April 6, 1954 J. J. ANGELO ET AL 2,674,142

CAMBER CORRECTING TOOL

Filed March 13, 1951 2 Sheets-Sheet 1

FIG 1

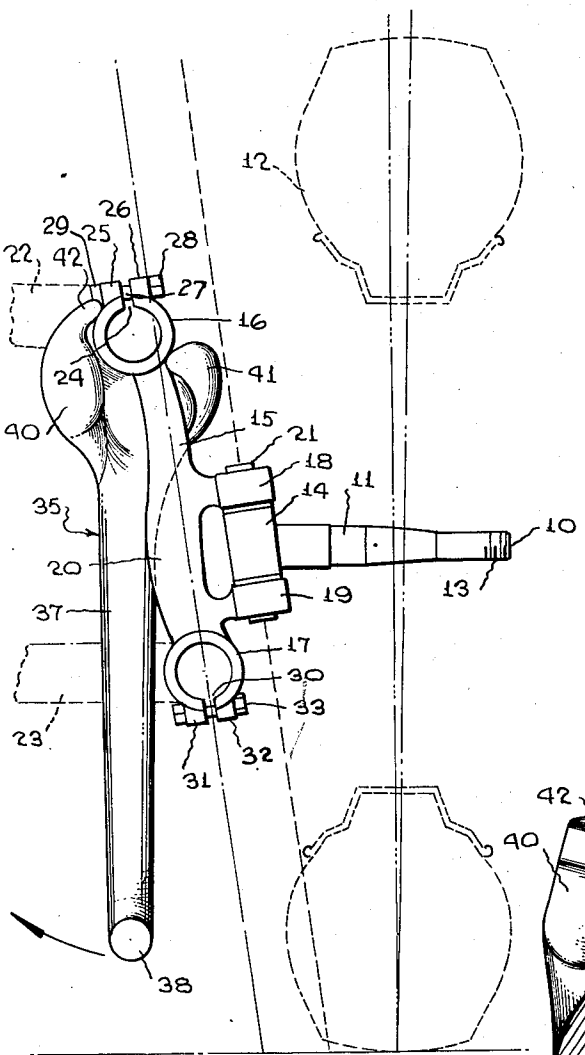


FIG 2

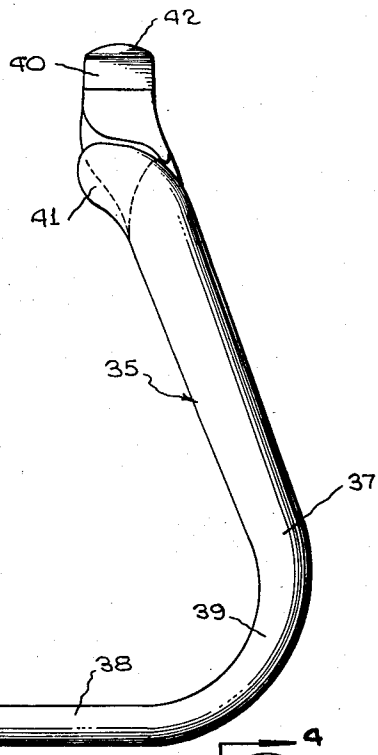


FIG 3

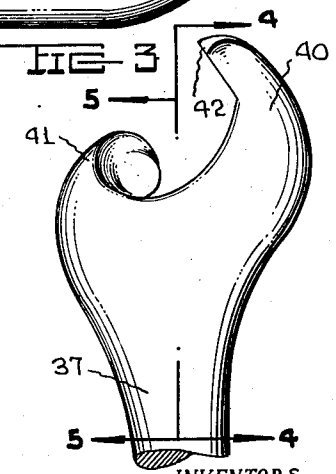


FIG 4

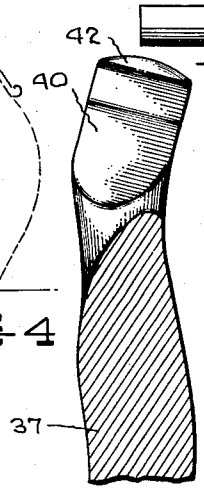
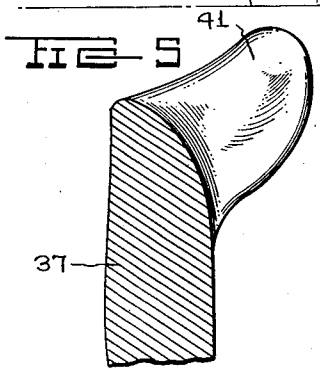


