July 26, 1932. B. BRONSON ET AL 1,869,334

METHOD OF MAKING STEERING WHEELS

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Fig. 1.

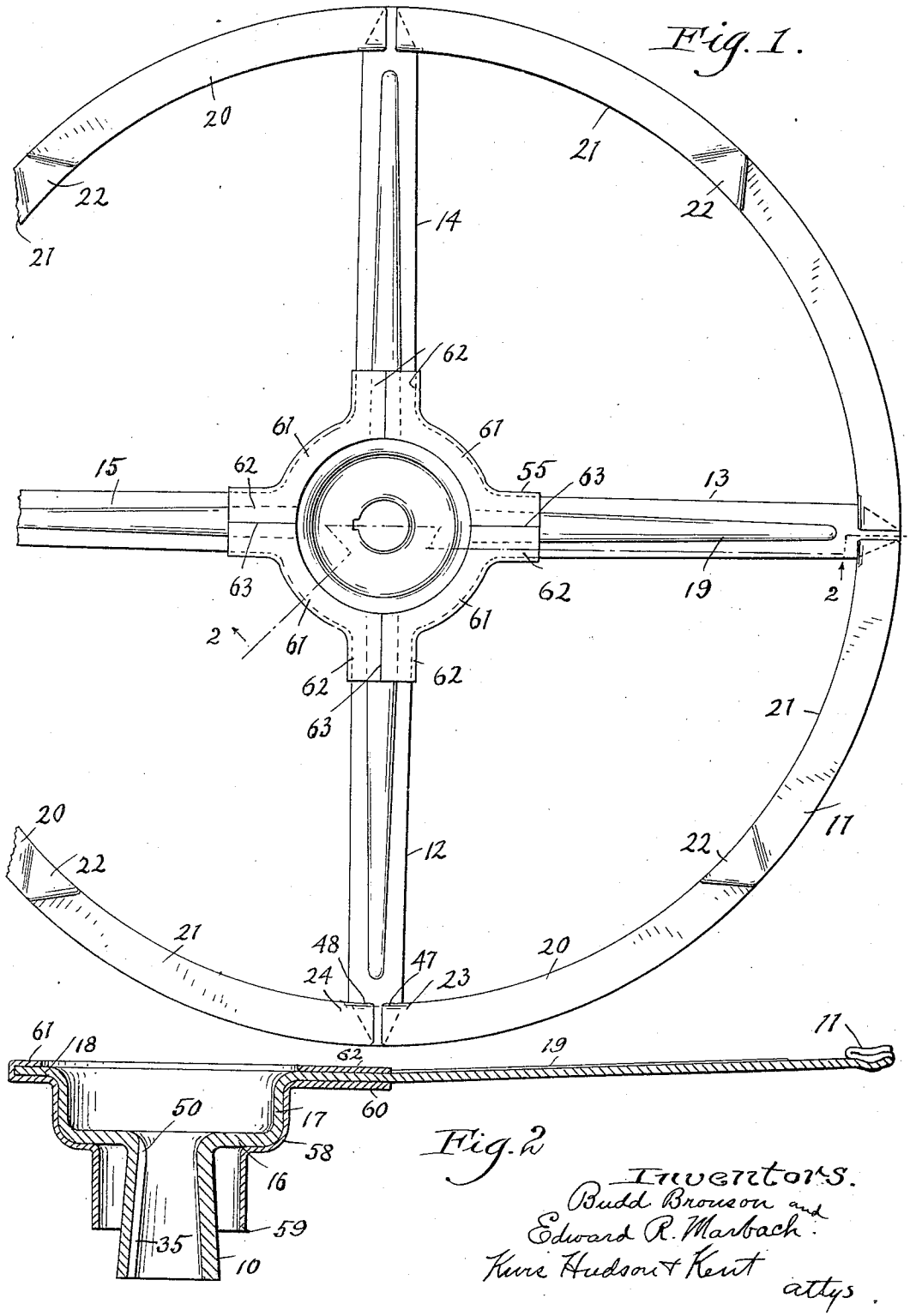

Fig. 2

Inventors.
Budd Bronson and
Edward R. Marbach.
Kerr Hudson & Kent
attys.

