Oct. 12, 1943. J. F. D. SMITH 2,331,861

ABRASIVE DEVICE

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Fig. 1.

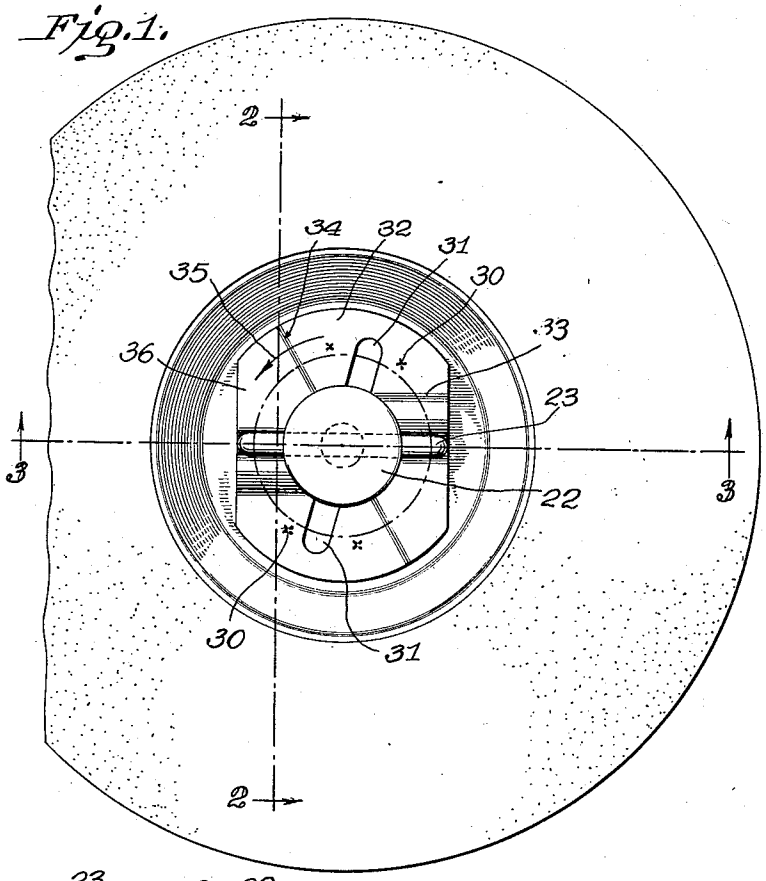
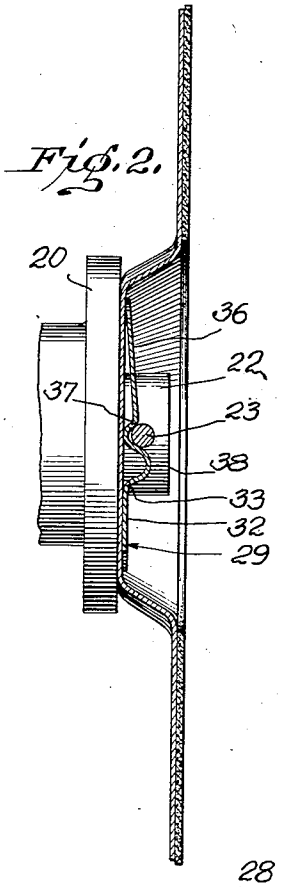


Fig. 2.



