Nov. 4, 1952 J D. HOUGH 2,616,230

ABRASIVE CUTOFF WHEEL

Filed July 11, 1950

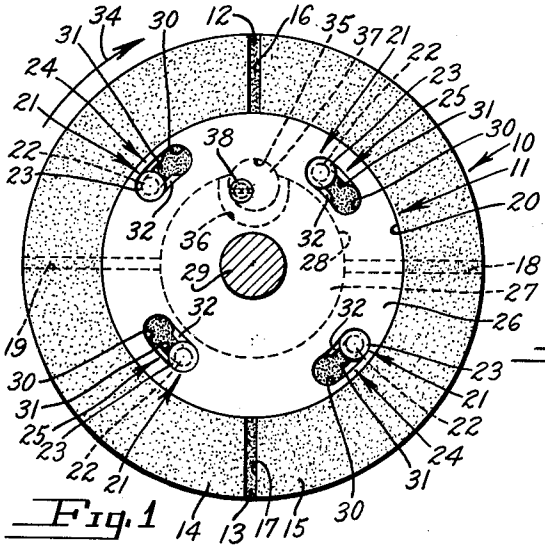


Fig. 1

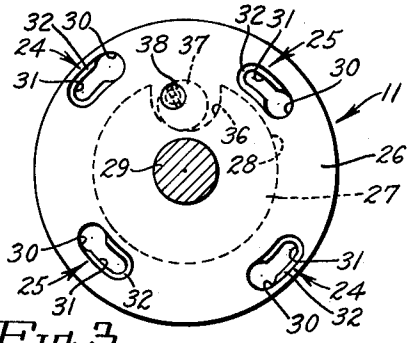


Fig. 3

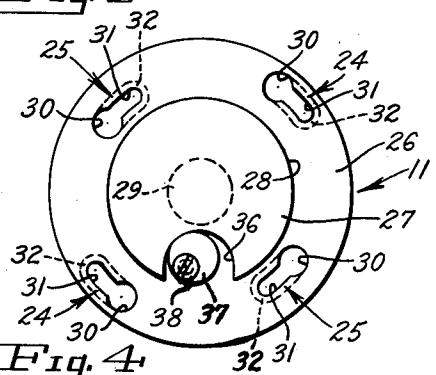


Fig. 4

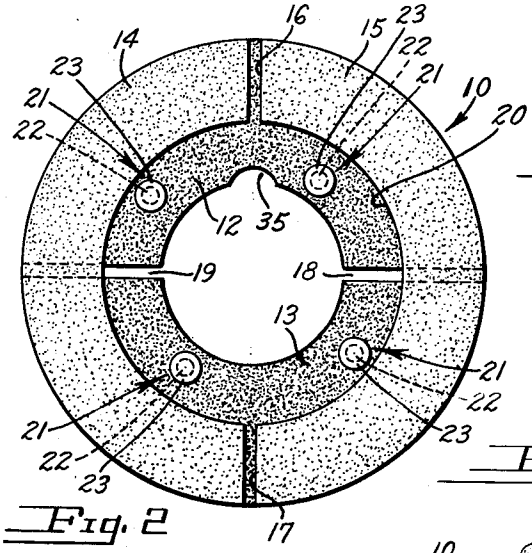


Fig. 2

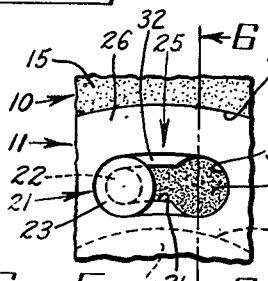


Fig. 5

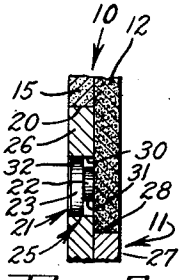


Fig. 6

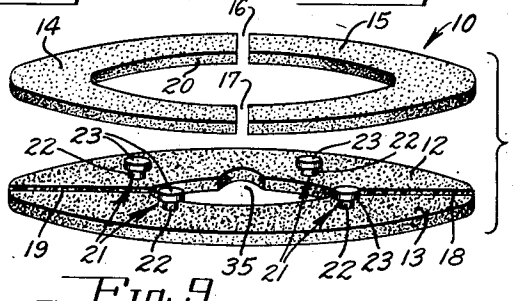


Fig. 9

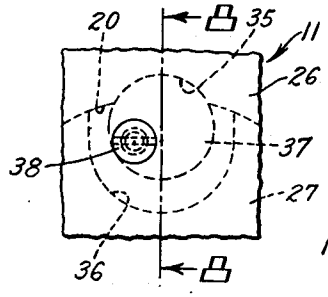


Fig. 7

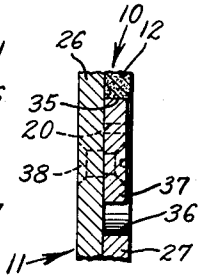


Fig. 8

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ABRASIVE CUTOFF WHEEL

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Application July 11, 1950, Serial No. 173,158

11 Claims. (Cl. 51—207)

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This invention relates to new and useful improvements in abrasive articles and has particular relation to abrasive cutoff wheels.

An object of the invention is to provide an abrasive cutoff wheel including an outer usable abrasive rim member and an inner permanent mounting hub, both of improved construction, wherein the rim is securely and rigidly mounted on the hub and whereby a worn down rim member may be easily and quickly removed and replaced by a new one.

Another object is to provide an abrasive cutoff wheel of the character indicated including means whereby a worn rim member may be easily and quickly removed from the hub and may be easily and quickly replaced by a new rim member, all from the front side of the wheel.

A further object is to provide an abrasive cutoff wheel having the characteristics indicated and including a means for easily and quickly locking a new abrasive rim in place on a hub against movement relative thereto and which locking means is easily manipulable to a released position for permitting the removal of a worn rim from a hub.

Other objects and advantages of the invention will become apparent from a consideration of the following detailed description taken in connection with the accompanying drawing wherein a satisfactory embodiment of the invention is shown. However, it is to be understood that the invention is not limited to the details disclosed but includes all variations and modifications as fall within the spirit of the invention and the scope of the appended claims.

In the drawing:

Fig. 1 is a rear elevational view showing an abrasive cutoff wheel made in accordance with the invention;

Fig. 2 is a rear elevational view of the abrasive rim of the wheel;

Fig. 3 is a rear elevational view of the wheel hub;

Fig. 4 is a front elevational view of said wheel hub;

