# United States Patent

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## [54] LUG TEMPLATE


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[52] **U.S. Cl.**.....**301/9 DN,** 85/32, 151/69, 206/65 R

[51] **Int. Cl.**.....**B60b 3/16**

[58] **Field of Search**.....301/9 N, 108 S, 37 S; 151/69; 206/65 R



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[57] **ABSTRACT**

A lug template in which a plurality of lugs are rotatably mounted to a flexible template wherein each lug may be individually and substantially deflected out of the normal plane of the template without substantially deflecting the remaining lugs and further in which the template may be limitedly deformed in its normal plane to slightly increase the effective distance between given lugs.


**5 Claims, 3 Drawing Figures**

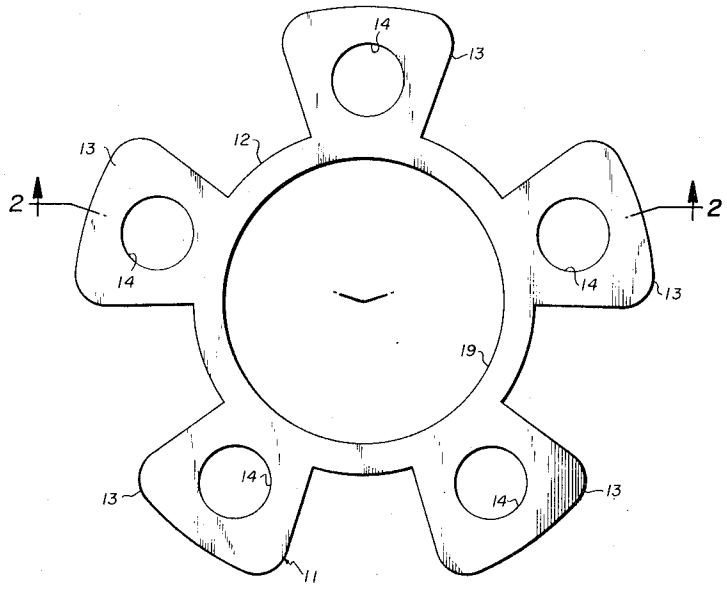
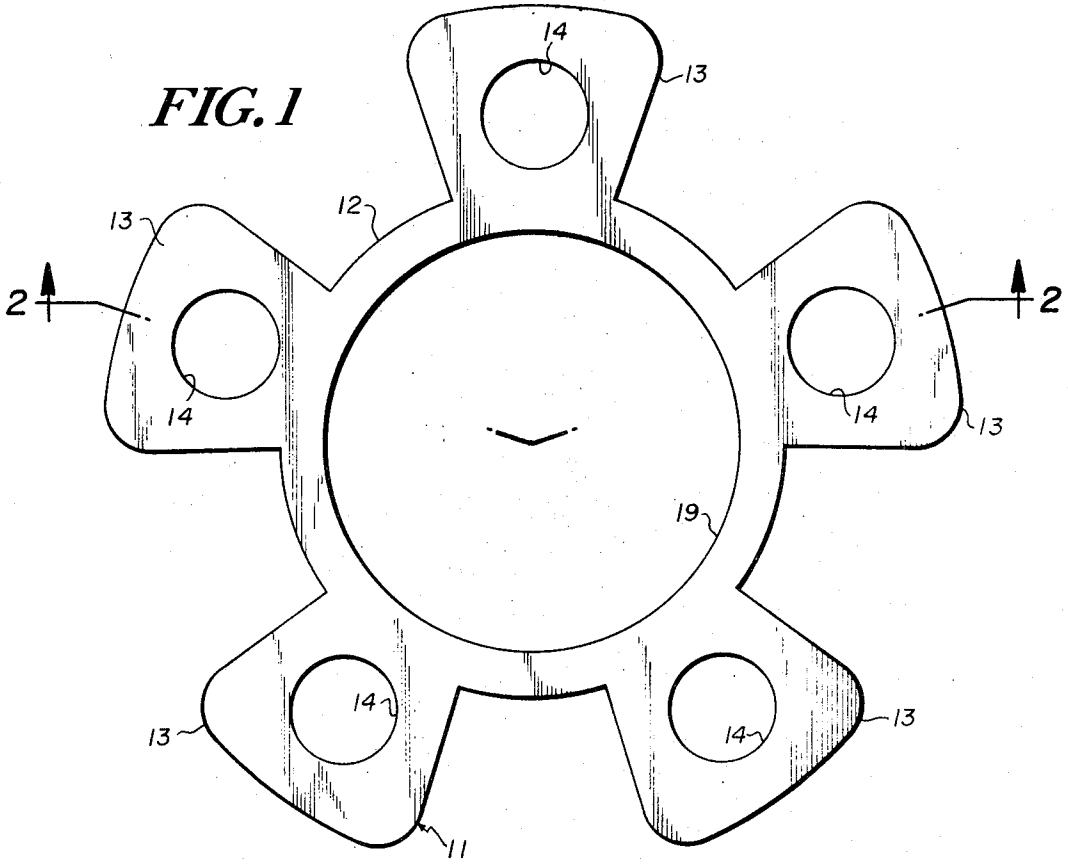