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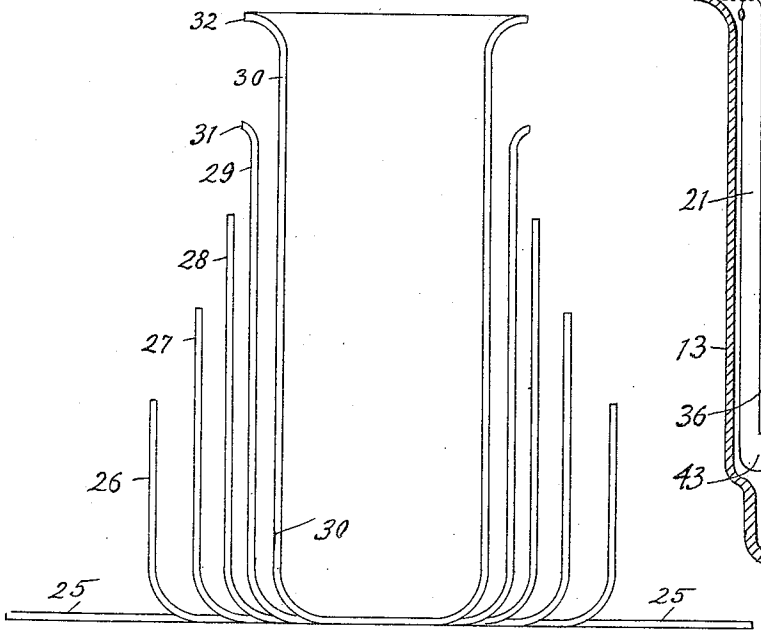

Fig. 3.

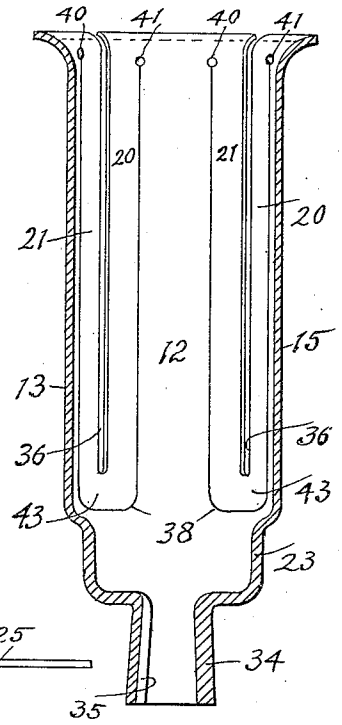

Fig. 4.

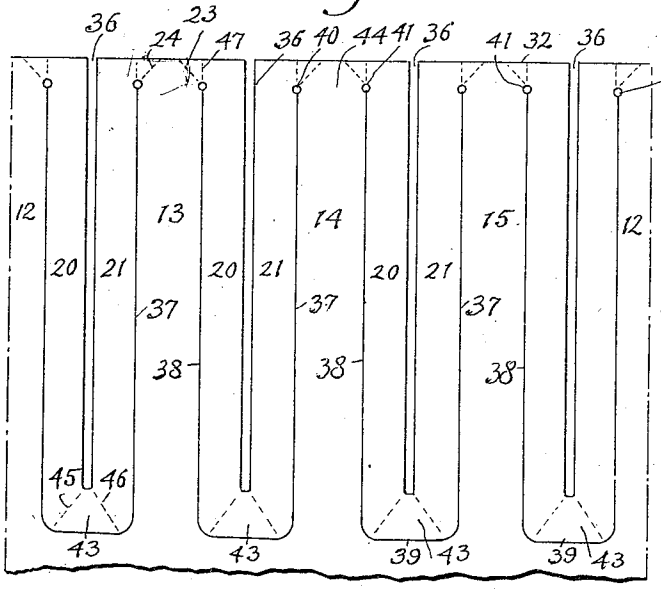

Fig. 6.

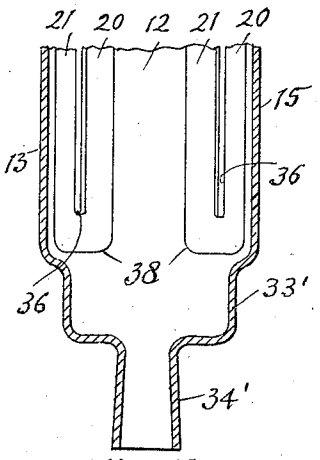

Fig. 5.

