May 27, 1941. C. L. EKSERGIAN 2,243,334

BRAKE DISK

Filed May 31, 1939

Fig. 2.

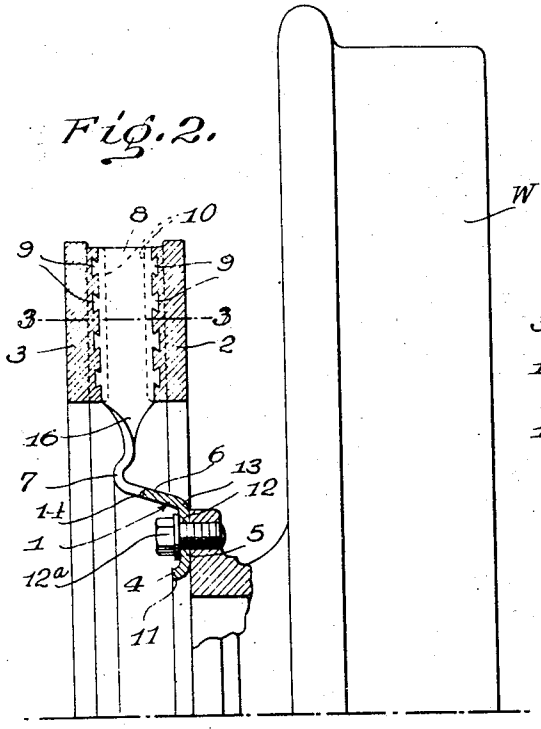


Fig. 3.

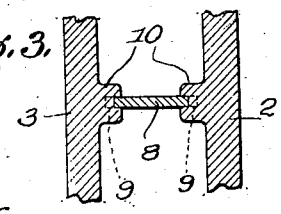
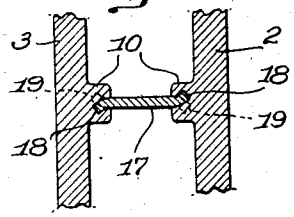


Fig. 6.



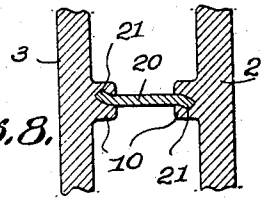


Fig. 8.

Fig. 1.

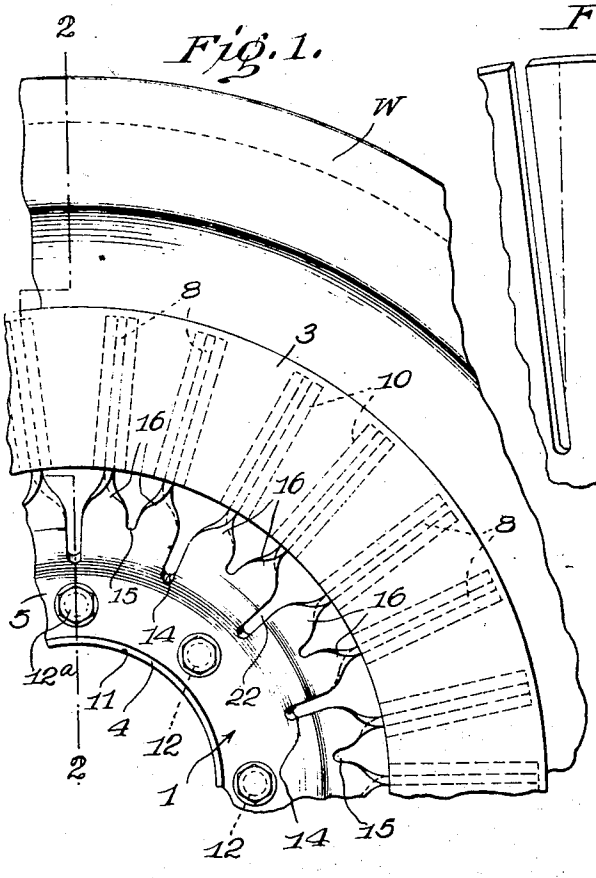


Fig. 4.

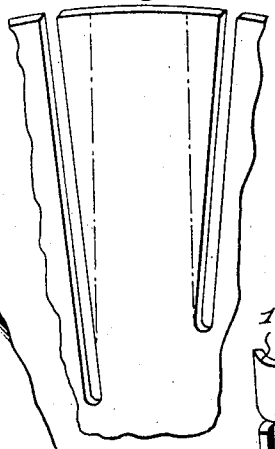
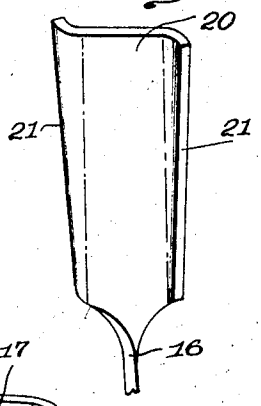


Fig. 7.



