June 24, 1969 H. J. McALEER 3,451,093

CARTRIDGE WORK WHEEL

Filed Oct. 23, 1965 Sheet 1 of 3

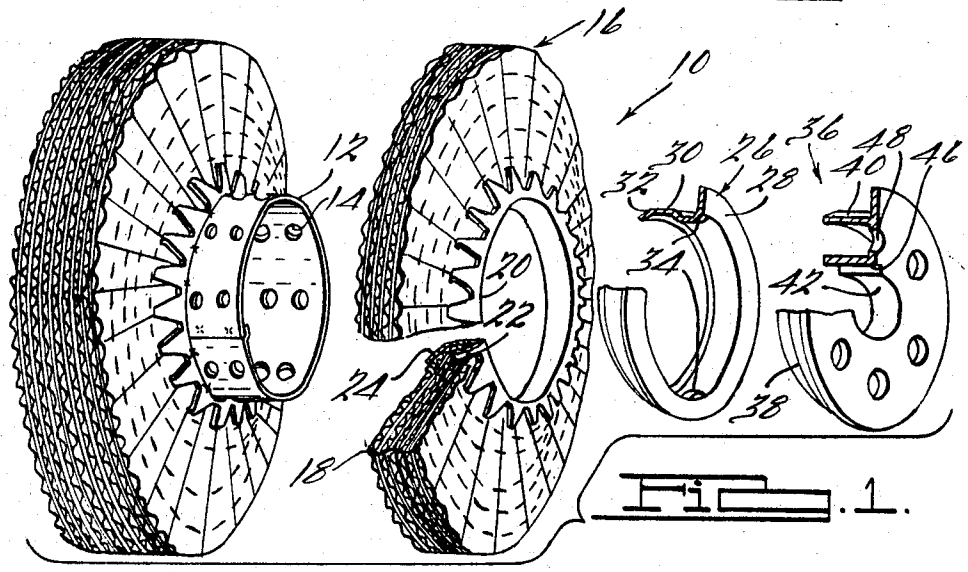


Fig. 1.

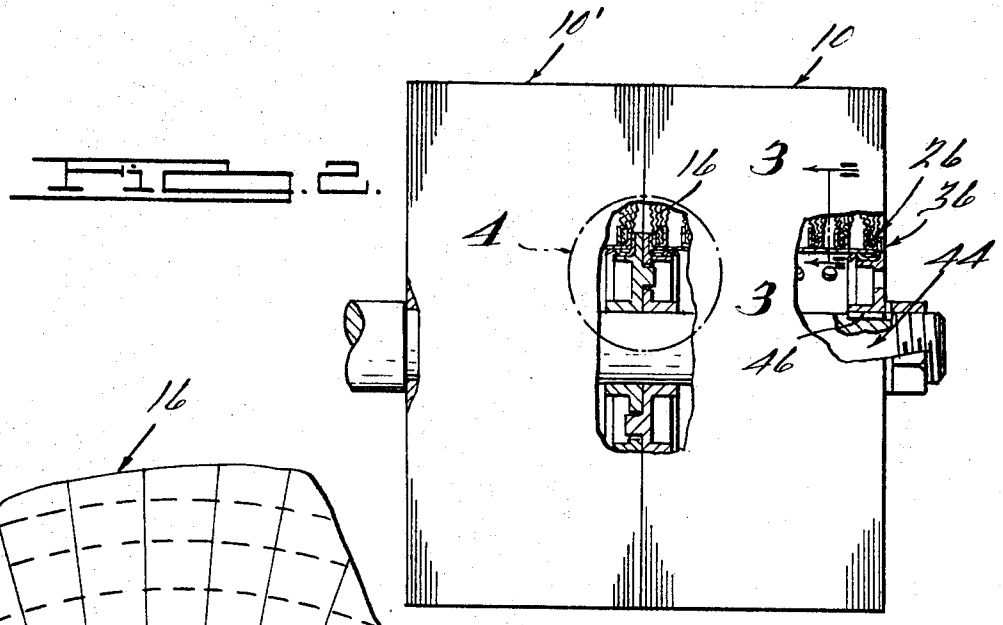


Fig. 2.

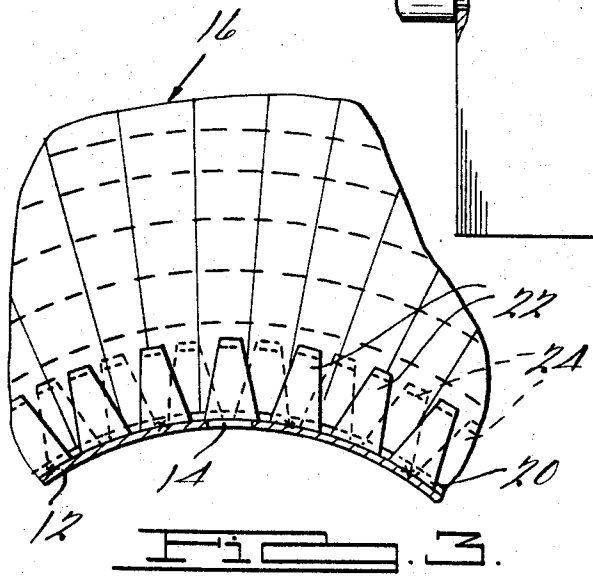


Fig. 3.