Inventors.
Budd Bronson and
Edward H. Marbach.
Kerr Hudson & Kent attys

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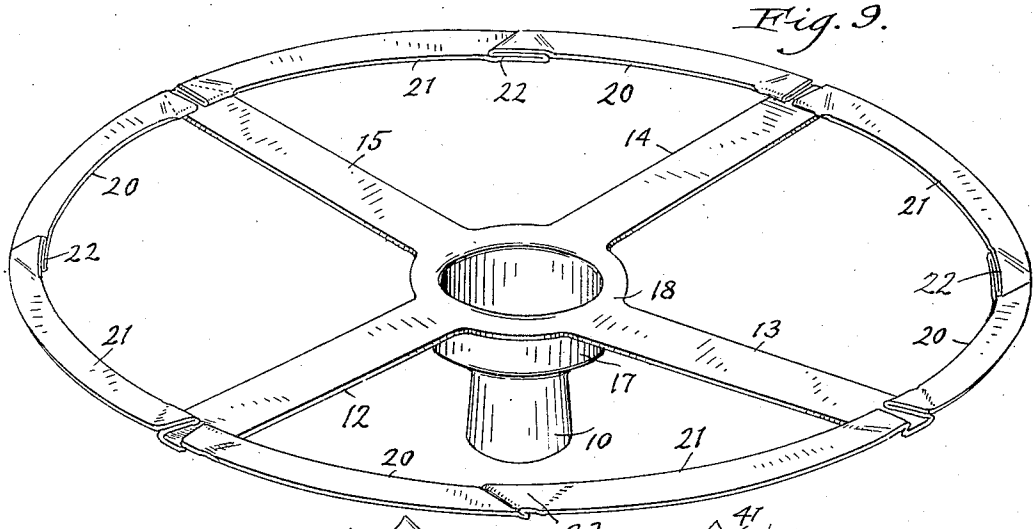
Fig. 9.



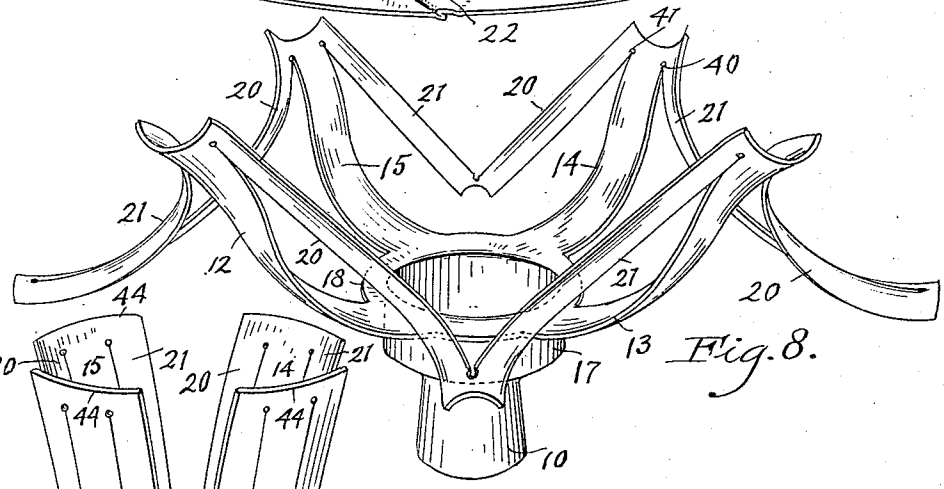


Fig. 8.

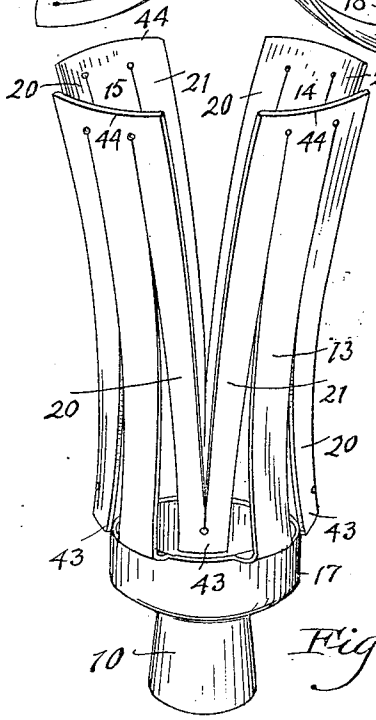


Fig. 7.

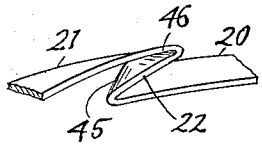


Fig. 10.