FIG. 1



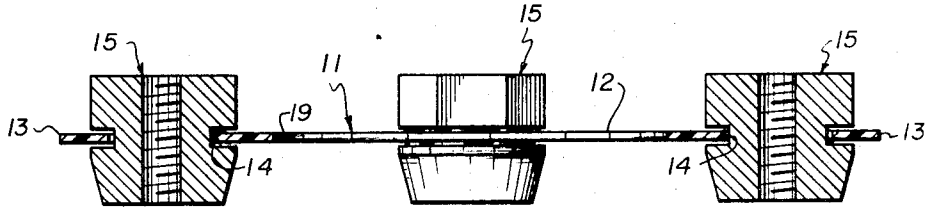




FIG. 2

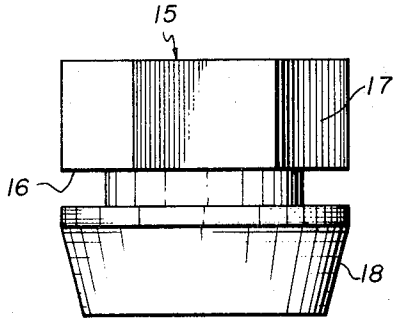



FIG. 3

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# LUG TEMPLATE

This is a substitute for U.S. Pat. application Ser. No. 725,697 filed May 1, 1968.

## BACKGROUND OF INVENTION

In the automotive arts, wheel lugs are frequently misplaced or lost when wheels are changed. Therefore, it would be advantageous to provide means which would retain lugs belonging to a particular wheel against separation from each other when disengaged from the wheel.

Moreover, it is advantageous to maintain all lugs belonging to a particular wheel in general registration with the mating threaded members when reinstalling the lugs. This provides not only rapid successive threadable engagement of the lugs with their mating members but also insures against having to reach long distances for scattered lugs while holding a wheel in place during remounting on the wheel drum.

The aforesaid objects may be achieved by employing a template in which the lugs are rotatably mounted with a relatively fixed angular relationship to each other corresponding to the angular relationship between their mating members with which they must be brought into registration. The simplest way of rotatably mounting lugs in a template is to provide a circular opening in the template having a diameter slightly smaller than the diameter of the lug. The lug is provided with a radially annular groove adapted to receive the template as the lug is forced through the hole therein.

However, since the template must retain the lugs in a relatively fixed radially angular relationship to each other, the template comprises a unitary base having a plurality of openings adapted to receive the rotatably mount lugs generally spaced about a center. Nevertheless, if lugs are to be engaged or disengaged from their cooperative fasteners singularly in sequence, the portion of the template surrounding each lug must be deflectable out of the normal plane of the template without unduly deflecting the template adjacent to the remaining lugs. In automobile wheels, the lugs are equally spaced about a circle. If the template were a circular sheet of material having the lugs rotatably mounted in holes equally spaced in near proximity to the parameter thereof, deflection of one lug out of the plane of the template would immediately cause deflection of lugs adjacent thereto. Sympathetic deflection of adjacent lugs is caused by an increase in the effective distance between lugs as one is deflected out of the plane of the template. If the periphery of the template were a continuous circle lying outside of the lugs, no such increase of the effective distance between lugs would be possible since it would constitute stretching the periphery of a solid body.

In order to obviate this difficulty, the template described and claimed herein, is defined by a generally circular inner base having a plurality of integral, separated, radial ears. The holes seating the lugs are positioned in each of the ears. The lugs may then be deflected out of the normal plane of the template by the deflection of individual ears which does not cause substantial deflection of adjacent ears carrying adjacent lugs.