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CARTRIDGE WORK WHEEL

Filed Oct. 23, 1965 Sheet 2 of 3

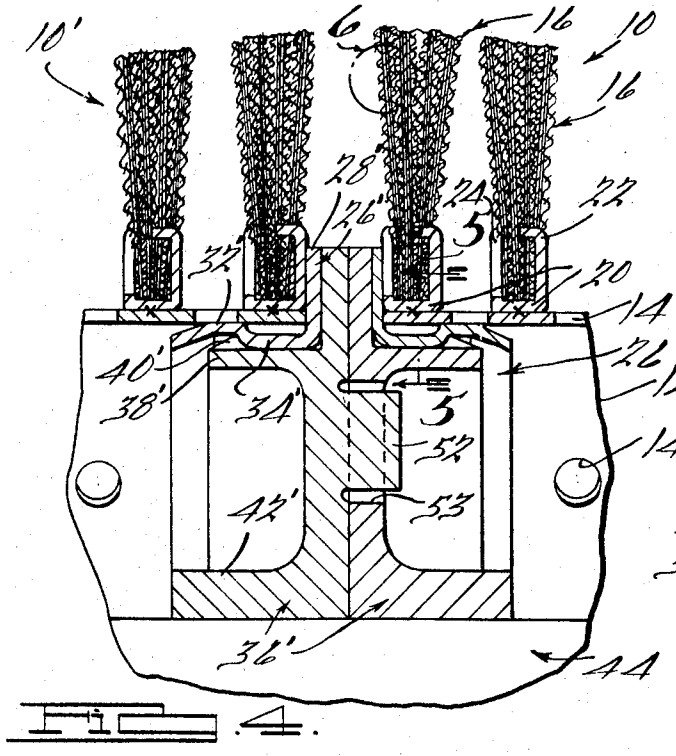


FIG. 4.

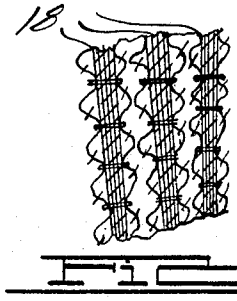


FIG. 6.

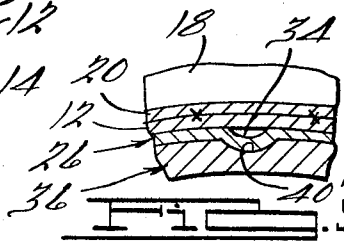


FIG. 5.

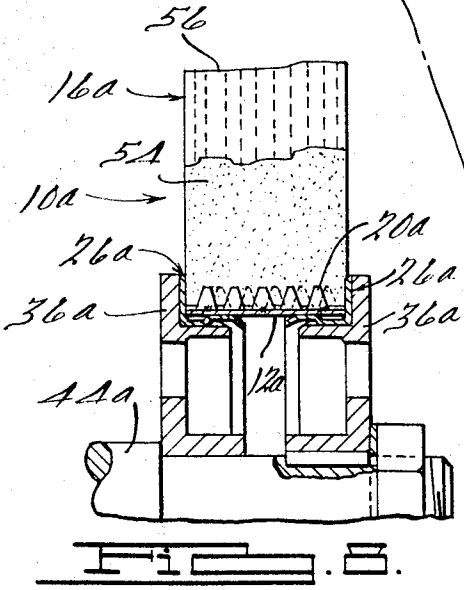


FIG. 8.

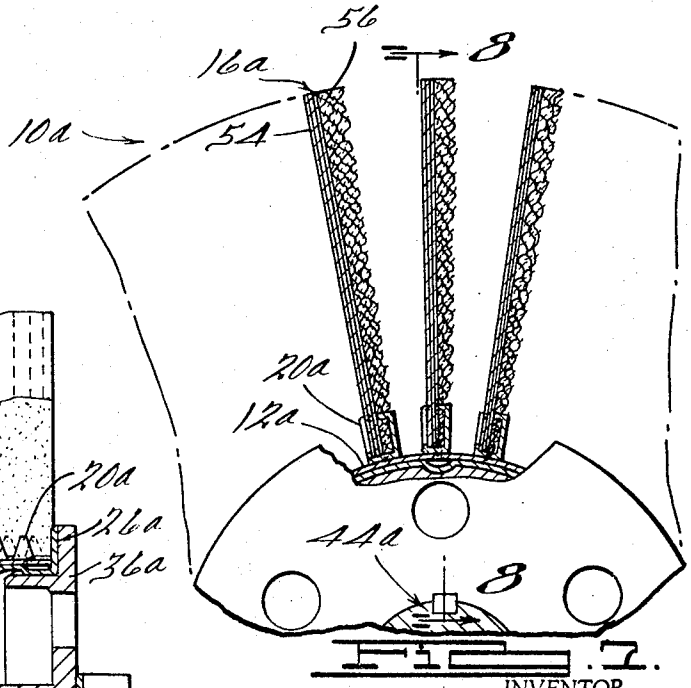


FIG. 7.

