April 11, 1961 E. S. HAVEN ET AL 2,978,845

ABRASIVE DEVICES

Filed Jan. 27, 1960

2 Sheets-Sheet 1

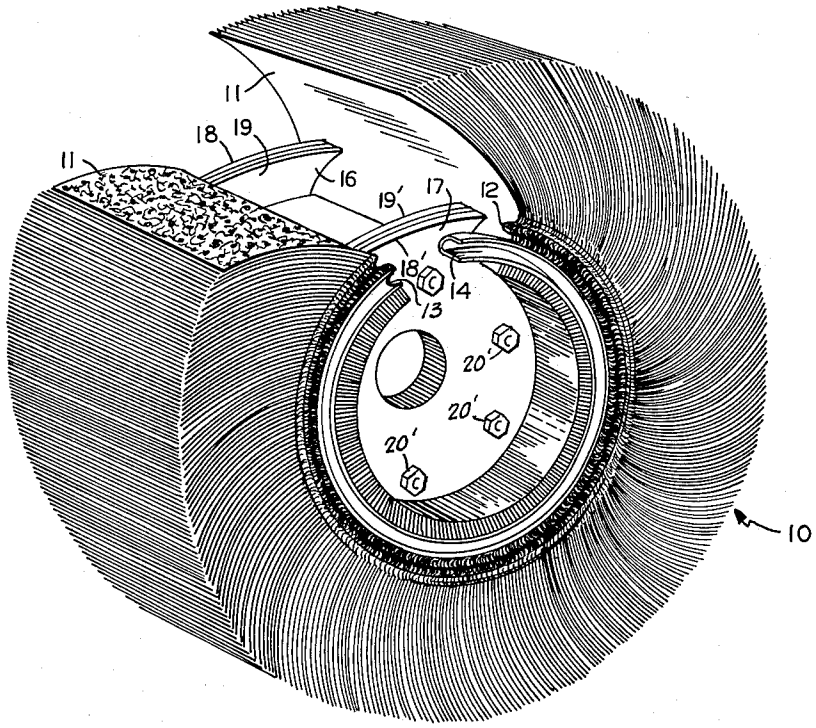


FIG. 1

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2 Sheets-Sheet 2

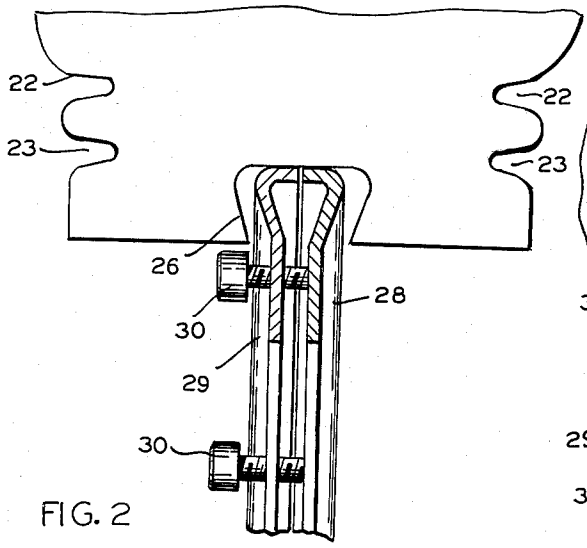


FIG. 2

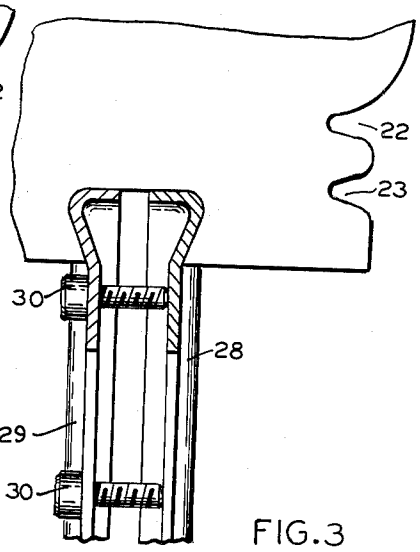


FIG. 3

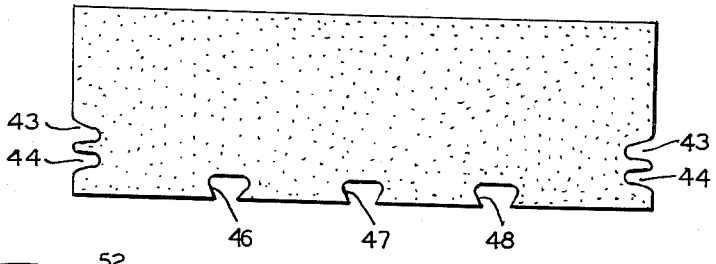


FIG. 4

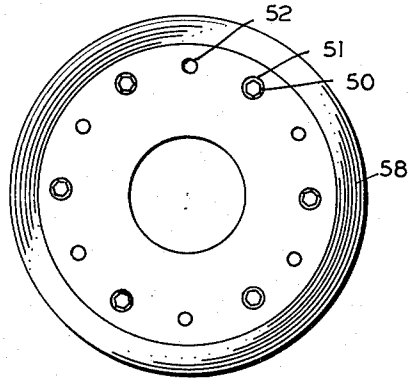


FIG. 5

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2,978,845

# ABRASIVE DEVICES

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3 Claims. (Cl. 51—193.5)

This invention relates to grinding and polishing wheels formed from a plurality of sheets of flexible coated abrasive material, wherein the sheets extend radially outwardly of the wheel. Such wheels are generally termed "flap wheels."

Wheels of the type referred to are shown in U.S. patents: 2,651,894; 2,818,691; 2,842,902 and others.

Wheels of this type have been particularly useful in certain applications. However, as is the case with any article which is rotated at high speeds, a point is reached at which the wheel will explode due to centrifugal force. Such explosions are of course a serious accident hazard.

It is therefore, an object of the present invention to provide a reinforced flap wheel construction having increased resistance to explosion at high rotation speeds.

It is a further object of our invention to provide a flap wheel construction whereby wide wheels may be constructed which are safe and economical.

In the past flap wheels have been constructed by reinforcing the inner ends of the flaps with an adhesive, such as glue, or preferably a curable synthetic resin. In some cases the adhesive has been applied only to the ends of the flaps, in other cases it has extended for some distance radially outwardly from the inner ends of the flaps. In addition it has been common practice to reinforce the wheels at the sides, a substantial distance radially inwardly of the wheel, by fitting one or more metal rings in one or more grooves at each side of the wheel. Such construction has proved satisfactory in narrow width wheels. However, with wide wheels, it has been found that additional support is required. The present invention provides such additional support by introducing novel support members at the inner circumference of the wheel.

The invention will now be more fully described, having reference to the accompanying drawings wherein:

Figure 1 is a perspective view, with some of the flaps removed for the purpose of illustration, of an unmounted wheel of the invention.

