Dec. 2, 1930. T. LARSSON 1,783,728

GRINDING WHEEL

Filed June 30, 1927

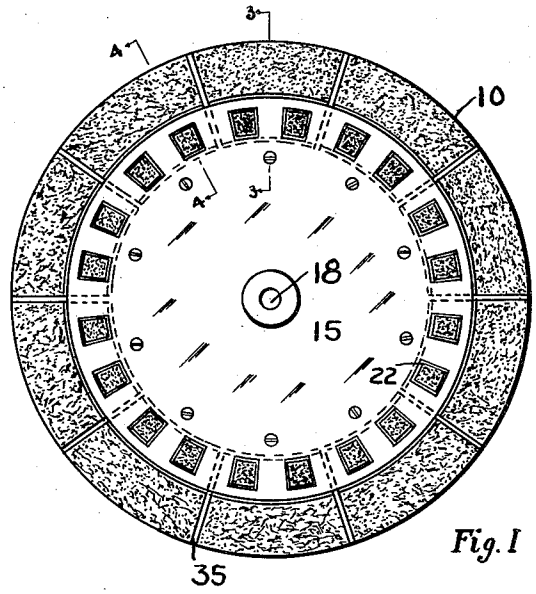


Fig. 1

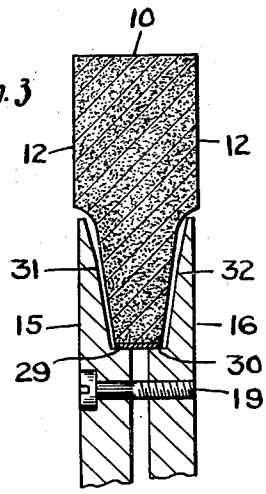


Fig. 3

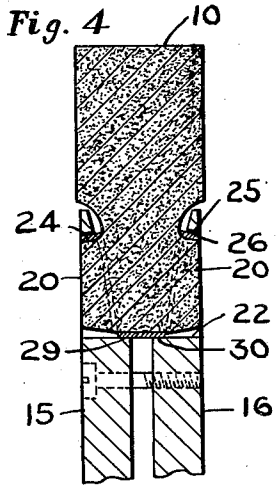


Fig. 4

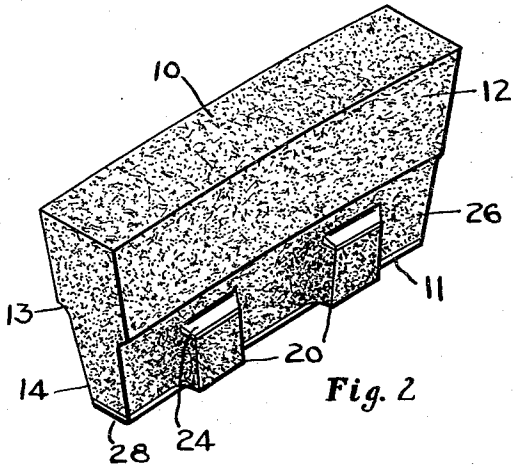


Fig. 2

Witnesses

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UNITED STATES PATENT OFFICE

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GRINDING WHEEL

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This invention relates to grinding wheels and more particularly to a grinding wheel made up of segments of bonded abrasive grains.

It has not been found feasible to make large grinding wheels of a single monolithic structure since such wheels, when rotated rapidly, are liable to burst under the stresses set up by centrifugal force and the grinding operation. Such a wheel may, however, be made of segments mounted on a suitable support and adjustably and rigidly fastened in position. There are, however, various problems connected with the manufacture and use of such a wheel since the fragile abrasive segments are liable to break from their settings unless held very securely in position. Various types of clamping devices have been provided heretofore for securing such segments on a support, but these have either been complicated in structure and difficult to handle and assemble, or they have been so large as to be in the way during the grinding operation or they have had various other objectionable features.

It is accordingly the primary object of my invention to overcome such difficulties and to provide a grinding wheel made up of abrasive segments secured rigidly on a support and which may be rotated at a high rate of speed under the ordinarily grinding conditions without danger of breakage.