Another difficulty attending full engagement or disengagement of each lug in sequence is an increase in the effective distance between generally opposing lugs when one lug is deflected out of the normal plane of the template. This difficulty is obviated by providing an opening in the template intermediate the circular base to provide limited deformation of the template in its own plane to increase at least slightly the effective distance between opposing lugs.

It has been found that if the lugs are not individually substantially deflectable out of the normal plane of the template without deflecting substantially adjacent lugs and if the effective distance between generally opposing lugs in the plane of the template cannot be slightly increased, full engagement or disengagement of one lug while the remaining lugs are oppositely engaged, will cause binding of the lug in the template and galling and damage of the template as a result.

Therefore, it is among the objects and advantages of the invention described and claimed herein to provide a lug template in which a plurality of lugs are rotatably mounted in a template readily flexible out of the normal plane of the template and limitedly deformable in the plane of the template to permit substantial deflection of individual lugs out of plane of the template without substantial deflection of adjacent lugs.



Another object of the invention described and claimed herein is to provide a lug template as aforesaid in which the template is sufficiently deformable in its normal plane to permit at least slight increases in the effective distance between opposing lugs.

Another object of the present invention is to provide the lug template of the character aforesaid in which individual lugs may be completely engaged or disengaged while the remaining lugs are oppositely engaged without galling the template or otherwise interfering with the engagement or disengagement operation.

## SUMMARY OF INVENTION

A lug template comprising a relatively thin, normally generally flat annular member, a plurality of relatively thin, generally flat radial extensions formed on the periphery of the annular member, lugs rotatably mounted in the extensions and secured thereto against accidental disengagement therefrom, the annular member being flexible and distortable, and at least a portion of the radial extensions being deflectable out of the normal plane of the annular member without substantial such deflection of adjacent radial members.

## PREFERRED EMBODIMENT OF INVENTION

The objects and advantages aforesaid as well as other objects and advantages may be achieved by the invention described and claimed herein, a preferred embodiment of which is illustrated in the drawings in which:

FIG. 1 is a top plan view of a lug template with the lugs disengaged therefrom;

FIG. 2 is a side elevational, cross-sectional view of the template taken along line 2—2 in FIG. 1 with the lugs rotatably mounted in the openings therein;

FIG. 3 is a side elevational view of a lug nut adapted to be rotatably mounted in the lug template illustrated in FIGS. 1 and 2.

Referring now to the drawings in detail, the lug template comprises a generally flat base **11** having an annular inner body **12** and a plurality of integral, radial ears **13**. For illustrative purposes only, five ears are shown in the drawings, equally spaced about the annular body **12**. Nevertheless, any number of ears may be employed at any angular relationship to each other either at equal or unequal distances from the center of body member **12**.

Each of the ears **13** is provided with a circular opening or hole **14**. While in the drawings, the openings **14** are shown as equally spaced from the center of the body member **12**, their precise location is a matter of choice in order to maintain registration of the openings **14** with the complementary members of the wheel and wheel drum with which the template is to be employed.

A lug **15** is rotatably mounted in each of the openings **14**. In the drawings, the lug **15** is illustrated as a nut. However, the lug could be a bolt or any other fastener adapted for engagement with a complementary fastener. The use of the term "lug" in the claims herein includes all such fasteners.

In order to rotatably mount the lug **15** in the opening **14**, each of the lugs **15** is provided with an annular groove **16**. The minor diameter of the annular groove **16** is slightly less than the diameter of the opening **14**. In the case of a lug nut, the annular groove **16** is most conveniently placed intermediate the hexagonal head **17** and the usual truncated conical shank **18**.

The ears **13** of the template **11** are relatively thin and flexible out of the normal plane of the template. The lug nut **15** is installed in the slot **14** by forcing the truncated conical shank **18** downwardly through the slot deforming the edges thereof downwardly and outwardly until the groove **16** is reached. The

normal resilience of the ear peripheral to the hole **14** causes the edges thereof to snap into the groove **16** rotatably locking the lug nuts **15** therein.

While one manner of rotatably mounting the lug nut **15** in the opening **14** has been illustrated, many equivalent constructions may be employed which are considered as being within the scope of the claims appended hereto.