Figure 2 is a partial cross-sectional view of a wheel showing the inner end of one of the coated abrasive flaps used in a wheel of the present invention with part of a reinforcing means shown.

Figure 3 is a view similar to Figure 2, showing the reinforcing means in operative position.

Figure 4 is a front elevation of an abrasive sheet for a flap wheel having three internal sets of reinforcing rings.

Figure 5 is a side view of a reinforcing ring of our invention.

In Figure 1 is shown the completed wheel **10** of the invention having two internal reinforcing means with a number of flaps removed to more clearly show the construction. The individual flaps are indicated at **11**, each flap being adhesively coated on one side with abrasive grain, the abrasive sides of the flaps all facing in the same direction. On each side of the wheel adjacent the inner diameter are two grooves or channels **12** and **13**, in at least one of which on each side of the wheel may be mounted a retaining and forming ring **14**. In the inner periphery of the wheel are shown two channels **16** and **17**, the walls of which diverge from the inner periphery, radially outwardly in dovetail fashion. Positioned in each groove **16** and **17** are a set of reinforcing rings **18**, **19** and **18'**, **19'**.



Each set of reinforcing rings **18**, **19** and **18'**, **19'** consists of two halves, identical in shape complementary to the internal shape of the dovetail channels **16** and **17**. One half (**18** and **18'**) in each set has a plurality drilled and tapped holes around its inner circumference to receive jacking screws **20'** shown in the reinforcing half **18'**. A similar set of screws, not shown in Figure 1, are positioned in reinforcing half **18**. With the jacking screws retracted, the ring set can be placed together face to face and the cross sectional dimension is then small enough to permit initial positioning of the flaps on the reinforcing rings. When all of the flaps have been positioned around the reinforcing rings the jacking screws are then turned in forcing the two halves apart until full engagement of the rings with the respective dovetail notches is achieved.

Figure 2 shows a single flap **11** of a modified wheel having a single set of internal reinforcing rings. Notches **22** and **23** are cut in each flap to form corresponding grooves similar to grooves **12** and **13** in Figure 1. At **26** is an internal dovetail notch in which rings **28** and **29** are mounted similar to rings **18** and **19** of Figure 1. In groove **26** is shown the ring assembly **28**, **29** in retracted position prior to turning of the jacking screws **30**.

