Nov. 28, 1939. F. H. LE JEUNE ET AL 2,181,848

METHOD OF FORMING DROP CENTER WHEEL RIMS

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FIG.1.

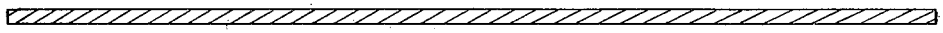


FIG.2.

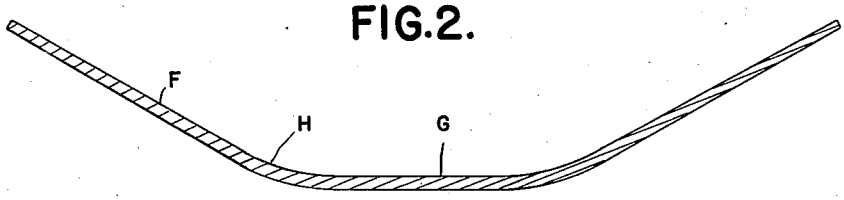


FIG.3.

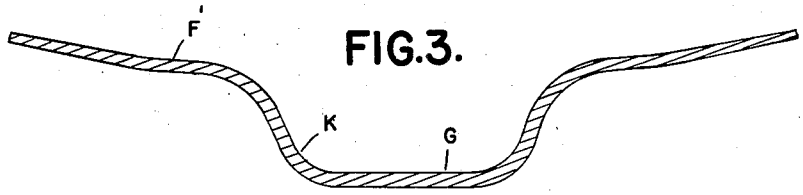


FIG.4.

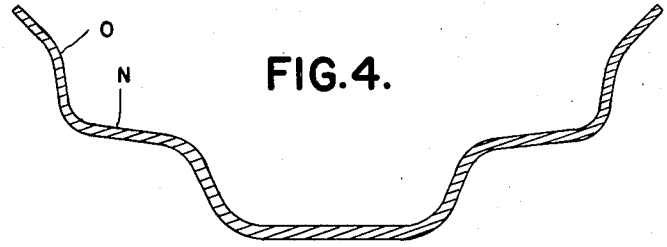
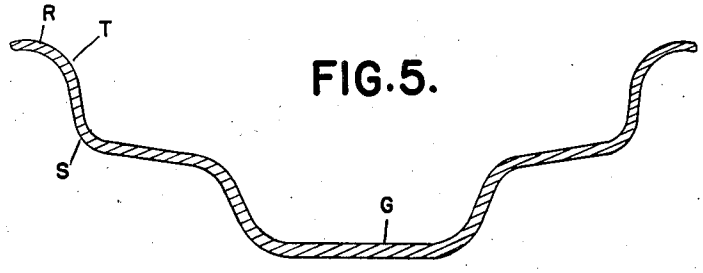


FIG.5.



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METHOD OF FORMING DROP CENTER WHEEL RIMS

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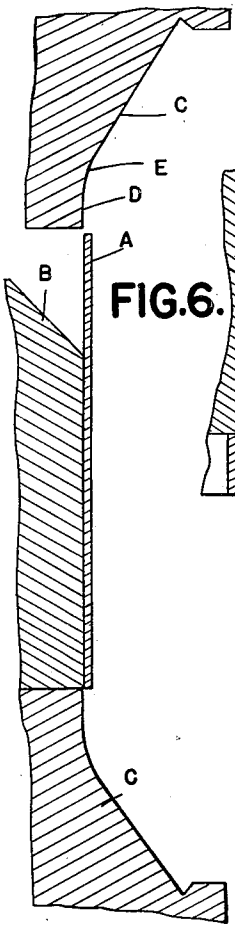


FIG.6.

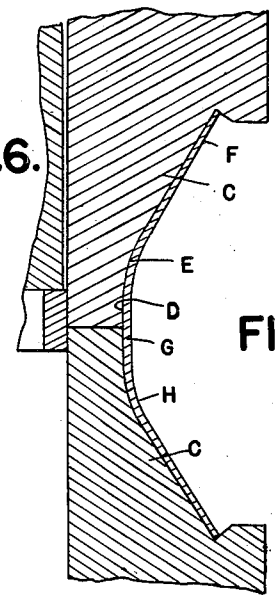


FIG.7.

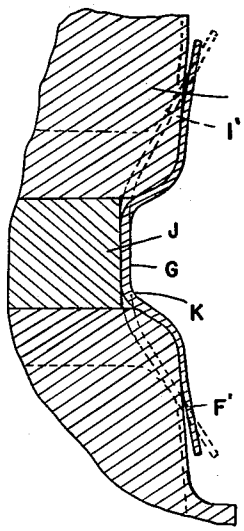


FIG.8.