In order to engage or disengage one of the lugs **15** while the remaining lugs are oppositely engaged, the ear **13** in which the lugs being engaged or disengaged is mounted must be readily deflectable out of the normal plane of the remainder of the template **11**. It has been found that a variety of plastic materials are particularly well suited for fabrication of the template. For instance, teflon, nylon, polyethylene or a number of other plastics may be employed. Such plastics should have a relatively flexible consistency with a relatively hard and preferably slippery surface. While teflon provides many of these characteristics, it is excessively costly. High density nylon is less costly and polyethylene is still less costly but frequently exhibits somewhat softer surface characteristics.

When the template **11** is employed to mount lug nuts of an automobile wheel, the wheel may be mounted or demounted in the following manner. If the wheel is mounted to the wheel drum, a power impact wrench or a mechanical lug wrench may be applied to each of the lugs **15** fully disengaging each said lug in succession. As the first lug **15** disengages, the ear **13** in which it is rotatably mounted, bends upwardly as the lug moves axially outwardly from the wheel and wheel drum. Since the ears **13** are not secured together along their radially peripheral edge, each ear **13** may deflect upwardly independently of the other ears, particularly immediately adjacent ears.

In the embodiment of the invention illustrated in the drawings, the ears **13** are relatively widely separated from each other by a bridging segment of the annular base **12**. Flection, both deflection upwardly and slight rotation of the segment of the base **12** between ears assists in permitting free deflection on one ear **13** independent of adjacent ears. Nevertheless, the ears **13** may be separated merely by a radial slit in the template **11**.

As each ear **13** deflects upwardly during removal of the lug **15**, the effective distance between the lug **15** being removed and generally opposing lugs **15** slightly increases. In order to accommodate for this effective change in distance between lugs **15**, the base **12** has been provided with a central opening **19**. In the embodiment illustrated in the drawings, the base **12** is actually an annular member defining a circular opening **19**. The opening **19** permits limited deformation of the template **11** in its own plane to permit at least a slight increase in the effective distance between generally opposed lugs **15**.

Since each ear may deflect out of the plane of the template **11**, independently of adjacent ears **13** and since the effective distance between lugs may be at least slightly increased by limited deformation of the template **11** in opposition to itself, the lugs **15** will not bind or gall and damage the template **11** during engagement or disengagement singularly in sequence. Nevertheless, the basic radially angular relationship between lugs is substantially maintained so that the lugs are automatically each brought into registration with their complementary fasteners by means of the template **11**.

Engagement of the lugs **15** is performed in an analogous fashion. Each ear **13** deflects downwardly out of the normal plane of the template **11** as its lug **15** is engaged to its complementary fastener. There is sufficient flexibility in the template **11** to "catch" the threads of each lug **15** in sequence rather than starting each lug by hand and thereafter applying a power, impact wrench. This represents a considerable saving in time and effort.

Although each of the ears **13** is readily deflectable out of the plane of the template **11** without substantially deflecting adjacent ears, there is nevertheless a reasonably substantial and effective force directed at the lug in opposition to deflection out of the plane of the remaining lugs. While this force is insufficient to cause binding of lugs during engagement or disengagement or otherwise substantially impeding rotation of the lugs in the openings **14**, it is sufficient to discourage accidental disengagement of lugs due to vibration. Thus, the template **11** tends to function as a locking device to secure the lugs **15** against unintended vibrational rotation and loosening and certainly against complete disengagement which could prove disastrous when a vehicle is in motion.

What is claimed is:

**1.** A lug template comprising,
a. a relatively thin, normally generally flat annular member,
b. a plurality of relatively thin, generally flat radial extensions formed on the periphery of the annular member,
c. lugs rotatably mounted in the extensions and secured thereto against accidental disengagement therefrom,
d. the annular member being flexible and distortable; and
e. at least a portion of the radial extensions being deflectable out of the normal plane of the annular member without substantial such deflection of adjacent radial members.

**2.** A lug template comprising,
a. the structure in accordance with claim **1** in which,
b. the annular member and the radial extensions are sufficiently distortable to permit at least a slight increase in distance between the centers of rotation of the lugs.

**3.** A lug template comprising,
a. the structure in accordance with claim **1** in which,
b. the radial extensions are symmetrically disposed about the periphery of the annular member.

**4.** A lug template comprising,
a. the structure in accordance with claim **2** in which,
b. the radial extensions are symmetrically disposed about the periphery of the annular member.

**5.** A lug template comprising,
a. the structure in accordance with claim **4** in which,
b. each radial extension is provided with a circular opening extending therethrough the lugs being rotatably mounted in the openings, and
c. the lugs having a radial peripheral groove in which the periphery of the openings in the radial extensions seat.

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