Figure 3 shows a fragmentary cross-sectional view of a flap wheel wherein the jacking screws have been operated to expand the ring assembly **28**, **29**.

Figure 4 illustrates a form of abrasive flap used in wide wheels of our invention where three internal reinforcing ring sets may be employed. The flap **41** is provided at each side with notches **43** and **44**. Along the bottom edge of the flap are provided three dovetail cuts **46**, **47** and **48** in which reinforcing ring sets similar to rings **18** and **19** of Figure 1 are mounted. As will be apparent, a plurality of sheets **41** are formed about three reinforcing rings to form an annular wheel similar to that of Figure 1.

In Figure 5 is shown a side view of a reinforcing ring **58** employed in the wheels formed from flaps such as shown in Figure 4. The ring is provided with tapped holes **50** to accommodate jacking screws **51**. In addition, access holes **52** are provided for insertion of a tool to actuate the jacking screws of the internal reinforcing rings. The ring **58** cooperates with a similar ring, but not provided with tapped holes, against which the jacking screws abut to expand the ring set.

The provision of the access holes is essential where more than two reinforcing rings are employed since the inner ring or rings are otherwise inaccessible when the flaps **41** have been positioned about the reinforcing rings. By providing such access holes and by properly lining up the jacking screws of the internal rings, any desired number of sets of internal reinforcing rings may be provided in a wheel.

In assembly wheels made according to the present invention, the internal reinforcing rings are mounted on a vertical support, spaced the proper distance apart and held temporarily in place by frictional contact, detent or other means, with the vertical support while the abrasive flaps are arranged about them. When a sufficient number of flaps have been inserted to form a wheel of the desired density, rings **14** may be inserted at each end of the wheel to add support and to help align the flaps,

When all the flaps are arranged in place, the jacking screws in the reinforcing rings are rotated to expand the reinforcing rings into snug engagement with the dovetail grooves.

Finally, adhesive is applied to the inner ends of the flaps **11** and allowed to penetrate radially outwardly of the inner ends of the flaps to a depth approximately equal to the depth of the dovetail grooves. This can readily be accomplished by temporarily capping the ends of the wheel, pouring the liquid resin at the desired locations at the inner annulus of the wheel and rotating the wheel about a horizontal axis.

As an example of the type of wheel which can be satisfactorily constructed according to my invention, approximately 950 sheets of a 120 grit silicon carbide coated "J" weight cloth backed coated abrasive are employed. The sheets, for example, are 10 inches in width and about 5¼ inches long, having notches **16** and **17** at their base and notches **12** and **13** at their sides. The sheets are formed into an annulus about the reinforcing rings **18**, **19** and **18'**, **19'** with the aid of an assembly fixture and the reinforcing and retaining rings are inserted as above described. Adhesive is then applied in the manner described above to the inner ends of the flaps and cured. The finished wheel is 10 inches wide and about 16 inches in diameter. It can be run without breaking at speeds as high as 2700 r.p.m. Standard end plates which mate with the grooves **12** and **13** are mounted at each side of the wheel when the wheel is in operative position on a shaft, ready for use.

We claim:

1. An annular abrasive wheel comprising a plurality of abrasive coated sheets, said sheets being secured in an annular row, each side of said wheel being provided with at least one annular groove having a reinforcing ring positioned therein, at least one annular groove in the internal periphery of said wheel, said groove being narrowest at its inner diameter and widest at its outer diameter, and a reinforcing member positioned in said groove, said reinforcing member conforming to the shape of said groove.



2. An annular abrasive wheel comprising a plurality of abrasive coated sheets, said sheets being secured in an annular row, at least one annular groove in the internal periphery of said wheel, said groove being narrowest at its inner diameter and widest at its outer diameter, an annular reinforcing means positioned in said groove, said reinforcing means being expanded from an initial condition whereby it is narrower than said groove to an operative position whereby said reinforcing means is locked in said groove.

3. An annular abrasive wheel comprising a plurality of abrasive coated sheets, said sheets being secured in an annular row, at least three annular grooves in the internal periphery of said wheel, each of said grooves having a lip narrower than the internal width of said groove, an annular reinforcing means positioned in each groove and operative from an initial condition whereby the maximum width of said reinforcing means is smaller than the width of said lip to an expanded condition whereby each reinforcing means is locked in its respective groove, access opening in at least one of said reinforcing means to permit entry of a tool for operating an adjacent reinforcing means from said initial to said expanded condition.

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