shall effect a maximum engagement with a brake shoe surface under all conditions of pressure and temperature.

Another object of my invention is to provide a brake drum of the above mentioned type with a circumferentially disposed flange having webs associated therewith to constitute bracing and heat conducting members between the flange and the braking surface of the drum.

A further object of my invention is to provide a braking ring, of the above mentioned type having a flange portion and heat conducting webs, with a supporting drum which shall engage the flange in such manner as to prevent the warping of the surface in the presence of severe strain and temperature changes and shall retain the flange against rotation thereon.

A still further object of my invention is to provide a machine for uniting a brake ring to a supporting member therefor, by the application of a pressure which crimps the member over the flange of the ring and which forces a portion of the member into clamping engagement with portions of the flange for retaining the member and the ring against relative lateral and rotational movement.

Numerous other objects and features of novelty of my invention will be either specifically pointed out or will become apparent, when referring, for a better understanding of my invention, to the following description in conjunction with the accompanying drawings, wherein:

Figure 1 is a broken view, partly in section and partly in elevation of a vehicle wheel having a brake drum associated therewith which embodies features of my invention.

Fig. 2 is an enlarged prospective view of the brake drum illustrated in Fig. 1,

Fig. 3 is an enlarged broken view of a section of the drum illustrated in Fig. 1 taken along the line 3—3 thereof,

Fig. 4 is a plan view of a brake drum illustrating one method of attaching the two elements

together against lateral and rotational movement,

Fig. 5 is a sectional view of the structure shown in Fig. 4 taken along the line 5—5,

Fig. 6 is a view similar to that shown in Fig. 5 illustrating a modified form of my invention,

Fig. 7 is an enlarged sectional view of the structure shown in Fig. 4 taken along the line 7—7 thereof,

Fig. 8 is a view similar to that of Fig. 7 showing a further modified form of my invention,

Fig. 9 is a broken plan view of the structure shown in Fig. 8,

Fig. 10 is a broken plan view of the structure shown in Fig. 7,

Fig. 11 is a view similar to that of the structure shown in Fig. 10, illustrating a further modified form which my invention may assume,

Fig. 12 is an enlarged view similar to that of the structure shown in Fig. 7, illustrating a still further modified form of my invention,

Fig. 13 is a sectional view of the structure shown in Fig. 12 taken along the line 13—13 thereof,

Fig. 14 is a plan view of a pressing die illustrated in Figs. 12 and 13,

Fig. 15 is a plan view, in section, of a machine for uniting the members of the brake drum illustrated in the above figures, taken along the line 15—15 of Fig. 16,

Fig. 16 is an enlarged broken view of the structure shown in Fig. 15 taken along the line 16—16 thereof,

Fig. 17 is a broken plan view of a further modified form of a brake ring and a supporting member therefor, and

Fig. 18 is a sectional view of the structure shown in Fig. 17 taken on the line 18—18 thereof.

My invention comprises in general a brake drum 20, mounted on a hub 21 of an automobile wheel 22 which is herein shown as being of the disc type. It is to be understood, however, that the mounting of the brake drum 20 is not limited to this specific type of wheel but may be applied to any type of wheel including wire spoked wheels and wheels of the artillery type. The above mentioned portions of the wheel are the rotatable elements, which have associated therewith the stationary elements including an axle housing 23, upon which brake shoes 24 and a guard plate 25 are mounted in fixed relation to each other.

Referring to Fig. 1, I have shown the brake drum 20 as comprising a pressed metal member of drum shape having a web 27 mounted in substantially the vertical plane of the wheel and having a flange 28 provided at substantially right angles to the web which constitutes a supporting member for a brake ring 29. The flange 28 is rigidly connected to the ring 29 by being firmly pressed into engagement with the outer circumferential portion of the ring. The method of attaching the ring 29 to the flange 28 and the means for effecting the attachment will be described fully hereinafter.

The brake ring 29 is shown enlarged in Fig. 2 as comprising an inner brake shoe engaging surface 30 and an outer surface which is provided with an outwardly projecting flange 31 more clearly shown in the enlarged sectional view of Fig. 3. The flange or web 31 is a continuous annular extension about the ring 29 and is herein shown as being provided medially of its width. It is to be understood that two or more annular flanges may be provided on the outer surface of the ring 29 which are similar to the flange 31 and which may be employed in conjunction with each other as a supporting means for the ring.

A plurality of webs 32 are provided between each side of the flange 31 and the outer surface of the ring 29 for the purpose of strengthening the outer edges of the ring and also to provide paths for conducting heat from the outer edges of the shoe engaging surface 30 of the ring. I prefer to mold the ring 29 from cast iron, but it is to be understood that other materials, such as steel may be employed and that under certain conditions a ring 29, similar to that illustrated, may be forged or fabricated from sheet material.

