

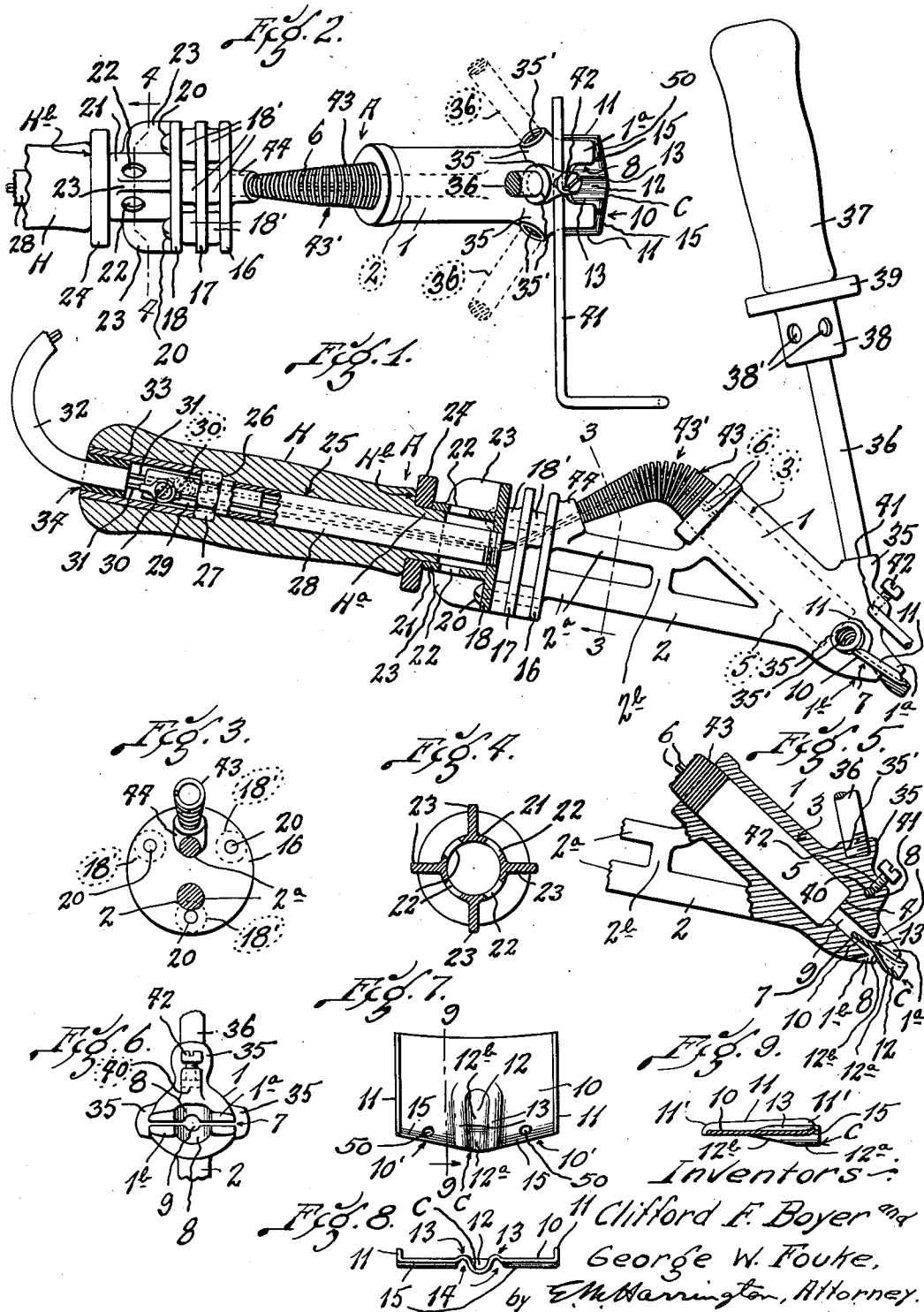
Feb. 18, 1936.