Fig. 5 is an enlarged rear elevational view of a small section of the wheel showing construction details;

Fig. 6 is a sectional view taken as along the line 6—6 of Fig. 5;

Fig. 7 is an enlarged rear elevational view showing a key locking the rim and hub together against relative turning movement;

Fig. 8 is a sectional view taken along the line 8—8 of Fig. 7; and

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Fig. 9 is an isometric view showing the rim member sections separated but positioned for assembly.

Referring in detail to the drawing, the improved abrasive cutoff wheel of the invention as there shown comprises essentially an outer rim member generally designated 10 and a hub member generally designated 11. Rim member 10 is shown as an abrasive annulus having outer and inner annular peripheries, although it may be differently shaped at its inner periphery.

The rigid driving hub 11 is preferably of metal and has its outer peripheral portions shaped to correspond with that of the inner peripheral portions of the rim member 10. As is later set forth in detail, rim member 10 is detachably mounted on the hub member 11 and is driven by the latter. With such a construction, when a rim member wears down to the point where it is no longer of a diameter to be economically used, the worn rim member is removed from the hub member and is replaced by a new full size rim member.

Rim member 10 is a laminated structure made up of a front layer and a rear layer. The front layer comprises a plurality of arcuate sections 12 and 13 of an annulus, while the rear layer comprises the arcuate sections or elements 14 and 15. In actual practice, rim 10 will, in many instances, be of relatively large outside diameter as, for example, a diameter of 36" or even more. Additionally, it is to be understood that the layers of the rim 10 may each comprise a single section, but preferably, at least, each comprises two sections and it will be understood that a rim may be made up of more than two layers.

The manufacture of a large diameter abrasive rim member by methods heretofore generally practised involves the use of large and expensive equipment, not available to the smaller manufacturers of abrasive cutoff wheels. The abrasive portion of the rim member of the present invention is preferably made by the method set forth in the application of Hugh V. Allison, Ser. No. 154,944 filed April 10, 1950. According to that method, abrasive rim 10, of substantially any desired diameter, may be made without the necessity of the manufacturer providing himself with large, expensive equipment.