Particular attention is directed to the fact that the webs 32 effect a dual function, that of bracing the outer edges of the surface 30 for preventing the warping of the ring in the presence of heat or uneven application of pressure and also for constituting conducting members for the heat generated on the inner surface 30 of the ring. The heat is conducted uniformly from the surface throughout its periphery which reduces the temperature rise of the ring and effects a uniform expansion both laterally and circumferentially throughout its entire inner surface.

When the ring 29 is rigidly secured to the flange 28 of the web 27, the ring rotates with the wheel 22 in such manner as to be engageable by a brake lining 33 provided on the outer surface of the brake shoe 24. This lining comprises a frictional material which withstands considerable wear and heat and usually is made in the form of an asbestos wire fabric. Suitable mechanism is provided (not shown) which expands the brake shoe 24 to cause the lining 33 thereon to intimately contact with the inner surface 30 of the ring.

In the presence of the centrally disposed engagement between the ring 29 and the flange 28, excess heating or straining, produced by a maximum application of force to the brake shoe, will in no way affect the lateral positioning of the surface 30, which is retained in exact parallel relation to the lining 33, and maximum engagement is thereby effected under all temperatures and pressure conditions existing between the two surfaces. Slots 34 are provided in the flange 28 for permitting the passage of air therethrough during the rotation of the wheel for cooling the brake ring 29 and the shoe 24 to limit the temperature rise therebetween.

It may be noted that, as particularly well disclosed in Fig. 3, the flange 28 of the web 27 is contracted about the outer edge of the flange or web 31 of the ring 30 so as to somewhat interlock with the webs 32. This interlocking engagement between the flange 28 and webs 32 effectively locks the ring 30 against possibility of relative rotation with respect to the web 27.

In Figs. 4 and 5 I have shown a method which may be employed, if desired, for further preventing relative rotation between the flange 28 and the ring 29, particularly where the webs 32 are not provided, and which is effected by extensions 35, four of which are shown provided at the inner edge of the ring 29. The extensions 35 project through slots 36 in the supporting member 27 and are engaged on their under surface by lugs 37 which are supported on the webs 27

by bolts 38. The lugs have an outer engaging surface of arcuate shape conforming to that of the surface 30 of the ring and which engage the projections 35 of the ring to center and retain the ring in rigid relation with the web 27. Axially directed webs corresponding to the webs 32 previously disclosed are shown in this and in the following described modifications, their use being optional in such constructions.

In Fig. 6 I have shown modified lugs 40 which are supported on the web 27 by bolts 38 and which are provided with inwardly extending fingers 41 which register in recesses 42 provided in the ring 29. In this construction, the annular flange 31 of the ring is disposed medial of the bottom of the recesses 42 and the outer surface of the ring to be centrally disposed relative to the portion which is engaged by the brake shoe, it being deemed inadvisable to employ the surface circumferentially adjacent to the fingers 41 as the finger may become bent and project inwardly of the surface 30 and thereby damage the brake lining and the shoe.

In Fig. 7 I have illustrated the method which I employ when assembling the ring 29 on the flange 28, the flange being disposed in angular relation to the web 27 for receiving the web 31 of the ring 29 which, when related thereto in a predetermined manner, is engaged by a press for forcing the flange 29 inwardly on the web 31 as shown in the figure. The press for effecting the bending of the flange 29 will be described hereinafter.

In order to eliminate the lugs 37 and 40 and to directly connnect the ring 29 with the flange 28 in such manner as to prevent their relative rotation, I have illustrated in Figs. 8, 11 and 12, three preferred methods of connection which will now be described. Referring to Figs. 8 and 9 I have illustrated a web 44 projecting upwardly from the ring in a manner similar to the projection of the web 31, with the exception that the width of the web is variable throughout its length having a wide portion 45 which decreases to a narrow portion 46 at a predetermined number of points throughout the periphery of the ring. When the flange 28 is pressed over the web 44, it is crimped downwardly about the wide and narrow portions of the web and the ring 29 is thereby retained on the flange 28 against rotational movement relative thereto.

In Fig. 11 I have shown a web 48 as being of meandering character or of serpentine shape which, when engaged by the flange 28 in the above mentioned manner, will prevent the relative movement of the ring 29 with the flange.

In Fig. 12 I have illustrated a further modified method of retaining the ring on the flange against relative rotational movement by providing a pressing die 50 with a plurality of serrations 51 in the body portion thereof adjacent to the flanges 28 and 31. In Fig. 14 I have shown a cutter 52, in dot and dash lines, that may be employed to cut the serrations in the die surface. The serrations are placed in contiguous relation to each other to effect cutting edges which may extend into the outer material of the flange 28 as shown in Figs. 12 and 13.