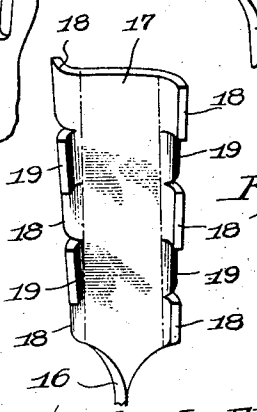


Fig. 5.

INVENTOR

Carolus L. Eksergian

BY John P. Parker

ATTORNEY

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BRAKE DISK

Carolus L. Eksergian, Detroit, Mich., assignor to Budd Wheel Company, Philadelphia, Pa., a corporation of Pennsylvania

Application May 31, 1939, Serial No. 276,577

10 Claims. (Cl. 188—218)

The present invention relates to brakes.

More specifically, it relates to improvements in the structure and manufacture of brake rings suitable for use in connection with brakes of the general type disclosed in copending application Serial No. 159,844 filed August 19, 1937, which issued September 17, 1940 as Patent No. 2,214,762.

An object of the invention is to simplify the structure and making of brake rings by providing all the cooling and strengthening vanes in a single piece of metal, punched or forged into proper shape to be cast into the brake rings so as to constitute a unitary structure therewith.

Preferably, the web portion with the vanes is made of sheet material, which has the necessary characteristics of toughness and elasticity, whereas the friction rings, against which the brake shoes are to be applied, are made of cast metal which has the proper frictional properties to fit it for use as a brake member.

Other objects and features of the invention will be clear from the present specification, disclosing a preferred form of the invention and several modified forms thereof, all of which are illustrated in the accompanying drawing. In said drawing:

Fig. 1 is an elevation of a fragment of a brake ring with its vanes and its supporting web cast thereinto and showing it mounted on a wheel.

Fig. 2 is a radial cross section through the structure shown in Fig. 1, on the plane indicated by the line 2—2;

Fig. 3 is a fragmentary sectional view along the line 3—3 of Fig. 2 to show the manner in which the vanes are secured to the rings;

Fig. 4 is a perspective of a modified sector-shaped vane, before bending up the edges;

Fig. 5 is a perspective of a vane such as that shown in Fig. 4, after the edges are slit to produce tongues, which are alternately bent up and down.

Fig. 6 is a view similar to Fig. 3, but showing the modified form of vane of Fig. 5 which may replace the one with dovetailed sides shown in Figs. 1, 2, and 3;

Fig. 7 is a perspective of a vane such as that shown in Fig. 4, after the respective edges are bent up and down, without slitting, and

Fig. 8 is a view similar to Fig. 3, but showing the Fig. 7 form of vane.

Referring first to Figs. 1, 2, and 3 there is shown a central web 1, here assumed to be made of sheet steel or the like, which has a central opening 11 through which passes the axle and/or hub of the wheel W to which the brake is to be applied. Any suitable number of holes 12 may be provided, preferably in the flat portion 5 of this web, whereby bolts 12a may be accommodated, to secure the web to the wheel or axle.

A sharply curved or flanged inner portion 4 may be provided if desired, to stiffen the central part of the web, around the central hole, 11. The web may also have a further bend as shown at 13, to provide a substantially frusto-conical portion 6, which gives additional stiffness to the web and also imparts a certain degree of resilience thereto.

Beyond this portion 6 the web may again be bent as at 7, so as to extend substantially parallel to the portion 5. The outer part of the web is subdivided into a number of flat parts 8, each of which is bent to occupy a position at right angles to the general plane of the web. Alternate deep and shallow cuts may be made in the web to accomplish this. The deep cuts are shown as terminating at 14, the shallower ones at 15.

A twist is then given to each of the sectors 8 thus produced, as indicated at 16, whereby each sector is turned through substantially a right angle, to occupy the position shown. While these end portions have been called sectors, this term is not strictly correct, in the Fig. 1 form, for the opposite edges of the "sectors" are parallel and preferably provided with dovetails or keys 9 or other locking notched portions, all of this shaping usually being accomplished in the initial punching of the material.

The web with the vanes 8 at its periphery is then placed in a suitable mold and the rings 2 and 3 are cast upon it, so that the notched or otherwise roughened edges will become embedded in the said rings and form an inseparable rigid structure therewith. In order to avoid weakening the rings 2 and 3 at the places where the vanes 8 are embedded in the castings, it is preferred to provide inwardly extending lugs or bosses 10 on the rings 2 and 3, where the vanes are to be secured, and to make the vanes narrow enough to keep them from projecting into the rings proper. In this way a structure is secured which has rings that are free from unduly chilled or weakened spots, which might cause trouble in service due to lack of uniformity, etc.