In the manufacture of the rim member 10, sections 12, 13, 14 and 15 are prepared. Such sections are in the nature of strips curved edgewise so that each comprises approximately one-half an annulus. The strips are of abrasive grain and a suitable bonding medium. The bond and

its cure is generally determined by the use to which the abrasive cutoff wheel is to be put and thus the bond may be resinoid or rubber, or of any other material or combinations of materials.

In making the rim member, strips may be rolled out and the sections died therefrom. Then the sections 12 and 14 will be arranged with their adjacent ends slightly spaced as in Fig. 9 but with their outer edges defining substantially a complete circle. Thereafter, the sections 14 and 15 are placed on the sections 12 and 13 in staggered relation with the latter but with the end portions of the sections 14 and 15 also slightly spaced.

In this assembly, the mid portion of the section 15 overlaps the space between a pair of adjacent ends of the sections 12 and 13 while the mid portion of the section 14 overlaps the space between the other pairs of ends of the sections 12 and 13. Then the mid portions of sections 12 and 13 span the spaces between the pairs of adjacent ends of the sections 14 and 15.

This staggering of the sections of one layer with respect to those of the other layer provides a rim member in the form of an annulus having through its rear face a pair of radially extending channels 16 and 17 extending from its inner through its outer periphery. Additionally, in the rim member, the spaces between the ends of the sections 12 and 13 of the front layer define a pair of channels 18 and 19 through the front side of the rim member and extending from the inner periphery of the front layer of the rim member to the outer periphery thereof.

The layers of the rim may be assembled green or prior to complete curing of the bonding medium although, in a completely cured state, the layers may be assembled with the use of proper adhesive. The layers are so assembled that their outer peripheries are substantially flush with one another. However, the sections 12 and 13 of the front layer are wider than are the sections 14 and 15 of the rear layer and thus the inner peripheral edges of the layers are not flush with one another. For example, in Fig. 3, the inner periphery of the layer made up of the sections 14 and 15 is of larger diameter than is the inner periphery of the front layer made up of the sections 12 and 13. This results in the formation of a recess 20 of a depth equal to the thickness of one of the segments 14 and 15 and opening through the rear side of the rim member and through the inner peripheral edge thereof.

A series of short rigid studs 21 are rigidly attached to the bottom wall of the mentioned recess or to the portions of the front layer exposed through the recess. As shown in Fig. 2, the studs 21 are staggered, one being toward the outer edge of the exposed bottom wall of the recess while the next is toward the inner edge of such portion. Thus, the studs are staggered radially over the surface comprising the bottom wall of the recess 20.

In a completed wheel, the mentioned portion of the front layer of the abrasive rim is overlapped by the outer peripheral portion of the hub 11, as will be set forth, and thus, in a completed wheel, the studs 21 are carried by a portion of the rim member which is overlapped by a portion of the driving hub member. These studs need not be abrasive or do not comprise a mixture of abrasive grain and a bond, but preferably are of metal or of a hard, tough resin suitably adhered to the defined portion of the rim member.

For a purpose to be described, the studs 21 each include a reduced diameter shank or stem-like portion 22 which at its free end is adhered to the rim member. Then, at its outer end, each stud includes an enlarged diameter portion or a head 23 located in spaced relation to the rim member. The studs may be attached to the rim member either before or after final curing of the bond of the latter. Preferably, the studs are positioned while the sections of the rim are yet green and are placed in the curing chamber with the other elements of the rim.

During the curing, as the various sections are bonded to one another, the studs are bonded in place. With the sections assembled to form the rim member prior to the final curing of the bond, the sections of one layer will become bonded to those of the other layer during the final cure and thus a substantially homogeneous structure results.

In this way, the bond between the sections of one layer and those of the other will be of the strength of the bond securing the grain in place and will have an equally useful life. It will be understood that the final cure will depend upon the bond employed. For example, if the bond is of rubber it will contain sulphur and other necessary ingredients and the rim member will be vulcanized. If the bond is resinoid, the rim member will be cured by a process for accomplishing the desired cure.

The hub 11 includes a larger diameter portion 26 of a diameter to be received in the recess 20 of the rim member and concentric with the portion 26 includes a thicker portion 27 of smaller diameter. Portion 27 is shown as a disc formed separate from the portion 26 and the portions are secured together in any desired manner but in concentric relation so that an annular shoulder 28 is formed. A shaft portion or stud 29 may be formed with the hub portion 26 and is adapted to be held by a chuck or the like, or may be otherwise driven and, in fact, may be a permanent part of some driving mechanism (not shown).