FIG 5



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FIG 6

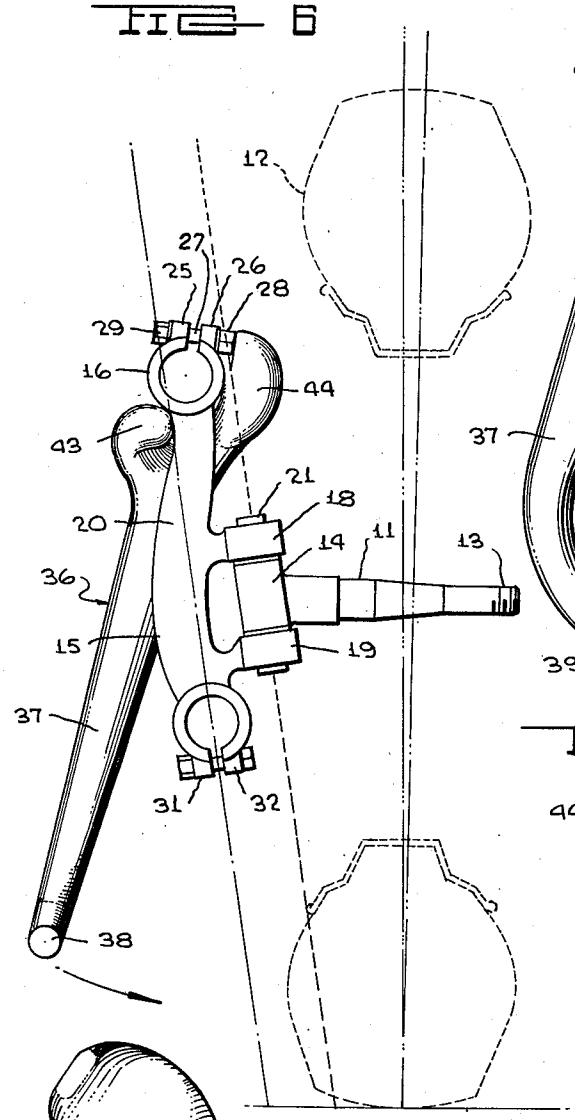


FIG 7

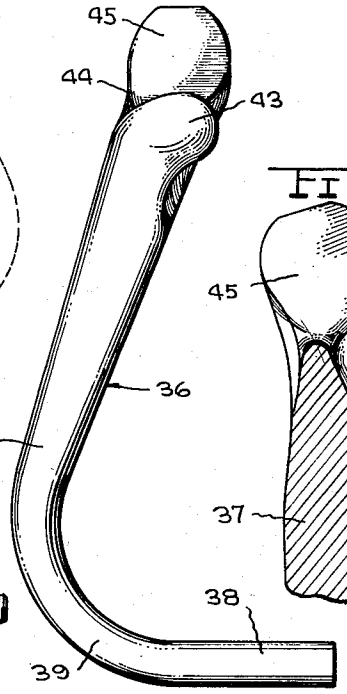


FIG 10

FIG 8

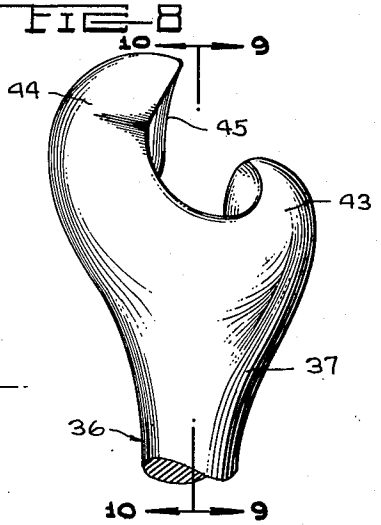
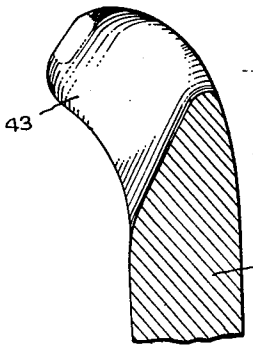


FIG 9



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Patented Apr. 6, 1954

2,674,142

UNITED STATES PATENT OFFICE

2,674,142

CAMBER CORRECTING TOOL

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Application March 13, 1951, Serial No. 215,299

3 Claims. (Cl. 81—15)

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This invention relates to improvements in tools for correcting the front wheel camber of automobiles.