It is a further object to provide a grinding wheel mounting capable of securing an abrasive annulus rigidly but removably to a rotatable support.

With these and other objects in view as will be apparent to one skilled in the art, my invention resides in the combination of parts set forth in the specification and covered by the claims appended hereto.

Referring to the drawings which illustrate one embodiment of my invention:

Figure 1 is a side elevation of a segmental grinding wheel;

Fig. 2 is a perspective view of one of the segments removed from its fastenings;

Fig. 3 is a fragmentary sectional view on the line 3—3 of Fig. 1; and

Fig. 4 is a similar fragmentary sectional view on the line 4—4 of Fig. 1.

In accordance with the embodiment of my invention illustrated in the drawings, a segmental wheel may be made of a number of abrasive segments so shaped and arranged as to form an annulus having an outer cylindrical surface and two side faces and an inner portion arranged to be engaged by clamping and support plates. These segments may be united into an integral body by a suitable cementitious material such as a low melting metal. The preferred arrangement for rotatably supporting an abrasive annulus, whether made of segments or of a monolithic abrasive structure, comprises clamping members having flanges engaging shoulders on the abrasive annulus which are adjustably mounted to draw the ring of abrasive tightly into position. In order that the supporting plates may lie substantially within parallel planes which pass through the side faces of the annulus, the clamping portion of the annulus may be reduced in size. In the present construction, I propose to form the clamping shoulders on lugs or columns of abrasive which project outwardly like pilasters from the side faces of the segments. This insures having the maximum amount of abrasive between the clamping plates and consequently a stronger wheel structure, than would be had if these shoulders were located within grooves or recesses.

Referring more particularly to the drawings, showing a wheel made of segments mounted on two plates, the abrasive segments may be shaped as shown in Fig. 2, each part having an outer convex surface 10 which forms a portion of the peripheral cylindrical surface of the grinding wheel and an inner concave surface 11. The side faces 12 may be parallel or suitably shaped as is desired in a wheel of this general type and the end faces 13 preferably form radial planes in the wheel. The inner portion 14 of each segment is shown reduced in size so that the clamping plates may lie within the planes formed by the side faces 12 of the segments when assembled as an annulus.

The clamping plates 15 and 16 which serve

to support the abrasive ring, are illustrated as made of disks of metal provided with central apertures 18 arranged to be suitably mounted on a grinding wheel spindle, but it will be understood that these plates may be suitably shaped and arranged for attachment to any rotatable device as may be desired for mounting the abrasive annulus. These plates may be secured together by screws 19 or other suitable means.

In order to form clamping shoulders which may be engaged by the plates 15 and 16, I preferably provide the annulus with a projecting portion of abrasive which in the present instance is shown as made up of spaced lugs or pilasters 20 projecting from each side face. If the wheel is made of individual segments, each is provided with one or more lugs on one or both side faces. These may project to substantially the planes of the side faces 12. These shoulders may be engaged by properly shaped flanges on the clamping plates but in order that the clamping plates may lie within these planes, it is preferred that the plates be cut away to provide a series of spaced grooves or openings 22 into which the lugs 20 may be inserted. The top shoulders 24 of the lugs are adapted to be engaged by shoulders 25 on the inner faces of the openings 22 cut in the plate, and in order to provide a wedging action between the clamping plates and the lugs, the shoulders 24 on the abrasive body are made beveled or sloping, and the shoulders 25 on the plates are shaped to fit the same, whereby upon drawing the clamping plates 15 and 16 together by means of screws 19, the segments are forced inwardly toward the center of the wheel.

Since the abrasive material is relatively fragile, as it is ordinarily made of abrasive grains bonded by vitrified ceramic materials, any severe clamping pressure on the lugs is likely to be unevenly distributed and to crack the abrasive body. Hence, I preferably provide the clamping shoulders of the segments with shoes 26 which may be made of a metal, such as babbitt or zinc. The shoes have smooth faces sloping as desired to engage and fit snugly the clamping shoulders of the plates. These shoes may be suitably formed in position as by casting the molten material on the shoulders.