Through the hub portion 26, outer and inner annular series of holes 24 and 25 are formed. The holes of one annular series are staggered with respect to those of the other series in the same manner as the studs 21 on the abrasive rim member. The holes correspond in number with the number of studs and each hole is in the shape of a keyhole comprising a portion 30 of a diameter through which the heads 23 of the studs 21 may pass and then comprising a radial extension 31 of substantially the diameter of the shanks 22 of said studs. The hub is countersunk in its portions about the radial extensions 31 of the holes, such countersinks being indicated at 32 and being of dimensions to receive the heads 23 of the studs 21 and to have such heads lie wholly within such countersinks.

In assembling the wheel, assuming that the hub 11 is part of a machine, the rim member 10 is disposed at the forward side of the hub with the studs of the rim member entering through the portions 30 of the series of holes 24 and 25 through the larger diameter portion 26 of the hub and with the hub portion 27 received within the inner periphery of the forward layer of the rim member. It will be clear that the outer peripheral portion or hub part 26 is received within the recess 20 of the rim member.

From Figs. 6 and 8, it will be seen that the hub 11 is of a thickness to be received between or within the planes defined by the front and rear

surfaces of the rim member. Conveniently, this is accomplished by having the larger diameter hub portion 26 of a thickness equal to or slightly less than that of the rear layer of the rim member and by having the smaller diameter hub portion 27 of a thickness equal to or slightly less than that of the front layer of the rim member. With this construction, the wheel is adapted to cut through a work piece of a diameter greater than the width of the abrasive wheel rim. This is true, since the thin metal driving hub of the present wheel may enter into a cut made by the abrasive rim.

The rim having been placed on the hub, as above described, the rim is given a slight turn on the hub, the latter remaining stationary. Such a turn carries the studs 21 on the rim through the radial slot-like extensions or portions 31 of the openings of the series 24 and 25 to the inner ends of such portions locating the heads 23 of the studs in the rear or closed-in portions of the described countersinks 32. Assuming that the wheel is to turn in the direction of the arrow 34 in Fig. 1, it will be understood that the wheel rim is turned in a counter-clockwise direction in locating the studs as described.

The studs 21 being in radially spaced annular series and the holes 24 and 25 being similarly spaced, it will be seen that the rim is attached to the hub at places spaced radially outwardly of one another. Also, the studs are of such length that their heads located in the countersinks 32 serve to keep the bottom wall of the recess 20 of the rim rather tight against the face of the larger diameter hub portion 26. At the same time, the heads of the studs do not project beyond the rear face of the hub portion whereby not to interfere with such hub portion entering a cut made by the described rim portion.

It is desired that the relationship of the holes 24 and 25 and the studs and the other parts be such that a certain friction exists when the rim is turned in the counter-clockwise direction as described whereby there is no play between the parts such as might result in flutter of the rim during use. Means are provided for locking the rim in the described turned relation with the hub. To the desired end, a notch 35 is cut through the innermost peripheral edge of the rim. Additionally, a notch 36 is provided in the thickened hub portion 27 and a locking key 37 is located in the recess 36 and is fast with a screw 38 eccentric with respect to the key.

On turning of this key, as from the position of Fig. 3 to that of Fig. 8, the key snugly enters the notch 35 in the innermost periphery of the rim whereby the rim has no turning movement on the hub or relative to the hub. Movement of the key is easily accomplished by a screw driver and the key may be turned in a reverse position or back to the position of Fig. 3 to an out-of-the-way position to permit of the necessary slight turning of a worn rim for releasing it from the key-hole slots 24 and 25. It will be understood that the key 37 and screw 38 lie within the planes defined by the sides of the rim 10.

In the assembled wheel, the slotted or head end of the screw 38 is at the forward side of the wheel, being in the thickened central portion 27 of the hub. Therefore, the hub being mounted and the key being positioned in the inoperative or released position of Fig. 4, rim member 10 may be disposed against the forward side of the hub and given a partial turning movement to operating position. Now, through use of a screw driver or other suitable tool, the key 37 is rotated or shifted through a slight increment so as to dispose a portion of it in the notch 35 of the rim, as shown in Figs. 1 and 8.