It is among the objects of the invention to provide a set of camber adjusting tools including four tools for increasing and decreasing the camber at the opposite sides of the front end of an automobile; which tools are especially adapted to correct or adjust the camber of independently sprung front wheels by applying pressure to the upper ends only of the front wheel spindle supports in a manner to avoid bending, breaking or binding the king-pins securing the front wheel spindles to the spindle supports; which can be used on different makes of automobiles and trucks; and which are simple and durable in construction, economical to manufacture, easy to use, and positive and effective in operation.

Other objects and advantages will become apparent from a consideration of the following description and the appended claims in conjunction with the accompanying drawings wherein:

Figure 1 is a somewhat diagrammatic view of a front wheel assembly showing in front elevation a front wheel spindle and spindle support with a camber decreasing tool illustrative of the invention operatively applied to the spindle support;

Figure 2 is an elevational view of the tool illustrated in Figure 1 with the tool turned 90 degrees from the position illustrated in Figure 1;

Figure 3 is an elevational view of the spindle support engaging end of the tool illustrated in Figures 1 and 2 looking at the opposite side of the tool from that illustrated in Figure 1;

Figure 4 is a fragmentary cross sectional view on an enlarged scale on the line 4—4 of Figure 3;

Figure 5 is a fragmentary cross sectional view on an enlarged scale on the line 5—5 of Figure 3;

Figure 6 is a view similar to Figure 1 showing a camber increasing tool applied to the front wheel spindle support;

Figure 7 is an elevational view of the camber increasing tool illustrated in Figure 6 with the tool turned 90 degrees from the position shown in Figure 6;

Figure 8 is an elevational view of the spindle support engaging end of the tool illustrated in Figures 6 and 7 looking at the side of the tool opposite that shown in Figure 6;

Figure 9 is a fragmentary cross sectional view on an enlarged scale on the line 9—9 of Figure 8; and

Figure 10 is a fragmentary cross sectional view on an enlarged scale on the line 10—10 of Figure 8.

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With continued reference to the drawings, the front wheel and wheel support assembly diagrammatically illustrated in Figures 1 and 6 represents a typical independently sprung front wheel assembly, such as is used in most modern automobiles and in some trucks. The illustrated portion of the assembly comprises a front wheel spindle 10 including an axle 11 upon which the front wheel 12 is journaled and having at one end a screw thread formation 13 for receiving the front wheel retaining nut and at its other end a cylindrical boss 14 provided with a vertical extending bore, the center line of which is disposed at an angle slightly greater than 90 degrees, to the center line of the axle 11.

A front wheel spindle support 15 comprises a vertical bar 20 joined at its upper end to an upper, substantially cylindrical eye 16 and at its lower end to a substantially cylindrical lower eye 17 both of which have their axes substantially at right angles to the longitudinal center line of the bar. Two spaced apart, apertured lugs 18 and 19 project laterally from the bar 20 of the support with the lower lug 19 adjacent the lower eye 17 and the upper lug spaced from the upper eye 16. These lugs receive the cylindrical boss 14 of the spindle therebetween.

A kingpin 21 extends through the apertures in the lugs 18 and 19 and through the bore of the boss 14 of the spindle to pivotally attach the front wheel spindle to the spindle support.

An upper support arm 22 is pivotally connected at its outer end to the upper eye 16 of the spindle support and a lower support arm 23 is pivotally connected at its outer end to the lower eye 17.

The assembly includes other components, such as bearings for attaching the upper and lower support arms to the corresponding side of the automobile frame, a spring, and a shock absorber, but these components being well known in the art, detailed illustration and description thereof is considered unnecessary for the purposes of the present disclosure.

The upper eye 16 is split at its upper side, as indicated at 24, and this eye is provided on its upper side with apertured lug formations 25 and 26 located at respectively opposite sides of the split 24. A clamp bolt 27 having a head 28 on one end and a nut 29 on the other end extends through the lug formations 25 and 26 for clamping the eye 16 together upon a bearing pin or shaft extending through the eye.

The lower eye 17 is provided at its lower side with a split 30 and with apertured lug formations 31 and 32 disposed at respectively opposite sides of the split and receiving the clamp bolt 33.