The serrations reduce the resistance, offered by the flange 28, to conform to the contour of the upper portion of the web 31 and the webs 32, which are intimately engaged thereby, as shown more clearly in Fig. 12. This same result could be obtained by applying a greater pressure to the flange 28 and since a greater pressure is undesirable, because of the possibility of permanently deforming the ring 29, the serrations effect the same result with a considerable reduction in applied pressure.

In Figs. 17 and 18 I have shown a further modification which my invention may assume for effecting a union between the ring 29 and the supporting flange 28 to prevent relative rotational and lateral movement. A plurality of outwardly extending lugs 48' project from the outer periphery of the web 31 at predetermined intervals thereabout. The lugs register with apertures 53 provided in the body portion of the flange 28 when the latter is forced about the web 31. The apertures may be slightly smaller than the lugs, to have the engagement therebetween effected under stress, to further increase the rigidity of the assembly. In Fig. 17 I have shown the flange 28 as being forced over the two outer lugs and in position to be forced over the center lug. It is to be understood, however, that I prefer to force the flange 28 over all the lugs simultaneously in a manner which will now be explained.

In Figs. 15 and 16, I have illustrated a machine 54 which I employ for pressing the flange 28 into firm fixed relation with the webs 31, 44 and 48 as hereinabove described. The machine comprises a base portion or table 55 upon which a spider 57 is mounted having a brake ring engaging surface 59 provided with a plurality of apertures 60 herein shown as being eight in number. Rods 61 are mounted centrally of the apertures 60 through which a spring 62 extends when encompassing the rod.

A shaft 63 is provided centrally of the spider 57 and is mounted thereon for slidable movement. The shaft extends through a hole 64 in the table 55, the end thereof being shouldered and threaded for the purpose of retaining a cross bar 65 in firm relation thereon by a nut 66. A pair of rods 67 are mounted in fixed relation to the cross bar and extend through apertures 68 and 69 which are respectively located in the table 55 and a heavy ram or pressure applying head 71.

The upper end of the rod 67 is provided with a pair of nuts 72 which are in locked engagement with each other and which are engageable by the ram 71 during its upward movement, to actuate the rod 67 along therewith. The upward movement of the rods 67, moves the shaft 63 upwardly for the purpose of raising the brake drum 20 upwardly therewith away from the work surface 59. The upper end of the shaft 63 is provided with an annular member 74 the lower surface of which rests upon the surface 59 while its upper surface engages the inner surface of the web 27 of the drum.

A boss 75 is provided on the surface 74 centrally thereof which snugly engages the hole through the center of the web 27 to retain the web in central aligned position in the machine. A plunger 76 is provided in the ram 71 and is biased downwardly thereof by a spring 77 a distance which is limited by the engagement of a shoulder 78, of the plunger, with a shoulder 79, provided on the ram.

During the downward movement of the ram 71 the plunger engages the outer surface of the web 27 and extends over the boss 75 to bias the web into firm centered relation with the annular member 74. A member 80 is provided on the surface 59 for receiving and centering the brake ring 29 relative to the web 27.

A bending die 50 is supported on a radially movable head 82 which is pivoted by a pin 83 to a connecting rod 84 which, in turn, is pivoted by a pin 85 to a plunger 86 which is vertically slidable on the rod 61. Each of the rods 61 are provided with a plunger 86, a connecting rod 84, and a reciprocable head 82 which, as will be noted from Fig. 15, are eight in number. It is to be understood however that any number of the die retaining and actuating members may be employed to meet the various requirements due to size and thickness of the flange 27. When the ram 71 is moved upwardly, the plungers 86 are biased upwardly therewith by the springs 62, which movement causes the withdrawal of the members 82 away from the brake drum 20 through the interconnection of the connecting rods 84.

The operation of my machine 54 will now be described. Assume the ram 71 to be in its uppermost position with the shoulder 78 of the plunger 76 engaging the shoulder 79 of the ram and the plungers 86 moved upwardly on the rods 61 through the bias of the springs 62. A ring 29 is placed on member 80 and a supporting member 27 is then inserted over the boss 75 with its inner surface engaging the top surface of the supporting member 74. The ram 71 is then moved downwardly, the plunger 76 engaging the top surface of the member 27 of the drum and forcing it into flat, predetermined position on the member 74. This movement forces the flange 28 into predetermined engagement with the web 31 of the ring which is centered on the member 80.