C. F. BOYER ET AL

2,031,028

TIRE GROOVER

Filed March 12, 1934



UNITED STATES PATENT OFFICE

2,031,028

TIRE GROOVER

Clifford F. Boyer and George W. Fouke, St. Louis, Mo., assignors to Kwick-Kut Manufacturing Co., Inc., St. Louis, Mo., a corporation of Missouri

Application March 12, 1934, Serial No. 715,138

13 Claims. (Cl. 30—20.2)

This invention relates generally to an improved device for grooving treads of vehicle tires, and more specifically to a tire-grooving device of the type which includes as parts thereof means for producing heat, and a blade providing the cutting element of the device to which such heat is applied so as to facilitate the groove-cutting operations performed by the device, the predominant object of the invention being to provide a device of the type mentioned which is so constructed and arranged that it performs its intended functions with greater efficiency and in a more facile manner than other similar devices heretofore known.

Fig. 1 is a view partly in side elevation and partly in section of the improved device.

Fig. 2 is a fragmentary plan view of the device illustrated in Fig. 1.

Fig. 3 is a cross-section taken on line 3—3 of Fig. 1.

Fig. 4 is a cross-section taken on line 4—4 of Fig. 2.

Fig. 5 is a fragmentary view partly in elevation and partly in section of the head portion of the device.

Fig. 6 is a fragmentary front elevation of the head of the device.

Fig. 7 is a plan view of the cutting blade of the device.

Fig. 8 is a front elevation of the cutting blade shown in Fig. 7.

Fig. 9 is a section of the cutting blade taken on line 9—9 of Fig. 7.

In the drawing, wherein is shown for the purpose of illustration, merely, one embodiment of the invention, A designates the improved device generally. The device A includes a head 1 which is located at the outer end of a shank portion 2, the major axis of the head being extended at an acute angle with respect to the major axis of the shank, as shown most clearly in Fig. 1. The head 1 and the shank 2 of the device A may be formed integrally with each other as suggested by Fig. 5, or, if preferred, these parts may be separately formed and suitably attached together.

Formed within and extended longitudinally of the head 1 of the device is a cavity 3 which extends to the rear end face of the head and terminates, as shown at 4 in Fig. 5, at a front cavity wall located inwardly of the forward end of the head. The cavity 3 receives an electrical heating element 5 which preferably is of cartridge form, that is to say, said heating element includes an outer shell of suitable material within which the resistance coils of the heating element are located. The forward end of the heating element contacts

with the front wall 4 of the cavity, and the rear end of said heating element is located a slight distance inwardly of the rear end of the cavity for a purpose to be hereinafter set forth. The heating element has suitably connected to it electrical conductors 6 by which electrical energy is conducted to the resistance coils thereof.

At its forward end the head 1 of the device A is provided with a slot 7 which extends from one side of the head to the opposite side thereof. This slot is open at the opposite sides of the head and at the forward end of said head, and terminates at its rear end at a wall which is located slightly forwardly of the front end of the cavity 3 (Fig. 5). Also, the forward portion of the head 1 is of forked shape, this shape being produced by forming vertical slots 8 in the head portions located above and below the transverse slot 7. By preference the transverse slot 7 is not in exact alignment with respect to the major axis of the head, but instead is disposed at a slight angle with respect to said major axis, as shown in Fig. 5. It is important to note that the head portion 1^a located above the transverse slot 7 is substantially longer than the head portion 1^b located below said transverse slot, whereby said upper head portion 1^a extends forwardly some distance beyond the lower head portion 1^b. This arrangement performs an important function which will be hereinafter referred to. Formed in the forward end portion of the head 1 is an opening 9 (Fig. 5) which communicates at its rearmost end with the cavity 3 and at its forward end with the transverse slot 7 and the vertical slots 8. The purpose of the opening 9 will be hereinafter set forth.

Arranged in the transverse slot 7 of the head 1 is a blade 10, which comprises a section of suitable thin material of a width slightly greater than the width of the transverse slot 7 and a length slightly greater than the dimension of the slot which extends longitudinally of the head 1. The blade at its opposite sides is provided with upturned flanges 11 having opposite rounded ends 11', and preferably the flanges 11 are of slightly greater height at the front portion of the blade than at the rear portion thereof. Also, the forward edge of the blade 10 tapers slightly from the opposite side edges of the blade forwardly and inwardly toward the center of the blade, as shown in Fig. 7, wherein 10' designates the tapered forward edge portions referred to.