With camber correcting tools now in use, the portion of the bar 20 between the spindle carrying lugs 18 and 19 is bent to some extent in making a camber correction. This causes the lugs to be displaced relative to each other and results in binding of the king pin 21 in the associated bearings and, in some cases, in bending or breaking of the king pin. The tools of the present invention bend the spindle support only at the location at which the bar 20 joins the upper eye 16 and do not displace the lugs 18 and 19 relative to each other to any extent. Since only a very slight bending of the spindle support is sufficient to properly correct the camber in an automobile, this bending can be accomplished at the end of the bar 20 immediately adjacent to the upper eye 16 and it is not necessary to bend or deflect any other part of the spindle support.

The several tools of a set in accordance with the present invention are all substantially identical in size, shape and construction, the only differences being that the tools used at the opposite sides of the automobile front end are reversed relative to each other so that two of the tools are right-hand and the other two are left-hand, and the jaw formations on the tools for decreasing the camber of the front wheels are somewhat different from the jaw formations on the tools for increasing the camber. Figures 1 to 5 inclusive show a camber decreasing tool and Figures 6 to 9 inclusive show a camber increasing tool, both for the same side of the front end of the vehicle. The camber decreasing tool is generally indicated at 35 and the camber increasing tool at 36. In both cases, the tool comprises an elongated, substantially straight shank 37 which is uniformly tapered from one end to the other, and a handle 38 of substantially uniform diameter joined at one end to the shank 37 at the smaller end of the latter by a tapering, arcuately curved portion 39 of the shank. The handle projects laterally from the shank 37 and the curved portion 39 extends through an angle of slightly more than 90 degrees so that the longitudinal center line of the handle is disposed at an angle of slightly less than 90 degrees to the longitudinal center line of the straight portion of the shank, and is in a plane passing through the shank.

At its opposite end the shank is provided with a pair of laterally spaced jaws 40 and 41 which receive the upper eye of the spindle support and the adjacent portion of the bar 20 therebetween.

When the tool is operatively applied to the spindle support with the upper eye 16 between the jaws 40 and 41, as illustrated in Figure 1, the shank of the tool depends from the upper eye of the spindle support and has a length such that the handle 38 is disposed below the lower eye 17 a distance sufficient to permit easy access to the handle and to provide the necessary leverage for bending the spindle support.

It will be noted that in order to bend the spindle support by the camber decreasing tool 35, particularly illustrated in Figure 1, it is necessary to pull the handle 38 inwardly of the vehicle and in a direction away from the associated front wheel axle 11. This can be conveniently accomplished by connecting between the handle 38 of the tool and the vehicle frame a suitable tension device including a turnbuckle which can be rotated to shorten the device and apply a sufficient pulling force to the tool handle to bend the spindle support to the necessary extent.

In using the camber increasing tool, particularly illustrated in Figure 6, the tool handle must be moved outwardly of the vehicle or toward the associated front wheel axle 11 and in order to accomplish this a suitable compression device, such as a jack, may be placed between the tool handle and the vehicle frame to exert sufficient pressure on the tool handle to bend the spindle support the required amount.

In both tools, the jaws are of unequal length and the free end of the shorter jaw is arranged to engage one side of the spindle support bar at a point contiguous to the underside of the upper eye 16, while the free end of the larger jaw is arranged to engage the lug formation on the other side of the upper eye. The pressure points for bending the spindle support are thus located one at the side of the upper eye joined to the bar 20 and the other at the side of the upper eye remote from the bar 20.

In the case of the camber decreasing tool, illustrated in Figure 1, the free end of the shorter jaw 41 is arranged to bear against the outer side of the spindle support bar 20, while the longer jaw 40 is arranged to extend past the inner side of the upper eye 16 and with its free end engaged with the inner side of the inner lug formation 25 on the upper side of the upper eye.

It will be noted that the long jaw 40 is provided on its free end and with a laterally inwardly directed and upwardly inclined extension 42 which reaches toward the short jaw 41 so as to reach around the side of the upper eye 16 and engage the outer side of the lug formation 25. The inner side of the free end of the short jaw 41 is sharply curved to engage around the bar 20 and engage its terminal end with the outer side of the bar 20 of the spindle support 15. The end of the shank 37 between the jaws 40 and 41 is concavely rounded to receive the lower portion of the eye 16 and also the adjacent side of the bar 20 of the spindle support.

Both jaws 40 and 41 project laterally from the shank 37 at the same side as that from which the handle 38 projects from the shank, so that when pressure in the indicated direction is applied to the handle 38, the twisting force imparted by the handle to the shank will tend to turn the jaws 40 and 41 to a tighter association with the spindle support so that this twisting force will be counteracted by the clamping force exerted by the jaws on the spindle support.