Any suitable roughening of the edges of the vanes may be used to cause secure interlocking between them and the cast rings, a very simple and effective form being the provision of dovetails or keys on the vanes, such as are shown at 9, in Figure 2.

Other ways of securing the vanes in place by casting are shown in Figs. 6 and 8. In Fig. 6 the vanes 17 have tongues or keys 18 and 19 at their edges, bent alternately to one side and the other, as shown best in Fig. 5, and in this form the vanes 17 are truly sector shaped when punched, there being no need to make them of uniform width. Obviously the successive tongues or keys then will be of varying transverse lengths, but this is immaterial, and a very good bond may thus be obtained between the cast metal and the web, without requiring the removal of any metal from the vanes, thus somewhat simplifying the tool requirements.

The form shown in Fig. 8 is still simpler, and here also the vanes 20 are sector shaped, but have no separate tongues or keys cut in their edges, which are merely bent as a whole, as shown best in Fig. 7 at 21, and finally embedded in the lugs 10 on the rings 2 and 3.

Regardless of the specific structure of the edges of the vanes, in all cases there will be slots 22 in the web 1, and these slots serve to increase the resilience of the web, while at the same time they permit air to flow therethrough, to provide a cooling effect on the brake rings 2, which otherwise would be shielded against the centrifugal air currents produced when the structure rotates in service.

Since the vanes are integral with the web 1, and are rigidly embedded in the cast metal rings 2 and 3, it is obvious that a very simple and rugged structure is attained, which has the proper mechanical properties at its different parts, which are desirable in a brake ring, namely, it has cast metal brake rings, usually cast iron, and a sheet metal web, ordinarily sheet steel, thus providing a good braking surface and a strong, sufficiently resilient supporting web for the same.

The operation of the brake is obvious from its structure. The vanes between the rings 2 and 3 act to support them mechanically and also act as blower-vanes, to produce radial air currents when the whole rotates, in service. These currents aid in disposing of the heat generated in braking. The slots 22 permit air to flow through the web, to assist in the cooling action.

What I claim is:

1. A composite brake disk comprising a central web of wrought metal having vanes integral therewith and extending at an angle to the general direction of the said web, and a cast metal ring having a generally radially extending braking face, said ring being cast around the adjacent lateral margins of said vanes to form a unitary structure therewith.

2. A composite brake disk comprising a central web of wrought metal having a series of vanes integrally formed at its periphery and extending at an angle to the general plane of the web, and two spaced cast metal rings having generally radially extending braking faces, one ring on each of the opposite sides of the series of vanes, said rings being rigidly cast around the margins of the said vanes.

3. A composite brake assembly comprising a sheet metal disk having a series of vanes at its periphery, integral with the disk, and extending at an angle to the general plane of the disk, said vanes being of substantially uniform width throughout their lengths, and two annular metal brake rings having generally radially extending braking faces, said rings being cast upon the lateral edges of the series of vanes so as to embed them, thus causing the vanes and the rings mutually to support one another, whereby the rings are held rigidly at a substantially uniform spacing from one another.

4. A brake disk as defined in claim 2, wherein there are apertures in the intermediate portion of the web, to afford passages for the flow of cooling air.

5. A composite brake disk comprising a central sheet metal portion carrying integral vanes at its periphery and a cast metal ring having a substantially radially extending braking surface, wherein the edges of such vanes are embedded, said edges being provided with keys and the ring being thickened in the region embedding the edges of the vanes to improve the strength of the resulting joint and to avoid chill hardening of the braking surface in said regions.

6. A composite brake disk of the kind defined in claim 5, wherein the keys are dovetail shaped.

7. A composite brake disk of the kind defined in claim 5 wherein the keys comprise portions of the vanes bent at an angle to the general plane thereof.

8. A composite brake disk of the kind defined in claim 5 wherein the keys comprise edge portions of the vanes bent in several different directions with respect to the general planes of the vanes.

9. A composite brake disk consisting of a central sheet metal web having radial slots therein extending toward its periphery and subdividing the said web into a series of separate substantially sector-shaped portions, certain of said portions being twisted to cause them to assume positions substantially at right angles to the plane of the web, and to leave openings therebetween, and a brake ring secured by, and securing, the said portions rigidly in place, said ring leaving at least a substantial portion of each opening unobstructed.

10. A composite brake disk comprising a central web of wrought metal having vanes integral therewith and extending at an angle to the general plane of said web, two substantially parallel spaced cast iron rings carried on opposite edges of said vanes, at least some of the vanes having their edges embedded in thickened portions of the rings, whereby the vanes support the rings in spaced relationship and define with the rings radially extending air flow ducts between the rings.

CAROLUS L. EKSERGIAN.