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June 24, 1969 H. J. McALEER 3,451,093

CARTRIDGE WORK WHEEL

Filed Oct. 23, 1965 Sheet 3 of 3

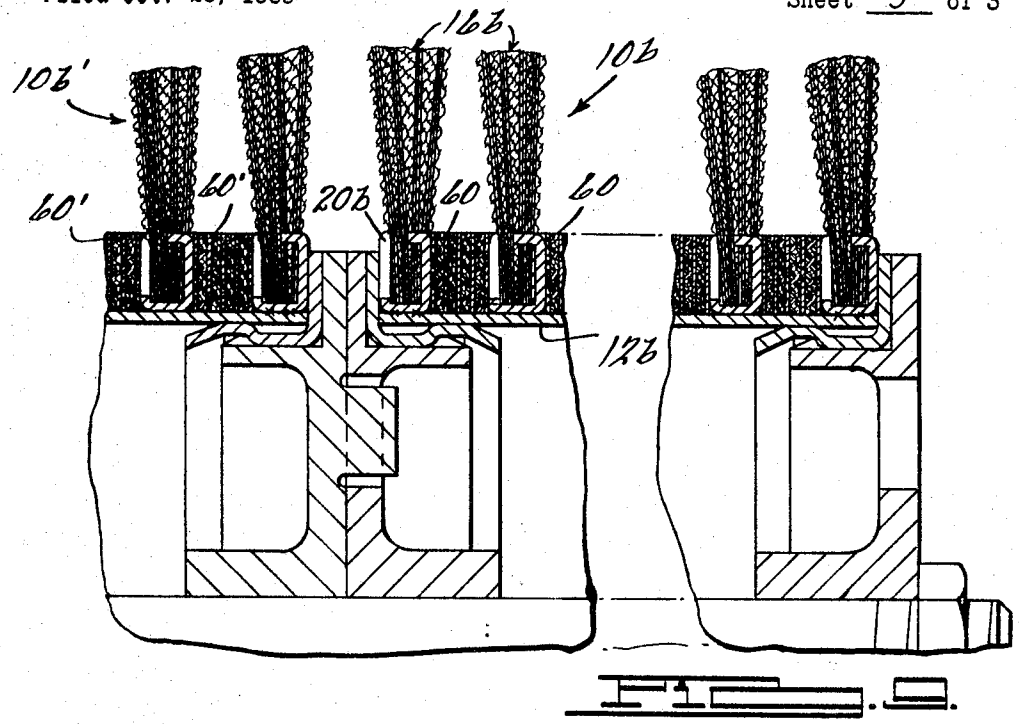


FIG. 9.

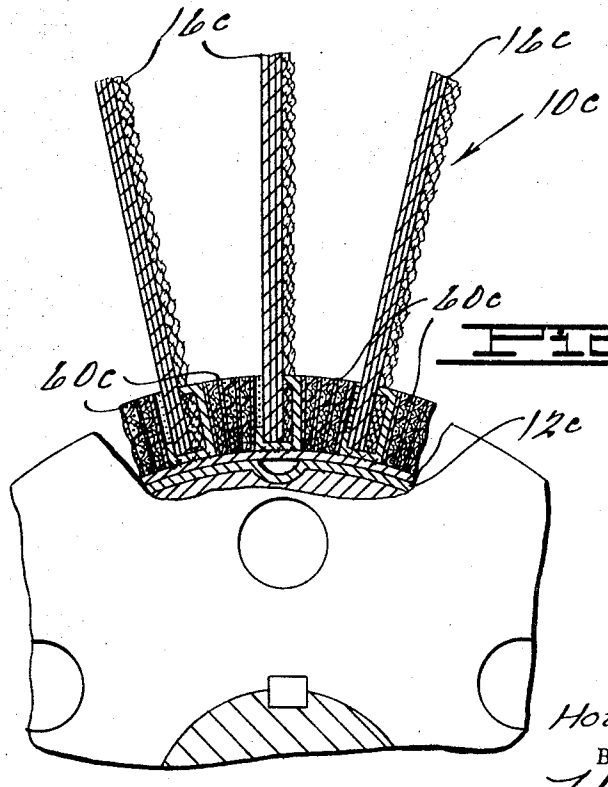


FIG. 10.