When using the present wheel, the slots 16, 17, 18 and 19 opening through the front and rear faces of the rim member 10 and extending radially thereof have a function in that they provide for the carrying of a cooling medium directly into a cut being made. Where these wheels operate in a fluid or coolant, as is commercially done with rubber bonded cutoff wheels, the mentioned channels will be filled with the coolant and as each channel successively moves into a cut during rotation of the wheel, coolant is carried into the cut.

Circumferentially, the channels are alternately in opposite faces of the wheel and thus the coolant will be carried into the cut successively at alternate sides of the wheel. While the formation of the rim member with the slots 16–19 is a preferred construction, it will be understood that the invention is not limited to such construction as many features of the invention are useful with rim members not provided with slots or other coolant carrying features.

When these cutoff wheels are in use, they are rotated at high speeds and where the wheels are of large diameters it will be clear that many linear feet of a wheel pass through a cut per minute of operation. As the wheels wear down, the mentioned passage of linear feet becomes less and finally a point is reached where efficient operation on a particular job is not had. With the present large diameter hub, the wheel is stiff and true running and the abrasive rim is entirely used up so there is no large stub to be discarded.

With the present wheel, when efficient operation is no longer attained, the screw 38 is operated to turn the key 37 to released position and the worn rim is then turned slightly to align the heads 23 of the studs 21 with the large diameter portions 30 of the openings 24 and 25 and the worn rim is simply moved laterally off the hub and is replaced by a new rim. The latter is secured in place in the manner above set forth when discussing the application of the rim to the hub.

Having thus set forth the nature of my invention, what I claim is:

1. An abrasive cutoff wheel comprising an abrasive rim member having a recess opening through one side and its inner periphery, a driving hub of a diameter having its outer peripheral portion received in said recess in overlapping relation with a portion of said rim member, said hub being of a thickness not greater than that of the rim member whereby to lie wholly within the planes represented by the side surfaces of the rim member, said hub having a series of keyhole openings therethrough, a series of headed studs on the overlapped portion of said rim member and having heads of a diameter to pass through the larger portions of said keyhole openings and having shanks to be received in the smaller portions of said openings on slight relative turning of said rim member and hub, a locking key on said hub, said rim having a notch to receive said key when the shanks of said studs are in the smaller portions of said openings whereby to lock said rim and hub against any relative turning movement, and means for manipulating said key into and out of said notch.

2. An abrasive cutoff wheel comprising an abrasive rim member having a recess opening

through one side and its inner periphery, a driving hub of a diameter having its outer peripheral portion received in said recess in overlapping relation with a portion of said rim member, said hub being of a thickness not greater than that of the rim member whereby to lie wholly within the planes represented by the side surfaces of the rim member, said hub having a series of keyhole openings therethrough, a series of headed studs on the overlapped portion of said rim member and having heads of a diameter to pass through the larger portions of said keyhole openings and having shanks to be received in the smaller portions of said openings on slight relative turning of said rim member and hub, and countersinks about the smaller portions of said keyhole openings and of sizes and depths wholly receiving the heads of said studs whereby the latter lie wholly within said planes.

3. An abrasive cutoff wheel comprising an abrasive rim member having a recess opening through one side and its inner periphery, a driving hub of a diameter having its outer peripheral portion received in said recess in overlapping relation with a portion of said rim member, said hub being of a thickness not greater than that of the rim member whereby to lie wholly within the planes represented by the side surfaces of the rim member, said hub having a series of keyhole openings therethrough, a series of headed studs on the overlapped portion of said rim member and having heads of a diameter to pass through the larger portions of said keyhole openings and having shanks to be received in the smaller portions of said openings on slight relative turning of said rim member and hub, countersinks about the smaller portions of said keyhole openings and of sizes and depths to wholly receive the heads of said studs, a locking key on said hub, said rim having a notch to receive said key whereby to lock said rim and hub against any relative turning movement, and means for manipulating said key into and out of said notch.

4. The abrasive cutoff wheel as in claim 1 wherein said openings and studs each comprise at least two radially spaced annular series.

5. The abrasive cutoff wheel as in claim 1 wherein said openings and studs each comprise at least two radially spaced annular series with those of one series in staggered relation with those of the other series.