Formed longitudinally of the blade 10 at the approximate center thereof is a groove 12 which is formed by pressing a portion of the material

of the blade downwardly, as shown clearly in Figs. 7 and 8. The forward portion 12^a of the groove 12 is of constant depth, and the portion 12^b of the groove located rearwardly of such forward portion thereof tapers rearwardly and upwardly until it merges into the blade 10 (Fig. 5). The groove 12 is of substantially semi-circular cross-sectional shape, as shown in Fig. 8, and is flared from a narrower width at its forward end to a greater width at its rearmost end, and at the opposed points where the side of the groove merge into the blade longitudinally extended humps 13 are produced. These humps extend above the top face of the blade slightly, and as a result of the presence of the humps at the top face of the blade longitudinally extended depressions 14 are formed at the lower face of the blade (Fig. 8) at the points where the depressed material forming the groove merges into the material of the blade proper. The wall of the groove 12 at the forward edge of the blade 10 is sharpened, as indicated at C, to provide a cutting edge, and the portions of the forward edge of the blade located at opposite sides of the groove 12 are unsharpened, and these forward edge portions are curved upwardly, as indicated at 15, to provide what might be described as sled end portions. By so curving the non-cutting portions of the forward edge of the blade, said edge portions are caused to slide freely over the surface of a tire when the device is in use without danger that the edge portions referred to might catch on the edges of grooves or other obstructions present at the surface of the tire. The blade 10 is secured to the head 1 of the device only by frictional grip between the walls of the transverse slot 7 and the faces of the blade, the slot being of such width that the blade is very firmly held in place by the very close contact between the top and bottom faces of the slot and the top and bottom faces of the blade.

The shank 2 of the device may be produced by a pair of spaced apart, longitudinally extended bars 2^a, as shown in Fig. 1, and if desired these longitudinal bars may be joined together by one or more transversely extended bar portions 2^b so as to give the required rigidity to the shank structure. By arranging the bars of the shank in spaced relation as described and shown, air may pass between and around the bars whereby heat to which the shank is subjected because of the operation of the heating element 5 will be dissipated by circulation of air with respect to the shank.

At its rearmost end the shank 2 is provided with a disk 16, which may be formed integrally with said shank or may be in the form of a separate element suitably secured thereto. The disk 16 has a pair of similar disks 17 and 18 associated with it in spaced relation, the disk 17 being provided with projected portions 18' formed on the opposite faces thereof which act as spacers for the disks. The disks 16, 17, and 18 are secured together by screws or other suitable fastening devices 20 which extend through said disks and through the projected portions 18' of the disk 17. The disk 18 has formed thereon a sleeve portion 21 which extends from said disk in a direction rearwardly of the device A. The sleeve portion 21 is provided with a plurality of apertures 22 formed through the wall thereof, and also fins 23, which extend rearwardly from the disk 18 and are arranged radially with respect to the sleeve portion 21, are provided.

By providing the device A with the spaced disks

16, 17, and 18, air is permitted to circulate through the portion of the device of which the spaced disks form parts, whereby heat is carried away from said portion of the device. Also, the apertures 22 formed in the sleeve portion 21 provide for the passage of air into the interior of the sleeve portion for cooling purposes, while the fins 23 provide additional faces with which air may contact and thereby carry heat away from the device.

Extended rearwardly from the portion of the device A provided by the spaced disks 16, 17, and 18 is the main handle H of the device. The handle H comprises an element of proper shape which is provided at its forward end with an extension H^a of reduced diameter, this extension H^a being extended into the rear end of the sleeve 21 already referred to herein. At the point where the extension H^a joins the handle H a shoulder H^b is provided, and interposed between this shoulder and the rearmost end of the sleeve 21 is a disk 24, said disk being provided with an opening formed centrally therethrough, through which the extension H^a of the handle passes. The disk 24 is formed of fiber or other suitable heat-insulating material and serves the purpose of protecting the hand of a user of the device which grips the handle H from the heat of the forward portion of the device.

Formed longitudinally through the handle H is an opening 25, which is of greater diameter at the rear portion of the handle than at the forward portion thereof, an annular shoulder 26 being present at the point where the larger and smaller portions of said opening meet. Arranged in contact with the shoulder 26 is a nut 27 which fits tightly within the larger portion of the opening 25, and screwed into said nut is one end of a tube 28, the opposite end of which is screwed into a screw-threaded opening formed centrally through the disk 18. Fitted tightly in the rearmost portion of the tube 28 is a bar 29 formed of electrical insulating material, said bar 29 being extended some distance beyond the rearmost end of the bar 28. The bar 29 is of rectangular shape in cross-section, and because the opening through the tube 28 is round in cross-section spaces are present within the tube 28 at opposite sides of the bar 29 through which the electrical conductors 6 are extended. The conductors 6 pass through openings formed through the spaced disks 16, 17, and 18 and pass through the tube 28, said conductors, as already stated, being arranged at opposite sides of the bar 29 and being secured at their rearmost ends to terminals 30 carried by said bar 29. Attached to the terminals by suitable attaching means is a pair of electrical conductors 31, which are enclosed in a flexible casing 32. At the free ends of the electrical conductors 31 a suitable electrical plug (not shown) is arranged, with the aid of which said conductors may be connected electrically to a source of electrical energy.