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United States Patent Office 3,451,093
Patented June 24, 1969



3,451,093

# CARTRIDGE WORK WHEEL

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Continuation-in-part of application Ser. No. 304,336, Aug. 26, 1963. This application Oct. 23, 1965, Ser. No. 511,271

Int. Cl. B05c 1/00

U.S. Cl. 15—230.1 8 Claims

## ABSTRACT OF THE DISCLOSURE

A work wheel having a plurality of packets each including a plurality of work members with the packets circumferentially fixed to a thin gauged tube member and spaced from each other.

This is a continuation-in-part of the patent application of Howard J. McAleer, Ser. No. 304,336, filed Aug. 26, 1963, now abandoned.

This invention relates to work wheels and more particularly to wheels for buffing and/or abrading.

A conventional buffing wheel constructed in accordance with past practice is made up of a plurality of individual discs which are mounted upon a shaft. The discs are frictionally held together and a selected number of discs are used to make up a wheel of a desired width. In such a wheel the discs can become loose and slip thereby losing their effectiveness and damaging the shaft and adjacent discs as by scoring, etc. Also, with the requirement that the discs be held together frictionally, it is necessary for the discs to be closely packed thereby causing cooling problems for a wheel of that construction. Slipping of the discs also results in loss of balance of the wheel. With wheels of this type it is common practice to retighten the wheel, and hence the discs, after the wheel has been run for a short time. This of course adds to the down time of that particular work station as well as adding to the maintenance required there.

Often the wheel is contoured across its width to fit the shape of a particular workpiece being buffed. In the conventional buffing wheel this requires the various discs to have different shapes and be assembled in a fixed order. Often after running a given quantity of one workpiece through a buffing work station, a different workpiece having a different shape is to be buffed at that work station. This requires the wheel to be changed and with the conventional wheel requires that the mounted wheel be carefully disassembled with the order of the discs noted and that the replacement wheel be carefully assembled with the discs mounted in a preselected order. The time required for such changes is quite significant especially in a plant where down time must be maintained at a minimum.

Another disadvantage of the conventional wheel is that it is difficult to change the density of the wheel across its width or face in order that different buffing results can be obtained.

The work wheel of the present invention is in the form of a disposable cartridge having a plurality of individual packets of the buff material. The packets are permanently fixed to a tube; thus the cartridge wheel can be readily assembled onto or removed from a drive shaft with the packets remaining intact. Since fewer parts are handled, this results in a reduction in down time when wheels are to be changed. The face of the cartridge wheel can be



contoured for a given workpiece and since the packets are fixed in a given position the cartridge wheel can be moved onto or off from the drive shaft without the need to orient a plurality of members into any particular order. This further facilitates changing of the wheels and enables a further reduction in down time to be realized. The cartridge wheel of the present invention can be balanced prior to assembly onto the drive shaft thereby simplifying its assembly. Since the packets cannot slip, the problem of rebalancing is eliminated and also retightening after a run-in period is not required. With no slippage between packets, the problem of damage to adjacent packets or to the drive shaft is eliminated. The individual packets, as fixed to the tube, can be spaced from each other thereby providing for improved cooling and also permitting the density across the face of the wheel to be readily preset from wheel to wheel or within an individual wheel.

In view of the above, it is a general object of this invention to provide a work wheel having an improved construction.

It is another object of this invention to provide an improved work wheel having a construction whereby the down time in changing such wheels at a work station is reduced.

It is another object of this invention to provide an improved work wheel having a construction which requires a minimum of maintenance.

It is still another object of this invention to provide a cartridge type work wheel of the above described type in which the problem of slippage between individual packets or discs of work members is eliminated.

It is an object of this invention to provide a cartridge type work wheel having a construction facilitating balancing and in which the problem of rebalance due to slippage between individual packets or discs of work members is eliminated.

It is an object of this invention to provide a work wheel having a construction providing improved cooling.

It is another object of this invention to provide a cartridge type work wheel in which the density across the work face from wheel to wheel or on an individual wheel can be readily preset.

It is an object of this invention to provide a cartridge type work wheel in which the contour of the face of the wheel can be readily fixed.

In one construction of the work wheel each of the packets extends circumferentially about the tube; in another construction, the packets are mounted about the circumference of the tube and extend axially relatively thereto. With the latter construction, the packets can be circumferentially spaced from each other. In conventional flap wheel constructions the work material is packed solidly together at the core and held together by a resin; with such a construction only a limited portion of the work surface of the work material is used since the extent to which the workpiece can be moved into the wheel is limited by the density near the core. In a wheel constructed in accordance with the alternate construction described above, the packets can be circumferentially spaced whereby the workpiece can be inserted further into the wheel and more of the working surface of each working member held by the packet is used. Therefore, it is another object of this invention to provide a work wheel having a construction whereby an increased portion of the work surface of the work member can be used.

In another construction of the work wheel, the packets are separated by means of a fibrous, corrugated or per-

forate structure; the entire assembly of packets and separators are fixed together on the tube by means of an epoxy resin. This construction results in a sturdy work wheel, and also provides a construction in which assembly is facilitated.