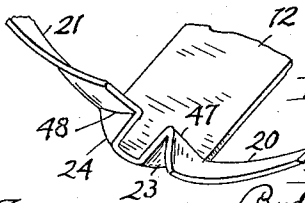


Fig. 11.

Inventors.
Budd Bronson and
Edward R. Marbach
Kerr Hudson & Kent
attys.

Patented July 26, 1932 1,869,334

UNITED STATES PATENT OFFICE

BUDD BRONSON AND EDWARD R. MARBACH, OF CLEVELAND, OHIO, ASSIGNORS TO THE OHIO RUBBER COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO

METHOD OF MAKING STEERING WHEELS

Application filed March 18, 1930. Serial No. 436,717.

This invention relates to steering wheels and more particularly to the type comprising a metal insert having a hub, spokes and rim, in which the greater part of the metal insert is covered with plastic composition, preferably rubber.

It is an object of the present invention to provide a method of constructing the sheet metal insert from a tubular blank so that the hub, spokes and rim are respectively integral with each other.

It is another object of the invention to provide an insert of this character which may be constructed from a tubular sheet metal blank without leaving substantially any scrap metal.

Further objects are to provide an insert and methods of constructing the same whereby the insert will be simple and economical in construction, having adequate strength and otherwise well adapted for the purposes set forth.

Other objects and features of novelty will be apparent as the following description proceeds, as taken in conjunction with the accompanying drawings in which

Figure 1 is a plan view of the completed insert for the steering wheel according to the preferred embodiment of the present invention.

Fig. 2 is a vertical section taken along the line 2—2 of Fig. 1.

Fig. 3 is a diagrammatic view illustrating the steps in the method of forming a sheet metal blank into a cup-like or tubular form.

Fig. 4 is a section through the blank, after the same has been upset and cut so that it may be expanded to form the insert.

Fig. 5 is a partial view similar to Fig. 4, but showing a modified construction for the lower portion thereof.

Fig. 6 is a development of the surface of the tubular member shown in Fig. 4.

Fig. 7 is a perspective view of the blank shown in Fig. 4, after the spoke and rim portions have been spread or expanded.

Fig. 8 is a perspective view of the structure shown in Fig. 7 showing still further expansion of the parts.

Fig. 9 is a perspective view of the completed insert formed from the tubular blank.

Fig. 10 is a detail perspective view showing the folding of the metal at the mid-point of the rim, and

Fig. 11 is a similar view showing the folding of the metal at the junction of the rim and spokes.

Referring more particularly to the drawings, the insert comprises a hub 10, a rim 11 and spokes 12, 13, 14 and 15, four being shown, but a greater or lesser number may be provided if desired. Between the hub and spokes a cup-like portion is provided, comprising a disc-like bottom portion 16 and a cylindrical side wall 17. An annular flange 18 projects radially from the upper edge of the portion 17, forming a strengthening web extending between the spokes. The spokes are further strengthened by forming a groove 19 extending longitudinally thereof, and it is obvious that any other corrugation may be employed and that the rim 11 may be similarly treated to strengthen the same.

While the rim 11 is a single continuous integral member, it comprises a plurality of rim portions 20, projecting in one direction from the end of each of the spokes, and a series of rim portions 21, projecting in the opposite direction from the ends of each of the spokes. The metal of the rim is doubly folded about a portion 22, at the mid-point of the rim section between adjacent spokes, and at the junction of the portions 20 and 21. The metal of the insert is also doubly folded as at 23, at the junction of each rim portion 20 and its associated spoke. A similar double fold occurs between the rim portion 21 and the associated spoke.

The remaining features of the insert will be best understood from the following description of the method of constructing the same. The insert is developed from a tube, which may be a section of a seamless or welded tube, or may be constructed from a flat piece of sheet metal.

Referring now to Fig. 3, the first position shown is that of a flat sheet metal blank 25 which may be rectangular or circular as desired, it being obvious that if the blank is

rectangular, the corners thereof may be trimmed off initially, or at a later stage in the method. The blank 25 is drawn through a die to form a cup-shaped member 26. Further drawing steps progressively form the blank into the smaller and longer cup members 27, 28, 29 and 30. The member 29 is slightly flared outwardly as at 31, and the member 30 is still further flared outwardly as at 32, the flare being along a smooth curve of comparatively large radius. The bottom of the member 30 is then cut or pierced to form an aperture, and it will be obvious that these operations result in a blank which is substantially identical with a section of tubing, so that the member 30 mentioned hereinafter is generic to either form.