At the outer end portion of the handle H a sleeve 33, which preferably is formed of wood, is driven into the larger portion of the opening 25. This sleeve contacts at one of its ends with the nut 27, and its opposite end is flush with the rear face of the handle H. Also, within the rearmost end of the sleeve 33 an annular plug 34 formed of rubber or other yieldable material is arranged so that it surrounds the casing 32 of the electrical conductors 31. The wooden sleeve 33 which is driven tightly into the opening 25 prevents displacement of the nut 27, and the rubber plug 34

permits free movement of the electrical conductors 31 and the casing thereof and prevents such twisting of the conductors 31 as would do damage thereto.

5 The head 1 of the device is provided with a plurality of extensions 35, each of which is provided with a screw-threaded opening 35'. The screw-threaded openings 35' of the extensions 35 are adapted to receive the screw-threaded end portion of the shank 36 of a guiding handle 37. The plurality of extensions 35 are arranged at different positions on the head 1, as shown in Fig. 2, where one extension is shown at the top of the head and two are located at opposite sides thereof, and because of this arrangement the guiding handle 37 may be arranged as shown by full lines in Fig. 1, or, if preferred, said guiding handle may be arranged in either of the positions suggested by dotted lines in Fig. 2. The guiding handle 27 includes a ferrule 38 which is provided with apertures 38' formed therethrough, whereby air may pass into and through said ferrule so as to prevent overheating of the guiding handle. Also, the guiding handle has associated therewith a disk 39 of fiber or other suitable heat-insulating material, which protects the hand of a user of the device from the heat of the head of the device.

Formed through a portion of the head 1 of the device is an aperture 40 through which a guiding element 41 is extended. This guiding element is adjustable within the aperture 40 rotatably and in a direction transversely of the head 1, and a set screw 42 for fixing said guiding element in positions to which it has been adjusted is provided. In the use of the device the guiding element is set so that it moves longitudinally through a groove in a tire, while an adjacent groove is being cut with the aid of the device, and in this manner the user of the device is assisted in guiding the device while cutting a groove. Also, if desired, the guiding element may be adjusted so that it contacts with a side face of a tire being regrooved with the aid of the device, so as to assist in guiding the device.

45 The electrical conductors 6 connected to the electrical heating element 5 pass through a conical coil spring 43 located at the rearmost end of the head 1. The larger end portion of the conical coil spring 43 is extended into the rearmost end of the cavity 3 formed in the head 1, said larger end portion of the coil spring fitting tightly in said rearmost end portion of the cavity and contacting with the heating element 5, so that the coil spring may not be readily removed from the end of the cavity, and so that the coil spring will prevent accidental displacement of the heating element from said cavity. The smaller end portion of the conical coil spring fits tightly in an opening formed in a boss 44 formed on the shank 2 and disk 16, through which opening the electrical conductors 6 pass. Because the coil spring 43 is of conical shape with the larger end located adjacent to the heating element 5, a conduit of substantial diameter is provided for the escape of heat from the cavity 3. Also, because of the bend 43' in the coil spring, the coils producing the spring are separated at said bend, whereby heat passing from the cavity through the coil spring may escape from the interior of the coil spring, whereby the heat will be dissipated before it reaches the rear portion of the device.