Therefore, it is another object of the present invention to provide a cartridge type work wheel having a construction utilizing a plurality of packets which are separated by a fibrous, corrugated or perforate structure with the packets and separator structure being secured to the tube by means of an epoxy resin, or the like.

Other objects, features, and advantages of the present invention will become apparent from the subsequent description, taken in conjunction with the accompanying drawings, in which:

FIGURE 1 is an exploded perspective view, with some parts shown broken away, of a preferred embodiment of the present invention;

FIGURE 2 is an elevational view, with some parts shown broken away and some parts shown in section, of a pair of work wheels of the type shown in FIGURE 1 in assembly relation on a drive shaft;

FIGURE 3 is an enlarged sectional view of one of the work wheels shown in FIGURE 2 and taken substantially along the line 3—3 in FIGURE 2;

FIGURE 4 is an enlarged view of a section designated by the numeral 4 in FIGURE 2 of the assembly shown in FIGURE 2;

FIGURE 5 is a sectional view of one of the work wheels of FIGURE 4 taken substantially along the line 5—5 in FIGURE 4;

FIGURE 6 is a blown up view of a portion indicated by the numeral 6 in FIGURE 4 of a work wheel shown in FIGURE 4;

FIGURE 7 is a fragmentary side elevational view with some parts broken away and some shown in section of a modified work wheel;

FIGURE 8 is a sectional view of the work wheel of FIGURE 7 taken substantially along the line 8—8 in FIGURE 7;

FIGURE 9 is a fragmentary view with some parts shown in section similar to that shown in FIGURE 4 and depicting a modified form of the cartridge work wheel shown in FIGURES 1 through 6; and

FIGURE 10 is a fragmentary view with some parts shown in section of a modified form of the work wheel shown in FIGURES 7 and 8.

Looking now to FIGURE 1, a cartridge work wheel embodying features of the present invention is generally indicated by the numeral **10** and can be mounted singly upon a drive shaft or can be mounted with one or more similar wheels upon a common shaft. In FIGURE 2, the cartridge wheel **10** is shown mounted with a similar wheel **10'**.

The cartridge wheel **10** includes a tube **12** which is made of generally light gauge material and is formed with a plurality of perforations as **14** to provide cooling in a manner to be seen. The tube **12** can be formed from flat sheet metal and can be rolled to the proper diameter and held in a circular shape by a lap joint. A plurality of packets, such as packet **16**, are located concentrically over and are fixed to the tube **12**. Each packet **16** includes several layers of an annularly extending buffing member, such as member **18**, which can be made of cloth, sisal, etc. (see FIGURE 6). The several layers **18** of each packet **16** are fixed together at their radially inner edges by an annular alligator ring or channel **20**. The alligator ring **20** has a generally U-shaped cross section and has two rows of circumferentially distributed teeth, as rows **22** and **24**, located at opposite sides of ring **20**. The teeth of row **22** are staggered relative to the teeth of row **24**. The several layers of buffing material **18** are located within the channel or ring **20** and the teeth are bent axially inwardly from opposite sides to grip the material **18**, with the staggering preventing the teeth of one row from engaging teeth in an opposite row. The ring **20** has an inside diameter substantially equal to the outside diameter of the tube **12** such that the ring **20** can just be slipped over the tube **12**. A plurality of packets **16** are located on and are spot welded or otherwise fixed to the tube **12**. The packet **16** are spaced axially from each other a preselected distance depending upon the density desired across the face of the wheel **10**. The perforations **14** are arranged in a random pattern whereby at least some will be in line with each space between adjacent packets **16**.

An annular collar **26** is of a generally L-shaped cross section and has a flat, radially extending flange portion **28** and an axially extending ring portion **30**. The flange portion **28** extends radially beyond the outer surface of the tube **12** and protects the end of the tube **12** and also the end one of the packets **16** to which it is adjacent. The ring portion **30** terminates in an annular radially inwardly converging lip **32**. The ring portion **30** has an outside diameter substantially equal to the inside diameter of the tube **12**. A collar **26** is located at each end of the tube **12** and is located with the radial portion **28** in abutment with that end of the tube **12** and with the ring **30** located snugly against the inner surface of tube **12**. The inclined lip **32** aids in assembling the collar **26** onto the tube **12**. The ring portion **30** on the collar **26** is formed with a pair of diametrically opposed radially inwardly extending dimples **34**. The collar **26** is then welded or otherwise fixed to the tube **12**.