The lower portion of the member 30 is preferably upset and drawn in as illustrated in Fig. 4, to form the thickened cup portion 33 and the further thickened hub portion 34. The thickening of the hub 34 permits a keyway 35 to be cut thereinto in the customary manner of forming a keyway. While it is preferred to thicken the metal at these portions for the purposes of strength, it is also within the contemplation of the invention to so draw the metal as to provide uniform thickness, this construction being illustrated in Fig. 5. The cup portion is indicated at 33′ and the hub portion 34′, in which the metal is of the same thickness as the remainder of the blank, the remaining portions of the blank being identical with those shown in Fig. 4.

The blank is next cut to permit the same to be expanded and form the spokes and rim of continuous integral metal. Accordingly a plurality of vertical cuts 36 are formed in the tubular blank, and a plurality of cuts 37 and 38 are formed intermediate the cuts 36 and alternating therewith. In effect the cuts 36 project from one edge toward the other, while the cuts 38 are oppositely disposed. It should be noted that the cuts 37 and 38 are continuous, being connected by a transverse portion 39 of the same cut.

The cuts may be formed in the tubular blank in any desired manner. For instance, the cuts 36 may be saw kerfs extending from the flared edge 32 the greater part of the length of the tube, but terminating short of the other end thereof. The cuts 37—38—39 may be sheared, and to prevent tearing of the metal the blank is preferably first drilled as at 40 and 41, the location of these drilled holes being predetermined at the terminal points of the cuts. Of course the cuts 36 may be sheared also if desired, in which case drilled holes will be formed at the inner ends thereof to avoid tearing in the same manner. When formed as above described, the cuts 37—38—39 are continuous, and form U-shaped cuts surrounding the lower ends of the respective cuts 36.

When the blank is cut as above described, the metal between the cuts 37 and 38 will form the spoke portions 12, 13, 14 and 15. The metal surrounding the cuts 36 will form the rim portions 20 and 21, the two together forming a rim section which will be designated as 43, while the entire portion lying between adjacent cuts 36 will be designated as 44.

Referring now to Fig. 7, it will be noted that the first operation in expanding the tubular blank is to spread the portions 44, which effects a widening of the cuts 36. Preferably at the same time the portions 43 are spread outwardly at the bottom thereof. This spreading and expanding of the blank preferably takes place simultaneously, an intermediate stage of this operation being shown in Fig. 8. It is to be understood that the illustrations of Figs. 7 and 8 are somewhat fanciful, portions thereof being exaggerated and distorted, the purpose of these views being to show the progress or path of the metal during the expansion. In other words Figs. 7 and 8 will be merely fugitive conditions during this operation. Also the spreading need not take place simultaneously, and the spreading of the portions 43 with respect to the portions 44 may take place in any desired sequence.

At some intermediate stage in the formation of the structure shown in Fig. 4 into the form shown in Fig. 9, the metal of the blank must be folded in order that the elements may lie in substantially the same plane. The fold at 22 is exaggerated by the showing in Fig. 10, while the folds at 23 and 24 are exaggerated by the showing in Fig. 11, these two figures being also merely for the purpose of showing the progress of the metal during the folding operations. Dotted lines are indicated on Fig. 6 to show the lines 45 and 46 along which the folding takes place about the portion 22. From Fig. 10 it will be obvious that the fold at 45 will be in the opposite direction from the fold at 46 so that the rim portion 21 may ultimately lie in substantially the same plane as the rim portion 20. Dotted lines are also shown on Fig. 6 to indicate the folds at 23 and 24, and supplementary folds are indicated at 47 and 48. These folds are at an angle to each other so that the rim portions 20 and 21 may be brought into position in the same plane, and each lying at substantially right angles to the spoke with which they are integral.

After the metal has been folded as above described, the insert may be put into a press so that a heavy blow may be struck at each fold, to flatten the folds as much as possible without weakening the same.

At an intermediate stage of the process, the sections 43 comprising the rim portions 20 and 21 will be bent into a circular con-

tour so that in the completed insert, a continuous circular rim is formed.