In the use of the device A, the electrical conductors 31 are connected to a suitable source of electrical energy, whereby the heating element 5 will be placed in electrical operation. This will

result in the head 1 of the device being heated to a high temperature, and because the portions of the head above and below the slot 7 are in close contact with the blade 10, the heat of the head will be transmitted to the blade. As already stated herein, the head portion 1^a located above the slot 7 extends forwardly a considerable distance beyond the forward edge of the head portion 1^b located below the slot 7, and therefore a considerable portion of the top face of the blade is in direct contact with the head, whereby free transmission of heat from the head to the entire blade will result. The forward edge of the portion of the head 1 located below the slot 7 is located some distance rearwardly of the forward edge of the blade, so that said portion will not interfere with the cutting action of the device, but the contact of the portion 1^a of the head with a considerable portion of the top face of the blade maintains, through transmission of heat from the head to the blade, the desired high temperature at the blade. Also, because of the presence of the opening 9 formed in the forward portion of the head, a conduit is provided for direct passage of heat from the heating element 5 to the blade 10, as is shown clearly in Fig. 5, and this aids in maintaining the proper temperature at the blade.

When a groove is being cut with the aid of the device, the cutting edge C at the forward edge of the groove 12 formed in the blade 10, of course, passes through the rubber tread of the tire being acted upon, and because of the pressure applied to the device during the cutting of a groove therewith, the rubber at opposite sides of the groove being cut is forced upwardly and is compacted into the depressions 14 at the lower face of the blade. This has been found to insure a clean cut at the opposite sides of the groove being cut, whereby ragged edges at opposite sides of the grooves are prevented. As already stated herein, the sled end portions at the forward edge of the blade and at opposite sides of the groove 12 formed therein serve to induce the non-cutting portions of the forward edge of the blade to slide freely over the tire being grooved, and the side flanges 11 of the blade act to prevent undue sidewise movement of the blade with respect to the head 1 of the device. With respect to the shape of the groove 12, the fact that the groove is flared from one width at its forward edge to a greater width at the rear of the groove prevents binding of the rubber strips cut from tires by the cutting edge C. Also, the inclination of the groove 12 from its maximum depth at the front edge of the blade to the point where the groove merges into the blade proper insures free passage through the groove of the strips of rubber cut from tires, with no binding effect on said strips caused by obstructions in the groove.

From the foregoing it is plain that the heat necessary to the operation of the device is concentrated at the blade where such heat is required, and also, because of the various means for dissipating the heat at remote points relative to the blade, said heat is prevented from being a source of discomfort to a user of the device.

If desired, we may provide the blade 10 with a pair of apertures 50 located substantially as shown in Figs. 2 and 7. These apertures are adapted to receive portions of a suitable tool (not shown) whereby removal of the blade from the head may be rendered more convenient.

We claim:

1. A tire-grooving device comprising a head having a cavity formed therein, an electrical

heating element supported within said cavity, a blade carried by said head, said cavity being extended throughout substantially the entire head, that is, from one end of the head to a point adjacent to the other end of the head which is in close proximity to said blade, so as to position the electrical heating element close to said blade, and a handle for controlling movement of the device, the major axis of said handle and said head being disposed at an acute angle relative to each other so that an end of the head is out of alignment with the handle, whereby the electrical heating element may be introduced into or removed from the cavity without removing the handle.

2. A tire-grooving device comprising a head, an electrical heating device associated with said head, said head having a slot formed at the forward end thereof which is open at said forward end of the head, a blade supported in said slot in close contact with the portions of the head located above and below the slot, the portion of the head above the slot which contacts with the top face of the blade being extended forwardly beyond the portion of the head below the slot which contacts with the lower face of the blade, and a handle for controlling movement of the device.

3. A tire-grooving device comprising a head, an electrical heating device associated with said head, said head having a slot formed at the forward end thereof which is open at said forward end of the head, a blade supported in said slot in close contact with the portions of the head located above and below the slot, the portion of the head above the slot which contacts with the top face of the blade being extended forwardly beyond the portion of the head below the slot which contacts with the lower face of the blade, and a handle for controlling movement of the device, said head portions above and below the blade-receiving slot being provided with vertically disposed slots which give a forked shape to said head portions.

4. A blade for a tire-grooving device comprising a substantially flat section of material, and a groove formed in said section of material and extended for a portion only of the length of the blade, said groove being of varying depth from its greatest depth at an edge of the blade to a point spaced inwardly from said edge of the blade where the groove merges into the material of the blade proper, and said groove being of varying width with the narrowest width thereof located at said edge of the blade and the greatest width of the groove at the point where the groove merges into the material of the blade.