The abrasive annulus is supported on its peripheral surface 11 and to this end one or both of the clamping plates may be provided with a peripheral surface on which the annulus rests. The inner peripheral faces 11 of the segments are preferably provided with shoes 28 which have smooth faces arranged to fit accurately against the supporting surface on the mount. It will be understood that the segments themselves may be shaped so smoothly and accurately as to provide for this purpose, or a layer of proper material may be inserted between the segments and supporting or the clamping surfaces of the plate. However, the shoe 28 is desirable for many sizes and types of wheel. In the form illustrated the annulus is arranged to rest upon and be firmly clamped against the peripheral cylindrical surfaces 29 and 30 on the clamping plates 15 and 16. The inner faces 31 and 32 of the plates 15 and 16 (Fig. 3) are so shaped that they will lie close to the side faces of the segment but they preferably will not contact therewith, it being desired that the only faces of the plates 15 and 16 which contact with the segments be those which engage the metal shoes thereon.

After the segments have been mounted in position on the clamping plates and in order to make an integral and unitary structure of the wheel, I prefer to place a filler in the crevices 35 between the radial faces 13 of the segments, and a suitable filler for this purpose is a cementitious material such as sulfur or a low melting metal which is poured in sufficiently hot to run down into the crevices and permeate the surface pores of the segments. This filler serves to unite the segments into a unitary structure and to make a solid wheel which may be employed with various types of supports or clamping plates. This filling material may be flowed into place between the segments either before or after the clamping plates have been put into position, but if the filler is placed between the segments beforehand, then I thereby form an abrasive annulus which may be shipped as such without the clamping plates and may be mounted between the clamping plates at the point of use. The annulus, as manufactured and ready for shipment, has not only the filler and cementing material between the segments, but it has the shoes 26 and 28 in place so that the wheel is ready for mounting as received from the factory.

Having thus described my inventiton, what I claim as new and desire to secure by Letters Patent is:

1. A grinding wheel comprising abrasive segments arranged in the form of an annulus having a peripheral grinding face, a peripheral supporting face and side faces, peripherally spaced abrasive lugs projecting from the side faces which form beveled clamping shoulders, and clamping members arranged on each side of the annulus in engagement with the peripheral supporting face and provided with portions engaging said shoulders which are adapted to adjustably secure the wheel segments in position.

2. A grinding wheel comprising an abrasive annulus having outer and inner peripheral faces, side faces and an inner reduced portion providing a recess whereby a clamping plate may be mounted within the wheel, spaced projecting lugs of abrasive on the sides of the reduced portion which form beveled clamping shoulders, and clamping plates

arranged on opposite sides of the annulus having portions clamping against said shoulders, one of the plates having a surface supporting the inner peripheral surface of the annulus.

3. A grinding wheel comprising abrasive segments arranged in the form of an annulus having a peripheral grinding face and an inner supporting face, a support therefor having a surface engaging said inner face, each of said segments having an abrasive portion projecting from each side face which has a clamping shoulder thereon, peripherally spaced from the clamping shoulders on the adjacent segments, and means for clamping against said shoulders and holding the segments securely against said supporting surface.

4. A grinding wheel comprising an abrasive annulus which has a peripheral grinding face, side faces and an inner reduced portion providing a recess wherein a clamping plate may be mounted, said portion having lugs of abrasive projecting from each side face and shoes thereon adapted to form clamping shoulders for mounting the annulus on a suitable support.

5. A grinding wheel comprising abrasive segments arranged in the form of an annulus, each having a peripheral grinding face, side faces and an inner reduced portion forming a recess, said portion being provided with lugs of abrasive projecting from each side face, a shoe of metal on each lug and clamping members arranged one on each side of the annulus in said recess having surfaces engaging and seating against said shoes which secure the segments in position.

6. A grinding wheel comprising an abrasive annulus having a peripheral grinding face and spaced lugs forming clamping shoulders, and plates slotted to receive and surround the projecting lugs and engage the clamping shoulders, said parts being so constructed and arranged that upon drawing the plates together the abrasive annulus is clamped in position.

