METHOD OF PRODUCING SPECIAL WHEEL RIMS

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Filed: June 28, 1974

Appl. No.: 484,157

Foreign Application Priority Data
Aug. 28, 1973 Germany 2343247

U.S. Cl. 72/84; 29/159.1

Int. Cl. B21D 53/30

Field of Search 72/82, 84, 29/159.1; 301/10 R

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ABSTRACT

The present invention relates to a method of producing special wheel rims of the slant shoulder type for trucks, said rims having an erected wheel flange joining the slant shoulder of the rim on the one side, and a recessed spring ring groove on the other side of the rim, from a sheet metal shell blank, whereby the wheel flange is expanded by a spinning operation and the spring ring groove on the other side is recessed by a spinning operation followed by an erection or raising of the edge.

4 Claims, 5 Drawing Figures
METHOD OF PRODUCING SPECIAL WHEEL RIMS

It is already known (German patent application 2,053,005 laid open to public inspection) to expand in a sheet metal shell blank welded into a cylindrical configuration, the wheel flange by means of a spinning operation and then to form initially the spring ring groove by a spinning operation on the other side and thereafter to raise the edge thereof. However, it is of disadvantage in this known rim that, although it may be formed by a pure shaping process on a spinning machine, a profile of optimum strength or of lowest weight, respectively, of the special rim cannot be obtained. On the contrary, the material is reduced in the region of the spring ring groove although the maximum stress is applied to this portion, while, on the other hand, the base of the rim is provided with the greatest wall thickness although the load is minimum at this place.

Further, it is known (German Patent 1,152,086) first to form, by starting from cylindrical sheet metal rings, an axially shortened cross-sectional structure of the rim from a sheet metal ring of a corresponding width, then to reduce the wall thickness of this profile in the area of the base of the rim in axial direction by means of a known per se stretch drawing operation, and at the same time to bring this profile to its final axial dimensions. However, it is of disadvantage in this known method that, although the wall thickness of the base of the rim can be stretched or drawn to the desired degree, the wheel flange is automatically held at a greater wall thickness than that of the spring ring groove such that there is thus still present a substantial amount of excess material. Further, it is disadvantageous in the known method that the width of the complete special rim cannot be adjusted precisely because thickness tolerances in the sheet metal exhibit themselves as longitudinal tolerances in a more than proportional manner during the stretching or drawing of the final profile, which tolerances affect the nominal width of opening of the special rim. Considered on the whole, therefore, the conventional method according to the abovementioned German patent does not allow to produce neither a special rim having an exactly defined width, nor a special rim wherein optimum use is made of the material. In contrast herewith, it is the object of the present invention to avoid the abovementioned disadvantages and that of the prior art and to provide a method for the production of special rims of the slant shoulder type, which method in a most economical manner and with the use of known spinning and stretch spinning machines allows to produce special rims of the slant shoulder type with minimum weight and by making use of the material in an optimum manner, in which special rims the material is reduced to such a degree that identical maximum allowable stresses are obtained and made use of over the full area of the rim.

In a manner being surprising to the expert, it has been found that the method according to the invention provides a reduction of weight in the order of from 20 to 30%, although the conventional methods have been known for a long time and considered as not capable of being improved any further.

Due to their low weight, the special rims produced in accordance with the present method allow to reduce the weight of the unsuspended masses and, thus, they provide an improvement of the running qualities of trucks.

The above-mentioned object is solved by the provision of a special rim of the slant shoulder type having an optimum profile of the wall thickness, namely with the provision of a profile of equal strength and, therefore, of minimum weight. Further, due to reduced quantity of high-quality material employed, the novel special rims can be produced in a particularly economical fashion.

In accordance with the method as outlined at the beginning, the object of the invention is solved by first recessing the spring ring groove, then stretching or drawing the blank to its desired wall thickness, and thereafter expanding the wheel flange.

Advantageously, during the stretching operation of the blank there may be formed a recess as a support for the spring ring adjacent the spring ring groove by means of a spinning operation, and in order to define a slant shoulder in front of the wheel flange, the stretching of the blank can be performed in a pair of roll passes, whereby in the course of the second pass the slant shoulder is formed in front of the wheel flange.

Advantageously, during the stretching operation of the blank a total of the reduction of the wall thickness of more than 20% can be realized.

In the following an exemplary embodiment of the present invention is described in greater detail by referring to the accompanying drawings, wherein:

FIG. 1 is a sectional view of a cylindrical sheet metal shell forming the blank;

FIG. 2 is a view of the sheet metal blank with the spring ring groove formed therein;

FIG. 3 is a view of the workpiece of FIG. 2 having a recess as a support for the spring ring formed therein and with the sheet metal shell being stretched;

FIG. 4 shows the rim body as stretched in the course of a second roll pass after the formation of the slant shoulder; and

FIG. 5 shows the final special rim of the slant shoulder type with the wheel flange erected.