In the camber increasing tool 36, as illustrated in Figure 6, the shorter jaw 43 has a free end which is blunter than the free end of the jaw 41 of the tool 35, and which is arranged to engage around the side of the bar 20 remote from the axle 11. The longer jaw 44, instead of having an extension, such as the extension 42, on the free end thereof, has at its free end a flattened area 45 facing the shorter jaw 43 which is arranged to engage with the outer end surface of the clamp bolt head 28 to apply a bending force to the upper end of the support bar 20.

The shorter jaw 43 of the tool 36 projects laterally from the same side of the shank 37 as that from which the handle 38 projects laterally from the shank, so that the twisting force imparted by the handle to the shank will be counteracted by the clamping action of the jaws on the spindle support. It will be noted that in the cases of both tools, the shank 37 is so inclined that the handle is disposed directly below the spindle support and the resultant force exerted by the tool is a direct inward or outward bending force on the upper end of the spindle support bar 20.

The shank of the tool **36** is concavely rounded between the jaws **43** and **44** to receive the lower portion of the upper eye **16** and the adjacent portion of the bar **20** and in both cases, the surface between the jaws extending in all directions.

The outer sides of the two jaws and the associated end of the shank are rounded and smoothly contoured to provide maximum strength at this end of the tool and to avoid any sharp bends or notches which might cause a concentration of stresses resulting in breakage of the tool. The tapered shape of the shank also provides adequate strength with minimum weight so that the shank will not be bent or twisted by the forces imparted to the handle to bend a spindle support.

By applying the bending pressure only at the above indicated pressure points, that is, at the juncture of the upper eye and the bar **20** and at a location on the upper eye at the side of its center or axis remote from the bar **20**, the axis of the upper eye can be moved toward or away from either side of the longitudinal center line of the bar **20** to correct the camber of the associated wheel.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is, therefore, to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are, therefore, intended to be embraced therein.

What is claimed is:

1. In a camber correcting tool for beading the upper end portion of a spindle support bar having an upper eye including a lug formation on the upper side of the eye, an elongated shank having a laterally projecting handle on one end, a long jaw and a short jaw on the other end of said shank, said jaws being laterally spaced from each other crosswise of said shank, said other end of the shank having a concave surface extending crosswise of the shank between the jaws at an acute angle with respect to the longitudinal axis of said shank, said jaws having inner surfaces to which opposite ends of said concave surface are joined, said jaws projecting from said other end of said shank principally in longitudinal directions relative to the length of said shank, with the long jaw extending longitudinally beyond the short jaw, said jaws having free end portions which extend laterally from one side of said shank and are inclined in the direction of their extension and of said one side of the shank.

2. In a camber correcting tool for beading the upper end portion of a spindle support bar having an upper eye including a lug formation on the upper side of the eye, an elongated shank having a laterally projecting handle on one end, a long jaw and a short jaw on the other end of said shank, said jaws being laterally spaced from each other crosswise of said shank, said other end of the shank having a concave surface extending crosswise of the shank between the jaws at an acute angle with respect to the longitudinal axis of said shank, said jaws having inner surfaces to which opposite ends of said concave surface are joined, said jaws projecting from said other end of said shank principally in longitudinal directions relative to the length of said shank, with the long jaw extending longitudinally beyond the short jaw, said jaws having free end portions which extend laterally from one side of said shank and are inclined in the direction of their extension and of said one side of the shank, at the same side of the shank as said handle.

3. In a camber correcting tool for beading the upper end portion of a spindle support bar having an upper eye including a lug formation on the upper side of the eye, an elongated shank having a laterally projecting handle on one end, a long jaw and a short jaw on the other end of said shank, said jaws being laterally spaced from each other crosswise of said shank, said other end of the shank having a concave surface extending crosswise of the shank between the jaws at an acute angle with respect to the longitudinal axis of said shank, said jaws having inner surfaces to which opposite ends of said concave surface are joined, said jaws projecting from said other end of said shank principally in longitudinal directions relative to the length of said shank, with the long jaw extending longitudinally beyond the short jaw, said jaws having free end portions which extend laterally from one side of said shank and are inclined in the direction of their extension and of said one side of the shank, the inner side of the free end portion of said long jaw having a flat surface and the inner side of the free end portion of the short jaw having a concaved surface substantially continuous with said concave surface of the shank.

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