6. An abrasive cutoff wheel comprising an abrasive rim member and a driving hub of less diameter than said rim member, cooperating means on said hub and rim member for securing the rim member on the hub and in driving relation therewith on relative lateral movement of said members against one another followed by the partial turning movement of one relative to the other, and a locking key pivoted on one of said members and manually pivotally movable into engagement with the other thereof to prevent casual reversal of said relative turning movement of the members and then pivotally movable out of such engagement to permit of reversal of such relative turning movement.

7. An abrasive cutoff wheel comprising an abrasive rim member having a recess opening through one side and its inner periphery, a driving hub of a diameter having its outer peripheral portion received in said recess in overlapping relation with a portion of said rim member, cooperating means on the overlapping portions of said hub and rim member and securing the rim member on the hub and in driving relation therewith on relative lateral movement of said members against one another followed by the partial turning movement of one relative to the other, and a locking key pivoted on one of said members and manually pivotally movable into engagement with the other thereof to prevent casual reversal of said relative turning movement of the members and then pivotally movable out of such engagement to permit of reversal of such relative turning movement.

8. An abrasive cutoff wheel rim comprising an abrasive body having an annular outer periphery and a pair of inner edges of which one is of greater diameter than the other whereby said body has a recess opening through one side and its inner periphery, studs extending laterally with respect to a side surface of said body from the inner wall of said recess for cooperating axial engagement with a hub on which said body is mounted, and said body having a notch opening radially through its inner edge of smaller diameter for cooperating radial reception of a key on a hub on which said body is mounted whereby to lock the body and said hub member against relative rotation.

9. An abrasive cutoff wheel rim comprising an abrasive body having an annular outer periphery and an inner edge, studs extending laterally with respect to a side surface of said body for cooperating axial engagement with a hub on which said body is mounted, and said body having a notch opening radially through its inner edge for cooperating radial reception of a key on a hub on which said body is mounted whereby to lock the body and hub member against relative rotation.

10. An abrasive cutoff wheel comprising an abrasive rim member having a recess opening through one side and its inner periphery, a driving hub of a diameter having its outer peripheral portion received in said recess in overlapping relation with a portion of said rim member, said hub being of a thickness not greater than that of the rim member whereby to lie wholly within the planes represented by the side surfaces of the rim member, said hub having a series of keyhole openings therethrough, a series of headed studs on the overlapped portion of said rim member and having heads on a diameter to pass through the larger portions of said keyhole openings and having shanks to be received in the smaller portions of said openings on slight relative turning of said rim member and hub, countersinks about the smaller portions of said keyhole openings and sizes and depths to wholly receive the heads of said studs, a locking key pivoted on said hub, said rim having a notched opening radially through an inner edge to receive said key whereby to lock said rim and hub against any relative turning movement, means for manually pivotally turning said key between a position entering said notch and a position free of said notch whereby in the former of said positions the key is locking the rim and hub against any relative turning movement and in the latter of said positions the rim and hub are capable of relative turning movement.

11. An abrasive cutoff wheel comprising an abrasive rim member having a recess opening through one side and its inner periphery, a driving hub of a diameter having its outer peripheral portion received in said recess in overlapping relation with a portion of said rim member, said

hub being of a thickness not greater than that of the rim member whereby to lie wholly within the planes represented by the side surfaces of the rim member, said hub having a series of keyhole openings therethrough, a series of headed studs on the overlapped portion of said rim member and having heads of the diameter to pass through the larger portions of said keyhole openings and having shanks to be received in the smaller portions of said openings on slight relative turning of said rim member and hub, countersinks about the smaller portions of said keyhole openings and of sizes and depths to wholly receive the heads of said studs, a locking key pivoted on said hub, said rim having a notch opening radially through its inner edge of smaller diameter to receive said key whereby to lock said rim and hub against any relative turning movement, means for manually pivotally turning said key between a position entering said notch and a position free of said notch whereby in the former of said positions the key is locking the rim and hub against any relative turning movement and in the latter of said positions the rim and hub are capable of relative turning movement.

J DONALD HOUGH.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
813,167	Olmstead	Feb. 20, 1906
977,325	Nichols	Nov. 29, 1910
980,882	Nichols	Jan. 3, 1911
1,162,970	Binford	Dec. 7, 1915
2,425,368	Doermann	Aug. 12, 1947
2,457,516	Allison	Dec. 28, 1948
2,524,323	Lloyd-Young	Oct. 3, 1950