Further downward movement of the ram 71 causes the undersurface thereof to engage the top surface of the plungers 86 to move them downwardly against the bias of the spring 62. This movement is transferred through the connecting rod 84 to the members 82 to effect their inward radial movement. The inward movement of the members 82 causes the dies 50, mounted in the end thereof, to engage the outer surface of the flange 28 to cause it to be pressed into firm engagement with the webs 31, 44 or 48 in a manner referred to hereinabove.

After the ram 71 has reached the bottom of its stroke, which is that shown in Fig. 16, it is moved upwardly to withdraw the members 82 and the die 50 from contact with the flange 28 and also to withdraw the plunger 76 from contact with the outer surface of the flange 27. Further upward movement, causing the ram 71 to engage the under surface of the nut 72, provided on the rods 67, to thereby raise the cross bar 65 and the shaft 63, to loosen the drum 20 from the surface 59. The drum is then removed from the boss 75 and another assembly mounted thereover and the operation repeated.

It will thus be seen that I have provided a brake drum for a rotating member which is provided with webs whereby heat is conducted uniformly from the entire engageable surface of the drum, which webs are also of benefit for preventing the distortion of the drum surface laterally when the surface is uniformly loaded thereacross. A ring is provided having an upstanding flange on its outer surface which is engaged by a projecting flange from a supporting member the two flanges being provided with a mechanical engagement which retains them in fixed predetermined position relative to each other against lateral or rotational movement. Serrations may be provided on the die for cutting the metal adjacent to the portion to be formed in order that the formation may be accomplished with a minimum amount of pressure. To apply the pressure to the flanges I have provided a machine which is simple in construction, which is positive in operation and which is economical of manufacture.

While I have described and illustrated several embodiments of my invention it will be apparent to those skilled in the art that various changes, omissions, additions and substitutions may be made therein without departing from the spirit and scope of my invention, as set forth in the accompanying claims.

I claim as my invention:

1. A brake ring for a rotatable member provided with at least one annular rib on its outer surface from which a plurality of webs radiate to the edges of said ring.

2. A brake ring for a rotatable member provided with at least one annular flange on its outer surface and a plurality of heat radiating webs connecting said surface and said flange.

3. A ring provided with a braking surface for a rotatable member having at least one web on its outer circumference by means of which said ring is supported to said member and means for bracing the outer edges of said ring to said web.

4. A ring provided with a braking surface for a rotatable member having at least one web on its outer circumference by means of which said ring is supported to said member and means for balancing the heat conductivity both laterally and circumferentially from said braking surface.

5. An annular brake ring which includes an engaging member for a brake shoe having an annular rib on its outer surface and a plurality of bracing webs between said rib and its adjacent outer surface.

6. A brake drum including in combination, a supporting member having a laterally flanged portion, a brake ring having a shoe engaging surface on its inner circumference and a projecting portion on its central outer circumference which is engaged by an outwardly pressed channel in said flange, the remaining outer surface of said brake shoe engaging surface being conductively connected to said flange by means additional to said projecting portion.

7. A brake drum including, in combination, a brake ring provided with a plurality of upstanding lugs on its outer periphery and a flange on a ring-supporting disc provided with recesses for registering with said lugs when said flange is pressed into engagement with said ring.

8. A brake drum including, in combination, a brake ring provided with an upstanding web about its outer periphery, lugs projecting from said web and a flange on a ring-supporting disc provided with recesses for receiving said lugs when said flange is pressed into engagement with said web.

9. A brake drum including a ring, an outwardly extending rib thereon of meandering formation, a disc-like supporting member, and means secured to said supporting member embracing opposite side faces of said rib.

10. A brake drum including a ring, an outwardly extending rib thereon, a side face of said rib deviating from a plane surface, a disc-like supporting member, and laterally extending means connected to said supporting member

embracing said rib and bearing against said side wall to prevent relative rotation between said ring and supporting member.

11. A brake drum including a ring having an outwardly extending rib thereon, the opposite side faces of said rib deviating from a plane surface, a disc-like supporting member, and means embracing said opposite faces and connected to said supporting member for locking said ring and supporting member together for equal rotation.

12. A brake drum including a disc-like supporting member, laterally projecting means on said member, a brake ring, an outwardly extending rib on said ring engaged by said means, and means in addition to and independent of the first mentioned means for locking said ring and member for equal rotation.

13. A brake drum including a disc-like supporting member, a brake ring, means interconnecting said member and ring for maintaining the concentricity thereof, and means independent of the first mentioned means connecting said ring and member for equal rotation with each other.

14. A brake drum including a disc-like supporting member, a brake ring, means interconnecting said member and ring for maintaining the concentricity thereof, and means additional to the first mentioned means removably engaging both said member and ring for causing equal rotation thereof.

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