An end flange **36** has an annular shoulder portion **38** which is formed with a pair of diametrically opposed slots **40**. The outside diameter of shoulder portion **38** is substantially equal to the inside diameter of the collar **26**. In mounting the cartridge **10** singly to a drive shaft, an end flange **36** is located within each end of the tube **12** with the slots **40** accepting the dimples **34**. The end flanges **36** have an annular support portion **42** which has an inside diameter equal to the outside diameter of a drive shaft such as **44**. The end flange **36** has a key way **46** whereby the flange **36** can be keyed to the drive shaft **44**. Thus, rotation of the drive shaft **44** causes rotation of the end flange **36** through the keyed connection therewith and in turn causes rotation of the cartridge **10** via the engagement of the dimple **36** in the slot **40**.

If a particular contour is desired across the face of the wheel **10**, the material **18** of each packet **16** can be preselected to a particular outside diameter and the various packets **16** arranged across the width of the tube **12** to provide the desired contour. Since the packets **16** are fixed to the tube **12**, this contour is fixed for that wheel cartridge **10**.

Thus, in operation, it is a simple matter to install the cartridge **10** upon a shaft and it is an equally simple matter to remove the cartridge **10** and replace it with a different one. With the cartridge **10** installation and removal are expedited since there is no requirement for maintaining a plurality of individual discs in a particular orientation.

The end flanges **36** are provided with a plurality of openings such as **48**. In operation, air is drawn into the confines of the cartridge **10** through openings **48** in end flanges **36** and is expelled out through the perforations **14** in the tube **12** thereby cooling the packets **16**.

The cartridge **10** can be made to any desired width; in some applications it may be advantageous to locate more than one cartridge **10** upon a shaft similar to the manner shown in FIGURE 2. In that case, a side flange **36'**, similar in construction to end flange **36**, is used at the adjacent ends of the cartridges **10** and **10'**. (The portions of side flange **36'** which are similar to like portions of end flange **36** are given the same numerical designation with the addition of a prime). The side flanges **36'** are provided with axially extending lugs such as lug **52** which are locatable within corresponding openings **53** in the ad-

jacent side flange 36' thereby coupling the two cartridges together. The side flange 36' has slots, as slot 40' (FIGURES 4 and 5), in engagement with dimples 34' in collar 26 thus rotatively coupling the flange 36' and collar 26. The cartridges 10 and 10' are held together against a shoulder on the shaft 44 by a nut and lock washer assembly on a threaded free end of the shaft 44. In FIGURE 4 a second collar 26' (similar to collar 26) is connected with cartridge 10' and portions of collar 26' similar to like portions of collar 26 have been given the same numerical designation with the addition of a prime.

An alternate construction of the cartridge wheel 10 of FIGURES 1–6 is shown in FIGURES 7 and 8 where like components are given the same numerical designation with the addition of a letter subscript.

Looking to FIGURES 7 and 8, a cartridge wheel 10*a* is shown to be mounted upon a drive shaft 44*a* via pair of end flanges 36*a*. The cartridge wheel 10*a* has a plurality of packets 16*a* which are mounted circumferentially about the outer periphery of a perforated tube 12*a*. The packets 16*a* are welded or otherwise fixed to tube 12*a* and are oriented to extend axially and are circumferentially spaced from each other. The packets 16*a* are composed of layers of abrading material 54, such as sandpaper, etc., and layers of buffing material 56, such as cloth, sisal, etc. In lieu of the above combination layers of abrading material 54 alone or layers of buffing material 56 alone could be used. The working members 54 and 56 are secured together at their radially inner end by a straight, longitudinally extending U-shaped alligator channel clamp 20*a*. By circumferentially spacing the packets 16*a* from each other, the density of the cartridge can be selected such that the workpiece can be inserted a substantial distance radially toward the center of the cartridge 10*a*. In conventional abrading wheels having a dense core, the abrading members are closely packed thereby preventing the workpiece from being inserted radially into the wheel to any substantial extent. The result is that only a portion of the abrading surface of each of the abrading members can be used and the wheel must be replaced even though the central portion of the wheel may be unused. With the cartridge wheel 10*a* a much greater amount of the abrading surface of each of the working members 54 and 56 can be used.

A pair of collars 26*a*, substantially identical to collar 26, are fixed in opposite ends of the tube 12*a* of the cartridge 10*a* and are drivingly engageable with end flanges 36*a*.

Looking now to FIGURE 9, a modified form of the cartridge work wheel as shown in FIGURES 1 through 6 is depicted in the description of the embodiment of FIGURE 9 components similar to like components in the embodiment shown in FIGURES 1 through 6 will be given the same numerical designation with the addition of the letter postcript *b*. The tube 12*b* is generally circular in shape and has a plurality of packets 16*b* located concentrically thereof and fixed thereto. The packets 16*b* are separated from each other by means of a plurality of spacers 60. The spacers as shown in the drawings are made of a corrugated material such as cardboard; however, it should be realized that any filler material or construction could be utilized which will permit the flow of a bonding material therethrough or thereabout. In assembly, the packets 16*b* are located with the spacers 60 located therebetween on tube 12*b* and the assembly then in the region of the spacers 60 and the adjacent areas of the packets 16*b* is covered by an epoxy resin which bonds the packets 16*b* and spacers 60 together to the tube 12*b* to form a member having a substantially solid core. Assembly can be facilitated by first welding the end one of one of the packets 16*b* to the tube 12*b*, the remaining packets 16*b* and spacers 60 are next assembled thereagainst. The spacers 60 being of a material or construction which is readily compressible and resilient permit adjustment of the width of the assembly such that a preselected width can be obtained. Next the last one of the packets 16*b* at the opposite end of the tube 12*b* is welded to the tube 12*b*. With the packets 16*b* at opposite ends of tube 12*b* welded, the intermediate ones are held in place and the epoxy resin can then be readily applied.