FIG.9.

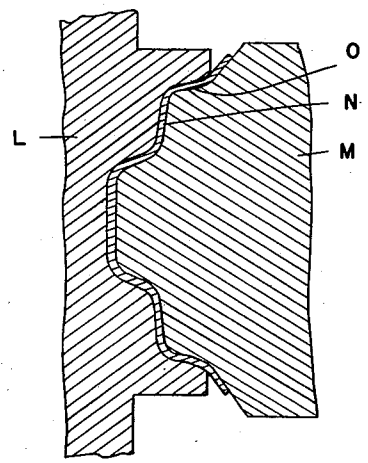
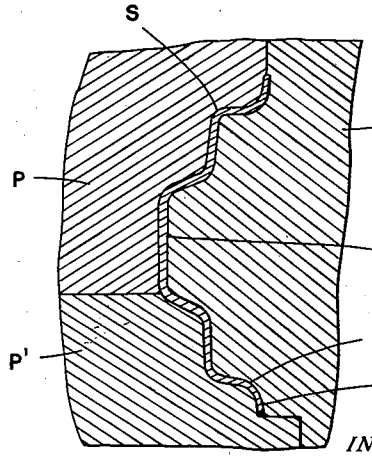


FIG.10.



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METHOD OF FORMING DROP-CENTER WHEEL RIMS

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Application August 3, 1936, Serial No. 94,082

3 Claims. (Cl. 29—159.1)

The invention relates to the manufacture of tire engaging rims of that type known as "drop-center" rims and comprising a radially inwardly extending well between the bead seats and radially outwardly extending flanges at the outer ends of said seats. It is one of the objects of the invention to obtain a construction having maximum strength with minimum weight. It is a further object to facilitate and expedite manufacture. With these objects in view, the invention consists in the method as hereinafter set forth.

In the drawings:

Figure 1 is a cross section through the cylindrical hoop from which the rim is to be formed;

Figures 2, 3, 4 and 5 are similar views showing the successive steps in the forming of the rim;

Figure 6 shows a portion of the dies for performing the first and second operations;

Figure 7 is a similar view after the completion of the second operation;

Figure 8 is a similar view showing the dies for the third operation, indicating in full lines the completion of this operation and in dotted lines the position for initial engagement;

Figures 9 and 10 are sections through the rolls for respectively forming the fourth and fifth operations.

The usual method of forming tire rims is to first bend a strip of metal into a cylindrical hoop form welding the ends together and then to refashion the hoop by rolling or pressing. During this refashioning, certain portions of the metal are thinned to a greater extent than other portions, this being particularly true at the bends between portions that extend in transverse planes. Thus the strength of the structure is impaired and the weight is greater than necessary.

It may be assumed that the portions of the hoop which are expanded in diameter would be proportionately thinner than the portions not so expanded. This is not necessarily true for the thinning of the metal is dependent also upon the direction in which the pressure is applied thereto. Thus as previously described, the corners between portions of the rim that extend transversely to each other are usually thinner than said portions.

With our improved method of fashioning the rim, the pressures applied thereto are so directed as to result in a gradual tapering of the cross section from the base of the well to the outer ends of the flanges. The method is also one in which each of the successive steps can be quickly performed with a considerable increase in output in a given period of time over methods heretofore used.

The cylindrical hoop A is formed in the usual manner by bending a strip of metal of uniform gauge and welding its opposite ends to each other. The average diameter of the hoop thus formed is substantially that of the bottom of the well or drop-center portion of the completed rim. However, the original hoop is seldom of true circular form. Thus the first operation as shown in Figure 6 is to sleeve the hoop A over a chuck B and to expand the chuck to circularize the hoop. The second operation shown in Figures 6 and 7 is to flare the end portions of the hoop so as to progressively expand the diameter thereof and to correspondingly decrease the thickness. We have found that this operation is best performed by conical dies C having a substantially straight line flare with a cylindrical nose portion D for entering the end of the hoop and an arcuate portion E connecting said cylindrical portion and flaring portion and tangent thereto. Such a die when pressed into the end of the hoop will produce a uniformly tapered cross section in the expanded portion, as indicated at F, Figure 2, and without any tendency to continue to curl, as is the case where the expansion is performed by an arcuate die. Also, where the angle of the cone is less than 45 degrees to the axis, there will be little tendency to produce any upsetting action. Thus the result of this second operation is to form a hoop of the cross section shown in Figure 2 having a substantially cylindrical central portion G, the tapering portion F and the tangent curve H connecting these portions.