5. A blade for a tire-grooving device comprising a substantially flat section of material, a groove formed in said section of material and extended for a portion only of the length of the blade, said groove being of varying depth from its greatest depth at an edge of the blade to a point spaced inwardly from said edge of the blade where the groove merges into the material of the blade proper, and humps formed at opposite sides of the groove and extended longitudinally thereof, said humps being extended above the top face of the blade and providing corresponding depressions at the lower face of said blade.

6. A blade for a tire-grooving device comprising a substantially flat section of material, a groove formed in said section of material and extended for a portion only of the length of the blade, said groove being of varying depth from

its greatest depth at an edge of the blade to a point spaced inwardly from said edge of the blade where the groove merges into the material of the blade proper, humps formed at opposite sides of the groove and extended longitudinally thereof, said humps being extended above the top face of the blade and providing corresponding depressions at the lower face of said blade, and upwardly extended flanges at opposite sides of the blade.

7. A blade for a tire-grooving device comprising a substantially flat section of material, a groove formed in said section of material and extended from the forward edge of the blade for a portion only of the length of the blade, said groove being formed by depressing a portion of the material of the blade, and said depressed portion of material having a cutting edge formed at the forward edge of the blade, and upwardly curved edge portions at the forward edge of the blade and at opposite sides of the groove for facilitating movement of the blade along the surface of the tire.

8. A blade for a tire-grooving device comprising a substantially flat section of material, a groove formed in said section of material and extended from the forward edge of the blade for a portion only of the length of the blade, said groove being formed by depressing a portion of the material of the blade, and said depressed portion of material having a cutting edge formed at the forward edge of the blade, said groove being of varying depth from its greatest depth at the forward edge of the blade to a point spaced inwardly from said forward edge of the blade where the groove merges into the material of the blade proper, and said groove being of varying width with the narrowest width located at the forward edge of the blade and the greatest width located at the point where the groove merges into the material of the blade, and upwardly curved edge portions at the forward edge of the blade and at opposite sides of the groove for facilitating movement of the blade along the surface of a tire.

9. A blade for a tire-grooving device comprising a substantially flat section of material, a groove formed in said section of material and extended from the forward edge of the blade for a portion only of the length of the blade, said groove being formed by depressing a portion of the material of the blade, and said depressed portion of material having a cutting edge formed at the forward edge of the blade, said groove being of varying depth from its greatest depth at the forward edge of the blade to a point spaced inwardly from said forward edge of the blade where the groove merges into the material of the blade proper, and said groove being of varying width with the narrowest width located at the forward edge of the blade and the greatest width located at the point where the groove merges into the material of the blade, upwardly curved edge portions at the forward edge of the blade and at opposite sides of the groove for facilitating movement of the blade along the surface of a tire, and upwardly extended flanges at opposite sides of the blade.

10. A tire-grooving device comprising a head, a blade carried by said head, an electrical heating element for imparting heat to said blade, a main handle for controlling movement of the device, a guiding handle for aiding in controlling the movement of the device, and a plurality of means associated with said head in varying positions

with respect thereto and adapted individually to receive a portion of said guiding handle in a manner to connect said guiding handle to said head, said guiding handle being connected to said head with the aid of any one of the variously positioned means so as to dispose the guiding handle in various positions with respect to said head.

11. A tire-grooving device comprising a head, a blade carried by said head, an electrical heating element for imparting heat to said head and blade, a shank portion associated with said head, and a handle for controlling movement of the device, said shank being comprised of spaced apart bar elements between and around which air may circulate for carrying away heat from the shank.

12. A tire-grooving device comprising a head, a blade carried by said head, an electrical heating element for imparting heat to said head and blade, a shank portion associated with said head, a handle for controlling movement of the device, said shank being comprised of spaced apart elements between and around which air may cir-

culate for carrying away heat from the shank, and spaced apart disks interposed between said shank and said handle between which air may pass for cooling purposes.

13. A tire-grooving device comprising a head having a cavity formed therein, an electrical heating element supported within said cavity, a blade carried by said head, a handle for controlling movement of the device, a shank extended from said head to said handle, electrical conductors leading from said heating element, and a conical coil spring through which said electrical conductors pass, the larger end portion of said conical coil spring being extended into an end of said cavity in the head and the smaller end portion thereof being extended into an opening formed in a portion of said shank, said conical coil spring being arranged in curved formation so that coils thereof are separated from each other at the bend thereof so that heat passing through the coil spring from said cavity may escape therefrom between said separated coils.

CLIFFORD F. BOYER.
GEORGE W. FOUKE.