In general, the method according to the invention is based upon the measure of starting from a material having a thickness which is greater by about 15% than the desired minimum wall thickness in the base of the spring ring groove. Then, in a first step the spring ring groove is formed, which operation results in a reduction of the wall thickness of about 15% in the base of the spring ring groove which is subjected to the greatest load, such that the desired wall thickness is set at this point of the special rim. The recessing of the spring ring groove per se corresponds to a spinning operation which is described in greater detail in the abovementioned German patent application 2,053,005 laid open to public inspection. In a further step of operation, a recess as a support for the spring ring is formed adjacent the spring ring groove by a spinning step, whereupon, in a further roll pass, the sheet metal blank is reduced or stretched on the whole, whereby a thickness reduction of more than 15% is obtained since the wheel flange which is subsequently formed from the material after this stretching operation, is intended to have a thickness smaller than that of the base of the spring ring groove as the bending stress of the wheel flange is lower than the stress, produced in the sharply curved spring ring groove.

Then, in a third step of operation the region of the blank which finally forms the base of the rim, is further stretched to the desired dimension while providing optimum strength, whereby such stretching operation in
front of the final wheel flange terminates in an inclined surface of 5° of inclination corresponding to the configuration of a slant shoulder. This transition can be easily provided for by a corresponding retraction of the spinning rolls during the stretching operation.

Thereafter, in a final step of operation the wheel flange is raised or erected. Such erection of the wheel flange has been described in greater detail e.g. in the periodical "Blech", No. 1, volume 1962, page 11, so that it need not be explained any further.

Apparently, in any case the second step of operation of the stretching of the sheet metal blank after the effected bending up within the spring ring groove may be performed along with the third step of operation of the reduction of the rim base and the formation of the slant shoulder with a single chucking step of the workpiece. However, for the bending up of the wheel flange, the workpiece must then be clamped in an external chuck.

However, the first step of operation in which the spring ring groove is formed in the rim, need not necessarily be conducted during the same chucking period as the second and third steps of operation.

Evidently, the method according to the invention actually provides the possibility of producing a special rim having wall thicknesses which may be adjusted as desired at every position thereof, whereby such wall thickness is at a maximum at the points where the highest stresses are applied and whereby the thickness of these wall portions may be adjusted in consideration of the stresses present by including the impact (notch) stresses. Hereby, the greatest wall thickness is obtained in the area of the base of the spring ring groove, while the next greatest wall thickness is obtained in the wheel flange and the minimum wall thickness occurs in the region of the base of the rim.

Furthermore, it is of particular advantage that any irregularities in the starting material merely tend to vary the length of the flange which, in turn, can be adjusted in the desired way by a finishing operation. In any case, the irregularities in the starting material may be left out of consideration for the final weight and for the strength characteristics of the special rim, because such irregularities are automatically compensated for in the method according to the invention. Even if the length of the wheel flange is not trimmed, there do not arise any disadvantages because the minor variations of weight occur in the length of the flange which is of no importance to the function. Accordingly, the economical advantages of the present method, in a manner being surprising to the expert, do not only reside in the fact that improved special rims of the slant shoulder type may be produced, but also in the fact that a substantially lesser quantity of material is required, whereas, additionally, the material employed may show greater tolerances of dimension as compared with the known prior art. Thus, on the whole, the method according to the invention can be attributed a surprising technical advance.

What we claim is:

1. A spinning process for making a special wheel rim from a metal cylindrical blank, said wheel rim having a recessed spring ring groove on one side, a central rim section, a slant shoulder and a raised wheel flange on the other side, said method comprising the steps of: spin forming a spring ring groove on one side of the metal blank to reduce the thickness of said initial metal blank and to form said groove with a predetermined wall thickness and with its final wheel spring groove shape, stretch drawing the remainder of the blank to reduce its cross-sectional thickness from said predetermined wall thickness and to extend the axial length of the remainder of said blank, spin drawing a slant shoulder on the other side of the blank, and spin forming the other side of the stretched metal blank radially outwardly to form the raised wheel flange having a wall thickness less than said predetermined wall thickness for the spring ring groove.

2. A method in accordance with claim 1 including the further step of: spin forming a recess adjacent the spring ring groove during the step of stretch drawing the remainder of the blank.

3. A method in accordance with claim 1 in which the step of stretch drawing includes a first stretch drawing pass and a second pass during which the slant shoulder also is formed.

4. A method in accordance with claim 3 in which the step of reducing the cross-sectional thickness of the wall of the metal blank includes a wall thickness reduction of more than 20% by the spin drawing passes.