The spacers 60 are of a radial height generally equal to the radial height of the ring 20*b*. The strong bond between the individual packets 16*b*, the spacers 60 and the tube 12*b* of the core of the wheel permits higher side loads to be applied to the wheel without severence of the packets 16*b* from the tube 12*b*; also by bonding the intermediate ones of the packets 16*b* by means of the epoxy resin to the tube 12*b*, a simplified assembly is provided since the welding of the intermediate ones of the packets 16*b* to the tube 12*b* can be eliminated.

In FIGURE 10, is shown a modification of that form of the work wheel shown in FIGURES 7 and 8. In the description of the embodiment shown in FIGURE 10 components similar to like components in the embodiment of FIGURES 7 and 8 will be given the same numerical designation with the addition of a letter postscript *c*.

Looking now to FIGURE 10 the packets 16*c* are peripherally welded to the tube member 12*c*. A spacer 60*c* is located intermediate the individual packets 16*c* and a hard core is provided by applying a coating of an epoxy resin to the spacers 60*c* as well as to the radially inner ends of the packets 16*c*. In the preferred form the spacers 60*c* are of cardboard; however, it should be understood that other materials and construction could be utilized. Note that with the formation of a strong central core, the loads applied to the individual packets 16*c* are more readily withstood without severence of the packets 16*c* from the tube 12*c*. Note that neither the tube 12*b* nor tube 12*c* need be perforated.

While it will be apparent that the preferred embodiments of the invention disclosed are well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope or fair meaning of the subjoined claims.

What is claimed is:

1. A work wheel assembly comprising: a cartridge work wheel adapted to be rotated about its axis for working upon a workpiece comprising a hollow, thin gauged tube member and a plurality of packets each fixed to said tube member and each extending circumferentially about said tube member, said each of said packets including work members each extending radially outwardly from said tube member and circumferentially about said tube member, an annular channel member located at the radially inner end of said each of said packets and having means for gripping said work members, said each of said packets having said channel member permanently fixed to said tube member with adjacent ones of said packets axially spaced from each other, said tube member being circumferentially perforated with at least some of the perforations communicating with the spaces between adjacent channel members, and an annular collar member fixed to each end of said tube member, said collar member having an annular ring portion matably located within the end of said tube member and being formed with a plurality of radially inwardly extending dimples, said collar member having an annular flange portion extending radially outwardly beyond the radially outer surface of said tube member, said wheel assembly further comprising a flange removably locatable on said collar member, said flange having an annular shoulder matably disposable within said ring portion of said collar member and having a plurality of slots for receiving said diples, said flange having a plurality of axially extending openings and having means for mounting to a drive shaft.

2. A disposable cartridge work wheel adapted to be rotated about is axis for working upon a workpiece com-

prising a hollow, thin gauge tube member, a plurality of packets disposed circumferentially about said tube member, a plurality of spacer members located in between adjacent ones of said packets and means bonding said spacers and the radially inner ends of said packets together to said tube, each of said packets including work means extending radially outwardly from said tube member for working upon a workpiece, said work means comprising a plurality of work members located adjacent each other at least one of said work members being of a fibrous construction including a cloth-like material, said spacers being made of a resilient construction to facilitate positional location of said packets on said tube member and being of a porous construction permitting the location of said bonding means between the structure of said spacers and said packets.

3. A disposable cartridge work wheel adapted to be rotated about its axis for working upon a workpiece comprising a hollow, thin gauge tube member, a plurality of packets each extending circumferentially about said tube member, a plurality of spacers each located between adjacent ones of said packets spacing said packets one from the other, and bonding means for bonding said spacers and the radially inner ends of said packets together and to said tube member, said each of said packets including work means extending radially outwardly from said tube member for working upon a workpiece, said work means comprising a plurality of work members located adjacent each other each said work member being of a fibrous construction including a cloth-like material, said spacers being made of a resilient construction to facilitate positional location of said packets on said tube member and being of a porous construction permitting the location of said bonding means between the structure of said spacers and said packets.