A decorative or finishing plate 58 may be applied under the spider if desired. This plate is cup-like, and surrounds the portion 17 and extends under the portion 16. The member 58 has a depending flange 59 adapted to overlie and conceal the upper edge of the steering mast which lies between the hub 10 and the flange 59. The upper portion of the member 58 comprises a radial flange 60 which underlies the flange 18 and portions of the spokes, and extends up around and overlies the top of the same. This construction forms segmental strips 61 overlying the flange 18, and flange extensions 62 overlying the inner portions of the spokes, with their edges meeting at the lines 63. In this manner the decorative finish at the hub and cup portion is provided without any riveting or welding. It is obvious that the preferred embodiment of the insert developed from the blank shown in Fig. 4 will have all of its parts integrally connected so that no joining of any character is necessary and also no scrap metal need be wasted.

While several embodiments of the invention have been illustrated and described in such detail as to enable anyone skilled in the art to practice the invention, nevertheless the invention is not to be limited to any of the details disclosed other than as necessitated by the development of the prior art, but instead includes such embodiments of the broad idea as fall within the scope of the subjoined claims, it being obvious that various changes and modifications may be resorted to without departing from the scope of the invention.

Having thus described our invention, we claim:

1. A sheet metal blank of the character described, comprising a tubular member having cuts therein dividing the same into spoke portions, rim portions and a hub portion; said cuts terminating within the confines of said blank, leaving said spoke portions integral with said hub portion, and said rim portions integral with said spoke portions, said rim portions being located between said spoke portions.

2. A sheet metal blank of the character described, comprising a hub portion, spoke portions projecting from one edge of said hub portion, and rim portions projecting reversely from the ends of said spoke portions and lying therebetween.

3. A sheet metal blank for forming a steering wheel insert having cuts extending from one end toward the other, but terminating short thereof, and substantially U-shaped cuts surrounding the first mentioned cuts and terminating short of the end from which the first mentioned cuts extend.

4. A method of forming an article of the character described, which comprises forming cuts in a tubular sheet metal blank from one edge toward the other, but terminating short thereof, forming substantially U-shaped cuts surrounding the first mentioned cuts, and expanding said blank to form a continuous element of the material of said blank on each side of the first mentioned cuts.

5. A method of forming an article of the character described, which comprises forming cuts in a tubular sheet metal blank from one edge toward the other, forming substantially U-shaped cuts surrounding the first mentioned cuts, and expanding said blank to form a continuous element of the material on each side of the first mentioned cuts, and to form said continuous element integral with strips remaining between adjacent pairs of said second mentioned cuts.

6. A method of forming an article of the character described, which comprises shearing a sheet metal blank between portions thereof adapted to form spoke portions and rim portions, and expanding said blank to spread said spoke portions and suspend said rim portions between the ends of adjacent spoke portions.

7. The method of forming a sheet metal blank for a steering wheel insert, which comprises cutting said blank to form spaced spoke portions, and cutting the metal between said spoke portions to form rim portions, but leaving the adjacent ends of said rim portions integral with the ends of said spoke portions.

8. The method of forming a steering wheel insert, which comprises cutting a tube to form spoke portions and rim portions, and spreading one end of said tube to separate the ends of said spoke portions and folding said rim portions to form a continuous integral rim.

9. The method of forming a steering wheel insert which comprises forming primary partial cuts in a tubular sheet metal blank from one end toward the other without severing therefrom any substantial areas thereof, forming secondary partial cuts extending parallel to the first mentioned cuts and around one end thereof, expanding said tube, and folding the portions between said primary and secondary partial cuts to form a continuous rim.

10. The method of forming a sheet metal insert for a steering wheel, which comprises cutting a tube to divide the same into as many portions as there are spokes in the finished wheel, further cutting each of said portions to divide the same into spoke portions and rim portions integral with the ends thereof, bending down said spoke portions, and forcing said rim portions outwardly to form a continuous integral element.

11. The method of forming a sheet metal insert for a steering wheel, which comprises cutting a tube to divide the same into as many

portions as there are spokes in the finished wheel, further cutting each of said portions to divide the same into spoke portions and rim portions integral with the ends thereof, bending down said spoke portions, forcing said rim portions outwardly to form a continuous integral element, and folding and bending said element to form a circular rim.

12. The method of forming a continuous metal insert for a steering wheel, which consists in cutting spaced slots in a tube, cutting other slots extending around the inner ends of said first mentioned slots, and expanding said tube.

In testimony whereof, we hereunto affix our signatures.

BUDD BRONSON.
EDWARD R. MARBACH.