7. A grinding wheel comprising a plurality of abrasive segments arranged in the form of an annulus having inner and outer peripheral faces and two side faces, projecting lugs of abrasive on each side face, a shoe on each projecting lug forming a clamping shoulder, a clamping plate on each side of the annulus having a portion projecting over the lug and engaging said shoe and a surface supporting the inner face of each segment, and means for drawing the clamping plates together to secure said annulus in position.

8. A grinding wheel comprising an annulus of bonded abrasive segments having a substantially continuous peripheral grinding face, side faces, and peripherally spaced lugs which project from the side faces and form clamping shoulders adapted for rigidly securing the annulus upon a rotatable support.

9. A grinding wheel comprising an annulus of bonded abrasive segments having a substantially continuous peripheral grinding face, side faces, an inner reduced portion providing a recess on the side of the wheel within which a supporting plate may be mounted, and peripherally spaced lugs integral with the side face within the recess which projects outwardly and forms clamping shoulders adapted for rigidly securing the annulus upon a rotatable support.

10. A grinding wheel comprising abrasive segments arranged in the shape of an annulus which has a peripheral grinding face and side faces, said annulus having projecting portions of abrasive on each of its opposite sides, each portion having an accurately shaped shoe integral therewith which forms a clamping shoulder on one surface thereof adapted to provide a means for exactly positioning said annulus upon a rotatable support.

11. A grinding wheel comprising a plurality of abrasive segments arranged as an annulus having a peripheral grinding surface and two side faces, each segment having peripherally spaced abrasive lugs projecting from its opposite sides which form clamping shoulders, and a cementitious filler between the adjacent segments uniting the same into a unitary structure.

12. A grinding wheel comprising a plurality of abrasive segments mounted to form an annulus having a peripheral grinding surface and two side faces, each segment having abrasive lugs projecting from each side face, a shoe on each lug which has a beveled surface forming a clamping shoulder, and a filler of metal flowed into the crevices between the segments and the surface pores which unites the segments into an integral wheel structure.

13. A grinding wheel comprising a plurality of abrasive segments arranged to form an annulus having inner and outer peripheral faces and side faces, projecting abrasive lugs on each side face forming clamping shoulders, a cementitious filler between the adjacent faces of the segments which unite them into an integral unitary structure, and a shoe on the inner peripheral face of each segment constituting a supporting surface.

14. A grinding wheel comprising a plurality of abrasive segments arranged to form an annulus having inner and outer peripheral faces, projecting abrasive lugs on each side face, a cementitious filler between the adjacent faces of the segments uniting them into an integral unitary structure, a shoe on the inner peripheral face of each segment constituting a supporting surface, and a shoe of metal integral with each projecting abrasive lug to form a clamping shoulder.

15. An abrasive segment arranged to be assembled with others to form an annulus

comprising a body of bonded abrasive grains having a partially cylindrical grinding surface and a concentric inner supporting surface, substantially parallel side faces, each of which has a lug of abrasive projecting therefrom and forming a clamping surface, whereby said segment may be exactly positioned upon its support, said lug being so located that it will be spaced peripherally from the lug of an adjacent segment.

16. An abrasive segment comprising a body of bonded abrasive grains having a partially cylindrical grinding surface, a concentric inner supporting surface and substantially parallel recessed side faces having spaced lugs of abrasive projecting therefrom, and accurately shaped metal shoes integral with said projecting lugs which form clamping surfaces whereby said annulus may be exactly positioned upon its support.

17. An abrasive segment comprising a body of bonded abrasive grains having a convex outer grinding face and a concave inner supporting face which is adapted to be mounted with similar bodies to form an annulus, substantially parallel side faces having peripherally spaced lugs of abrasive projecting therefrom, a shoe on the inner concave face constituting a supporting surface, and accurately shaped metal shoes integral with said projecting lugs forming clamping surfaces thereon.

Signed at Worcester, Massachusetts, this 28th day of June 1927.

THURE LARSSON.