The third step of the process as shown in Figure 8 is to change the angle of the inner part of the flared portion so as to form the side of the well or drop-center of the rim. This is accomplished by an axial movement of the die members I which initially bear upon the flared portions in zones intermediate the ends thereof, as indicated in dotted lines at I', Figure 8, and at a radial distance outward from the base or cylindrical portion corresponding to the height of the side of the well. Due to the relatively small angle of the original flare, the length of the portion between the base and point of initial bearing of the die is considerably greater than the length of the side of the well. Consequently, during the inward movement of the die, it will slide along the surface of the metal as the angle is gradually changed, so that the friction will produce a slight tendency towards upsetting the

metal rather than to draw and thin the same. However, this effect is not sufficient to produce any material change in gauge. During this operation the width of the hoop is reduced by the movement of the opposite end portion thereof towards the center. Also, the change in the angle of the inner portion of the flare will draw the outer portion thereof slightly inward in a radial direction, but not down to the diameter of the bead seats. It is important to hold the central portion of the hoop against any radially inward movement during the performance of this third operation, which is accomplished by a chuck J. Thus the result of the third operation is to form the structure shown in Figure 3 having the cylindrical central portion G, the same as in Figure 2, the sides K of the well and the flaring end portions F'.

Where sheet metal is formed solely by the pressure of dies, as in the steps previously described there is always a tendency for the metal to spring back slightly, due to its inherent resiliency. We, therefore, preferably complete the forming of the rim by rolling operations which will fashion it to the desired form with less tendency towards springing out of shape. These operations are illustrated in Figures 9 and 10. In Figure 9 a female roll L and a male roll M engage the rim to form the bead seats N and the flanges O as shown in Figure 4. In Figure 10 the flanges O are further fashioned by female rolls P, P' and a male roll Q to form the outwardly curved portions R, as shown in Figure 5. The object of forming the flange by the two rolling operations instead of the one, is to avoid any drawing or thinning of the metal which might occur in the bends S and T when formed by a single operation. Thus in the operation illustrated in Figure 9, the metal is free to move inward during the forming of the curve S and in the operation illustrated in Figure 10 the curve T is formed without any drawing or thinning action.

The final form of the rim is of the cross section shown in Figure 5 and it will be noted that the thickness of the metal is greatest in the cylindrical portion G and gradually tapers in thickness from this point to the outer ends of the flanges. This is precisely the form that is required to secure the greatest strength with the least weight.

What we claim as our invention is:

1. In a method of forming drop-center wheel rims, the steps of forming a hoop of a diameter substantially corresponding to the base of the well of the rim, expanding in diameter and progressively reducing in thickness portions on opposite sides of that portion for forming the well base to produce substantially straight line flares extending substantially from the last-mentioned portion to the edges of the portions being expanded while the latter portions are free from any external constraint, maintaining the diameter of the portion for forming the well base and while the diameter is being maintained, applying pressure in an axially inward and radially outward direction to the flared portions in zones intermediate the outer and inner ends thereof to move the same axially inward and radially outward while the flared portions are free from any external constraint, thereby forming the sides of the well and subsequently refashioning the portions beyond the sides of the well to form the bead seats and flanges.

2. In a method of forming drop-center wheel rims the steps of forming a hoop of a diameter substantially corresponding to the base of the well of the rim, expanding in diameter and progressively reducing in thickness portions on opposite sides of that portion for forming the well base to produce substantially straight line flares extending substantially from the last-mentioned portion to the edges of the portions being expanded, maintaining the diameter of the portion for forming the well base and while the diameter is being maintained, applying pressure in an axially inward and radially outward direction to the flared portions in zones intermediate the outer and inner ends thereof to move the same axially inward and radially outward while the flared portions are free from any external constraint, thereby forming the sides of the well, and subsequently refashioning the portions beyond the sides of the well to form the bead seats and flanges.

3. In a method of forming drop-center wheel rims, the steps of forming a hoop of a diameter substantially corresponding to the base of the well of the rim, applying pressure simultaneously throughout the circumferential extent of each portion at each side of that portion for forming the well base to expand in diameter and progressively reduce in thickness each side portion and produce substantially a straight-line flare extending substantially from the portion for forming the well base to the edge of each side portion being expanded, maintaining the diameter of the portion for forming the well base, and while the diameter is being maintained applying pressure in an axially inward and radially outward direction to each flared portion simultaneously throughout its circumferential extent in a zone intermediate the outer and inner ends thereof to move the same axially inward and radially outward while each flared portion is free from any external constraint thereby forming the sides of the well and subsequently refashioning the portions beyond the sides of the well to form the bead seats and flanges.

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