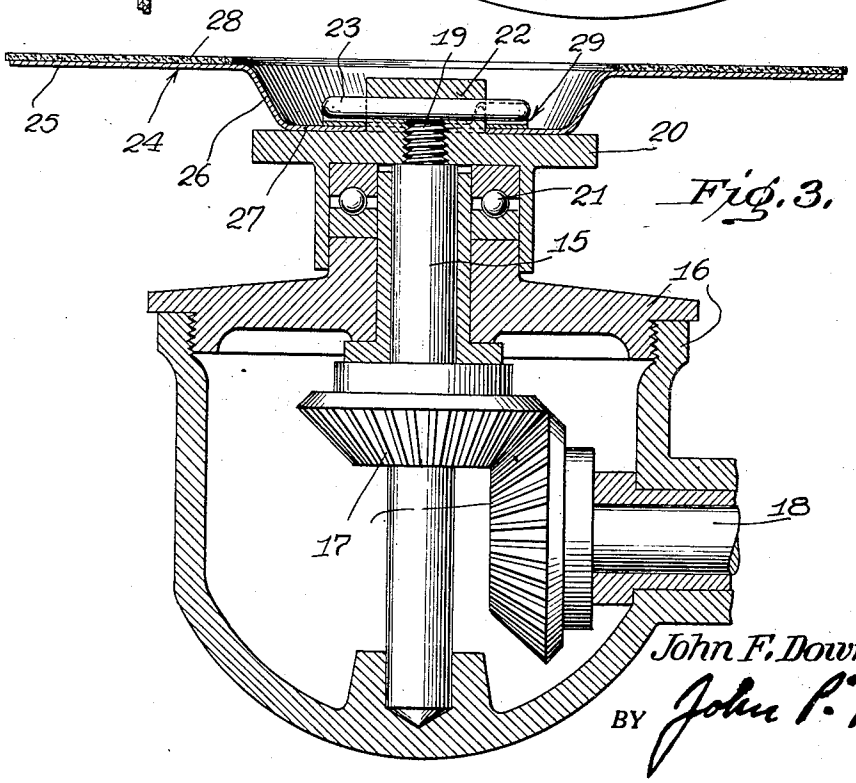


Fig. 3.

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Fig. 4.

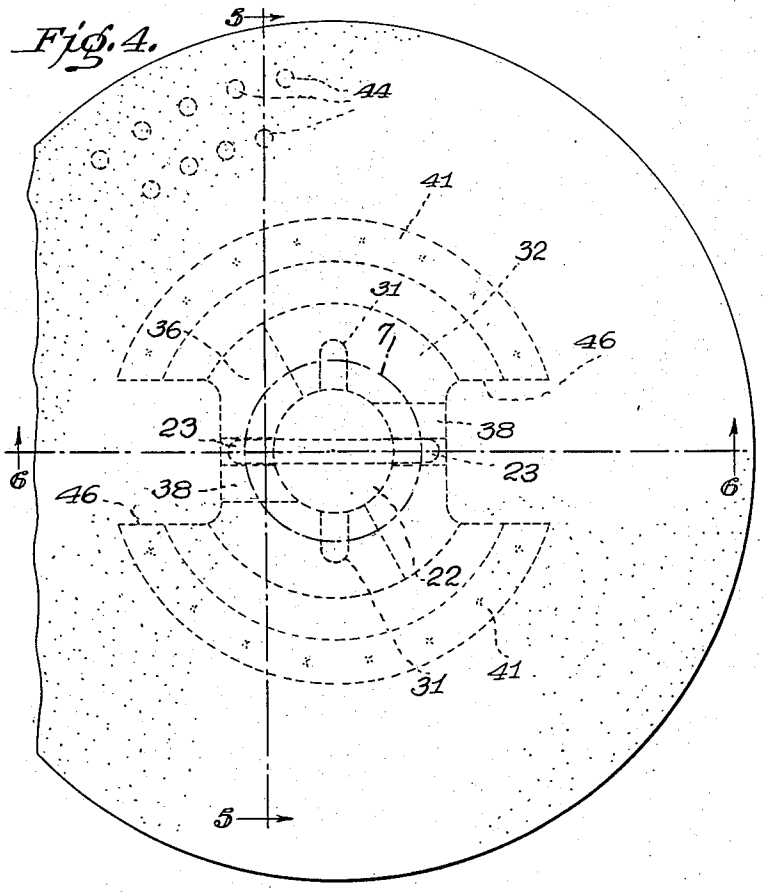

Fig. 5.

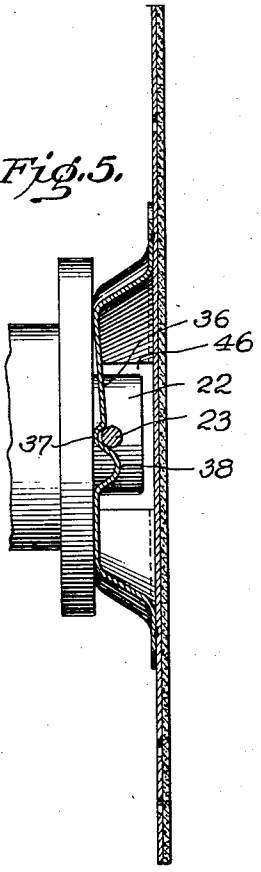

Fig. 6.

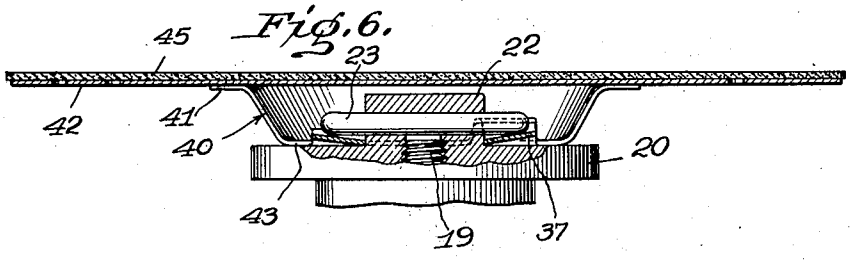

Fig. 7.

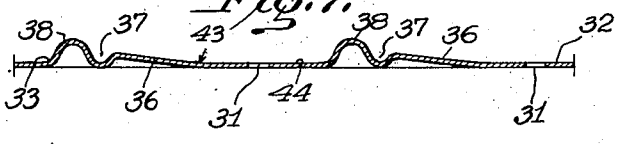

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Fig. 8.

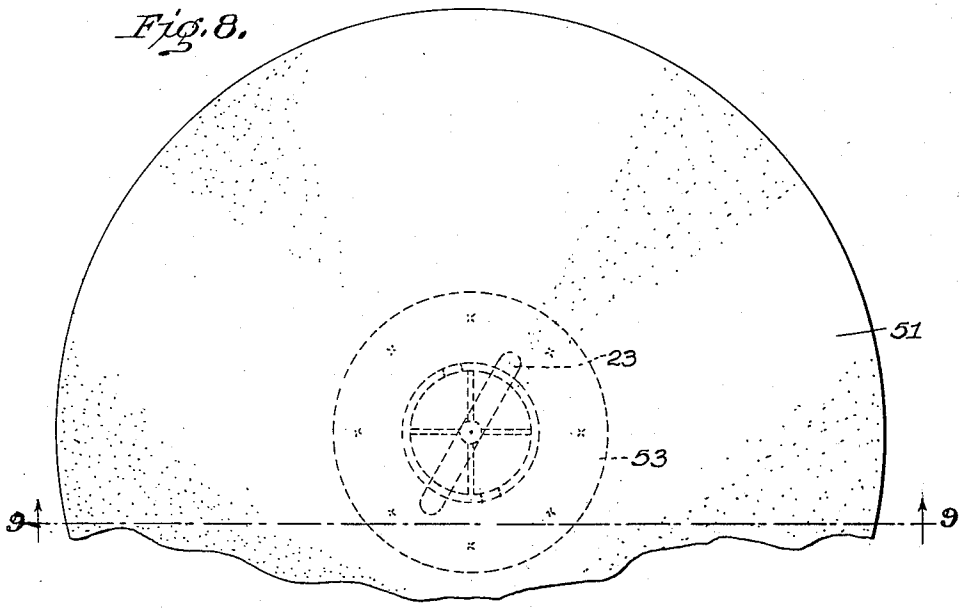

Fig. 9.

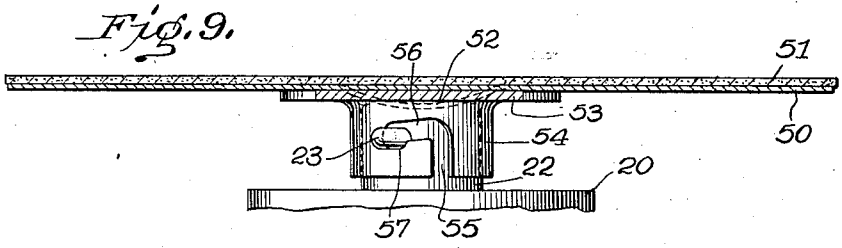

Fig. 10.

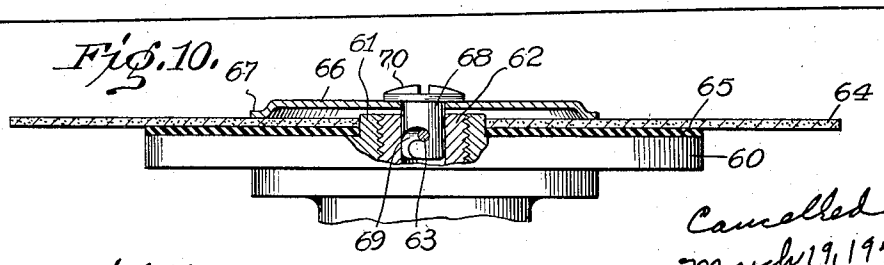

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Fig. 11.

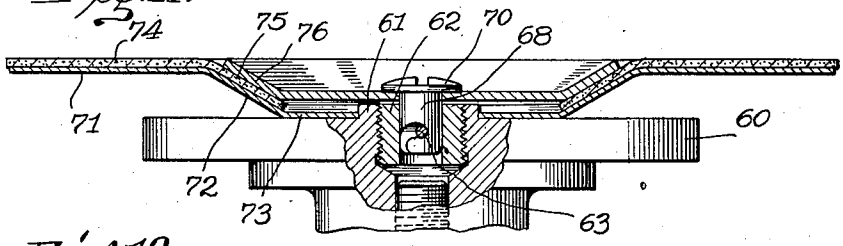
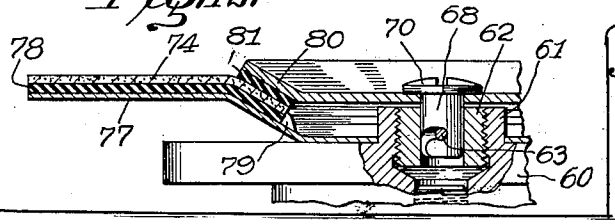


Fig. 12.



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Patented Oct. 12, 1943

2,331,861

UNITED STATES PATENT OFFICE

2,331,861

ABRASIVE DEVICE

John F. Downie Smith, Philadelphia, Pa., assignor to Edward G. Budd Manufacturing Company, Philadelphia, Pa., a corporation of Pennsylvania

Application July 29, 1940, Serial No. 348,143

3 Claims. (Cl. 51—197)

The invention refers to abrasive devices of the kind used for finishing sheet metal or other articles especially in the automobile body industry. More particularly, the invention refers to a disc or pad for supporting the abrasive material and to the means for connecting such disc with a driving shaft.

It is among the objects of the invention to reduce the costs of the finishing operations by facilitating the exchange of a worn-out abrasive disc for a fresh one, by making it possible to recoat a disc many times or even practically indefinitely, or by using the disc as a pad which has a very long life.

Another object of the invention consists in a disc which has those characteristics of flexibility which are highly desired and present an outstanding factor for the satisfactory performance of the finishing operations.

A still further object of the invention has to do with means for fastening an abrasive disc and a separate supporting pad to the driving shaft.

Some of the above objects are attained by the use of a disc or pad, which consists of flexible sheet steel and more particularly of high-tensile stainless steel, and/or which is integral with a central portion, the latter forming through its inherent flexibility one of the members of a coupling between the disc or pad and the driving shaft.

Another feature of the invention consists in providing a cup-shaped central member to the back of the disc or pad and to locate means for connecting the disc to the driving shaft in this portion.

Further objects, advantages and features of the invention will appear from the following description of several embodiments of the invention when read in connection with the attached drawings.

In the drawings:

Figure 1 is a fragmentary plan view of one embodiment of the invention.

Figures 2 and 3 are sections along lines 2—2 and 3—3, respectively, of Figure 1, Figure 2 showing a small part and Figure 3 in section a greater part of the driving device for the disc.

Figure 4 is a fragmentary plan view of another embodiment of the invention.

Figures 5 and 6 are sections along lines 5—5 and 6—6, respectively, of Figure 4.

Figure 7 is a development of a circular section through the disc along the circle line 7 of Figure 4.

Figure 8 is a fragmentary plan view of another embodiment.

Figure 9 is a section along line 9—9 of Figure 8.

In the embodiment shown in Figures 1, 2 and 3, a shaft 15 is rotatably located in a housing 16 and driven by bevel gears 17 from a shaft 18, the latter being located in the same housing. For driving the shaft 18, an electric or other motor may be directly connected to the housing 16 or the shaft 18 may be connected to one end of a flexible shaft, the other end of which is driven from some distant motor. The shaft 15 has a threaded end 19 screwed into a member 20. This member 20 rests by a roller bearing 21 against the end face of the housing 16. The details of this motor and the flexible shaft, respectively, are not shown because they are along with the members 15 to 21 of conventional design and do not form a part of this invention.

A cylindrical extension 22 is formed on the member 20 coaxially with the shaft 15. A pin or thin bolt 23 is pressed into a transverse opening of the portion 22 and has its two ends extending radially beyond the cylindrical surface of said member.

The circular disc 24, consisting preferably of high-tensile stainless steel or other resilient material, has an annular substantially flat outer portion 25, and a cup-shaped central portion 26 with a substantially flat bottom wall 27. The surface of the portion 25 is covered by the abrasive 28 which may be attached to this surface directly by means of some appropriate adhesive or it may be supported, as well-known, by a sheet of web material such as paper, cloth or the like, in which latter event the sheet is adhesively fastened to the surface of the disc portion 25.

The central flat portion 27 of the disc is reinforced by a member 29 which may likewise be formed of a resilient sheet metal plate. The member 29 is fastened to the disc 24 preferably by spot welding at 30. The disc portion 27 and the reinforcing member 29 are provided with a central hole and with slots 31 extending radially from the hole, the hole and slots allowing the entrance and the retraction therethrough of the members 22 and 23 at the end of the driven shaft 15. The member 29 is provided in circumferential direction adjacent to the slots 31 with a flat portion 32 extending from each of these slots to the lines 33 and 34. Beyond the line 34 in the direction of the arrow 35, each flat portion 32 is continued by an inclined portion 36 at the end of which is provided a radial recess or groove 37. Behind each recess 37 follows a

radial projection or ridge 38, which latter merges at the respective line 33 into the other flat portion 32.

The axial distance between the outer flat surface of the member 20 and the bolt 23 on the one hand and the axial distance between the rear surface of the disc portion 27 and the outer surface of the different sections of the member 29 is such that the bolt 23 may pass freely through the slots 31 and then extend slightly above the surface of the portion 32 of the member 29. Yet, when the disc and the member are then rotated relatively to each other, the bolt 23 runs against the inclined surfaces 36 and snaps into the depressions 37 after having depressed the end portion of the section 36. The diameter of the bolt 23 and of the depression 37 is such that the bolt 23 firmly presses against the side walls of the depression 37 after it is snapped into it thereby holding the disc as a whole against the member 20. The projection or ridge 28 prevents the rotation of the disc relative to the member 20 beyond the fastening position which is shown in the drawings.

Instead of having the inclined surfaces of the ridges and depressions formed as separately manufactured members, they may also be formed on the central portion 27 of the disc itself if the material of the disc is fitted for this purpose.

In the embodiment shown in Figures 5 to 6, there will be found the same member 20 with the extension 22 and the pin or bolt 23 all of which may be considered as a part of the driving shaft, the threaded end 19 only of which being shown. A cup-shaped member 40 is attached such as by spot welding and by means of its marginal flange 41 to the back of a flat disc 42. The bottom 43 of the member 40 is shaped corresponding to the member 29 of the first embodiment with a central opening and slots 31, flat sections 32, inclined sections 36, a groove 37, and a ridge 38. The outer portion of the disc may be perforated such as at 44 for the purpose of weight decrease and flexibility increase. The abrasive 45 or an intermediate sheet carrying the abrasive is adhesively fastened to the outer surface of the disc 42. The disc 42 proper and the cup-shaped portion 40 may consist of different material or be of different thickness. The cup-shaped portion 40 presents preferably again a sheet metal stamping, and the lateral openings 46 in its side allow to inspect whether the disc 42 and the member 20 are in proper engagement.

In the embodiment shown in Figures 8 and 9 the member 20 with its extension 22 and the bolt or pin 23 is present again. The disc 50, which carries the abrasive 51 in the same manner as previously described, has a depressed central portion 52 and fastened to its back such as by welding is the marginal flange 53 of a sleeve 54. This sleeve is provided with oppositely arranged, axially extending slots 55 which are continued by about circumferentially arranged, slightly rearwardly inclined slot portions 56, and the walls of the slots 56 which are farther away from the disc 50 are notched at 57. The distance between the slot portions 56, the notches 57 and the depression 52 of the disc on the one hand relative to the distance between the bolt 23 and the outer end face of its supporting portion 22 on the other hand is such that the projection 51 is kept under tension when the members are in the engaged position shown in Figures 8 and 9 and has to be further outwardly pressed if the disc shall be disengaged from the member 20 or a new disc be brought into engagement therewith.

As apparent, the discs or supporting pads can with the same ease be taken off or put on the member at the end of the driven shaft by simply forcefully turning the disc with respect to the shaft member. The embodiments have in common among other features that a disc formed member (or members) through its resiliency belongs to the means for removably holding the disc or the sheet with the abrasive to the end member of the driving shaft.

The invention is not restricted to the specific forms and the relative dimensions of the shown and described embodiments but many changes in detail will easily occur to anybody skilled in the art. Such embodiments and modifications are intended to be covered by the following claims. It should also be noted that certain features of one of the embodiments may obviously be used in combination with features of another embodiment.

What is claimed is:

1. Abrasive disc or pad of resilient yet durable material, such as steel, having a cup-shaped rearwardly extending portion, such portion forming an integral part of said disc and being provided with a central opening, slots extending radially from such opening and with cam surfaces extending circumferentially from said slots, the opening and the slots being adapted to allow a member at the end of a driven shaft and radial projections of such member to be passed therethrough, said cam surfaces being adapted to releasably engage or disengage said projections upon relative rotation between the disc and said driving shaft member.

2. Abrasive disc or pad comprising a rearwardly extending dished portion, the bottom wall of said rearwardly extending portion being provided in circumferential succession with a flat portion adjacent to each one of a pair of radially extending slots, a resilient inclined portion, a radial groove or recess, and a radial projection or ridge; said inclined portions being adapted to have radially extending projections of a driving shaft member run against them, and said grooves being adapted to have such projections snap into them, whereas said ridges or projections are adapted to act as a stop for such projections.

3. Abrasive disc or pad comprising a rearwardly extending portion forming an integral part thereof, said portion being provided with a central opening arranged concentrically to the center of the disc and with slots extending radially outwardly from said opening, cam surfaces being provided on said portion which extend from said slots in circumferential direction, each of said cam surfaces being followed by an axially extending recess and an abutment extending axially in the opposite direction of said recess, said opening and said slots being adapted to allow a member at the end of a driven shaft and radial projections on the latter to be passed therethrough, said cam surfaces being adapted to be engaged by said projections upon relative rotation between the disc and said member, and said recesses and abutments being adapted to limit the relative rotation between disc and member and to hold the latter in engagement.

JOHN F. DOWNIE SMITH.