4. A disposable cartridge work wheel adapted to be rotated about its axis for working upon a workpiece comprising a hollow, thin gauged tube member, a plurality of packets circumferentially located about said tube member, a plurality of spacers located between adjacent ones of said packets and separating said packets one from the other, and means for bonding said spacers and the radially inner ends of said packets together and to said tube member, each of said packets located to extend axially on said tube member, said each of said packets including work means extending radially outwardly from said tube member for working upon a workpiece, said work means including at least one work member being of a fibrous construction including a cloth-like material, said spacers being made of a resilient construction to facilitate positional location of said packets on said tube member and being of a porous construction permitting the location of said bonding means between the structure of said spacers and said packets.

5. A work wheel assembly comprising: a cartridge work wheel adapted to be rotated about the axis for working upon a workpiece comprising a hollow, thin gauged tube member and a plurality of packets each fixed to said tube member and each extending-circumferentially about said tube member, said each of said packets including work members each extending radially outwardly from said tube member and circumferentially about said tube member, an annular channel member located at the radially inner end of said each of said packets and having means for gripping said work members, said each of said packets having said channel member permanently fixed to said tube member with adjacent ones of said packets axially spaced from each other, a plurality of spacers located between adjacent ones of said packets for spacing said packets one from another, said spacers being constructed of a resilient material whereby spacing of said packets can be facilitated by compressing said spacers more or less, and bonding means for bonding said spacers and said packets together and to said tube member, said spacers being made of a construction permitting the flow of said bonding means to interlock said spacers to said packets and to said tube member, and an annular collar member fixed to each end of said tube member, said collar member having an annular ring portion matably located within the end of said tube member and being formed with a plurality of radially inwardly extending dimples, said collar member having an annular flange portion extending radially outwardly beyond the radially further comprising a flange removably locatable on said outer surface of said tube member, said wheel assembly collar member, said flange having an annular shoulder matably disposable within said ring portion of said collar member and having a plurality of slots for receiving said dimples, said flange having a plurality of axially extending openings and having means for mounting to a drive shaft.

6. A work wheel assembly comprising: a cartridge work wheel adapted to be rotated about its axis for working upon a workpiece comprising a hollow, thin gauged tube member and a plurality of packets each fixed to said tube member and disposed circumferentially about said tube member, said each of said packets including work members each extending radially outwardly from said tube member and circumferentially about said tube member, a channel member located at the radially inner end of said each of said packets and having means for gripping said work members, said each of said packets having said channel member permanently fixed to said tube member with adjacent ones of said packets axially spaced from each other, and an annular collar member fixed to each end of said tube member, said collar member having an annular ring portion matably located within the end of said tube member and being formed with a plurality of radially inwardly extending dimples, said collar member having an annular flange portion extending radially outwardly beyond the radially outer surface of said tube member, said wheel assembly further comprising a flange removably locatable on said collar member, said flange having an annular shoulder matably disposable within said ring portion of said collar member and having a plurality of slots for receiving said dimples, said flange having a plurality of axially extending openings and having means for mounting to a drive shaft.

7. A work wheel assembly comprising: a cartridge work wheel adapted to be rotated about its axis for working upon a workpiece comprising a hollow, thin gauged tube member and a plurality of packets each fixed to said tube member and each extending circumferentially about said tube member, said each of said packets including work members each extending radially outwardly from said tube member and circumferentially about said tube member, an annular channel member located at the radially inner end of said each of said packets and having means for gripping said work members, said each of said packets having said channel member permanently fixed to said tube member with adjacent ones of said packets axially spaced from each other, and an annular collar member fixed to each end of said tube member, said collar member having an annular ring portion matably located within the end of said tube member and being formed with a plurality of radially inwardly extending dimples, said collar member having an annular flange portion extending radially outwardly beyond the radially outer surface of said tube member, said wheel assembly further comprising a flange removably locatable on said collar member, said flange having an annular shoulder matably disposable within said ring portion of said collar member and having a plurality of slots for receiving said dimples, said flange having a plurality of axially extended openings and having means for mounting to a drive shaft.

8. The cartridge work wheel of claim 7 further comprising a plurality of spacers each located between adjacent ones of said packets spacing said packets one from the other, and bonding means for bonding said spacers and the radially inner ends of said packets together and to said tube member.

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9

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DANIEL BLUM, *Primary Examiner.*

U.S. Cl. X.R.

15—118, 230.12, 230.16, 230.17

# UNITED STATES PATENT OFFICE

# CERTIFICATE OF CORRECTION

Patent No. 3,451,093 June 24, 1969

Howard J. McAleer

It is certified that error appears in the above identified patent and that said Letters Patent are hereby corrected as shown below:

Column 5, line 56, cancel "thereof" and insert -- thereover --. Column 6, line 71, "diples" should read -- dimples --; line 75, "is" should read -- its --. Column 8, line 7, after "radially", second occurrence, insert -- outer surface of said tube member, said wheel assembly --; line 8, after "said" cancel "outer surface of said tube member, said wheel assembly"; line 67, cancel "extended" and insert -- extending --.

Signed and sealed this 14th day of April 1970.

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents