May 10, 1949. A. P. BEAM ET AL 2,469,429

ABRASIVE AND POLISHING HEAD

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Fig. 3

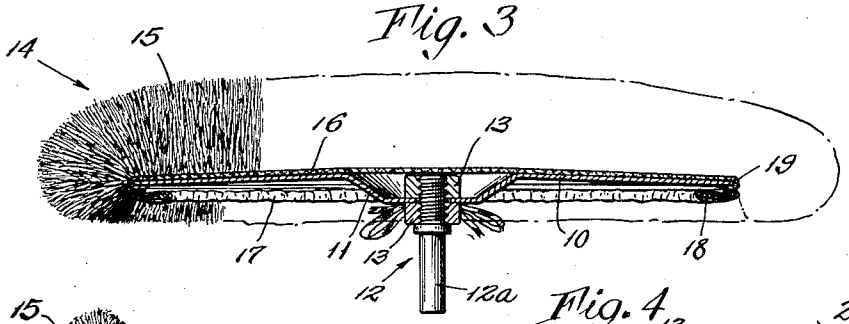


Fig. 4

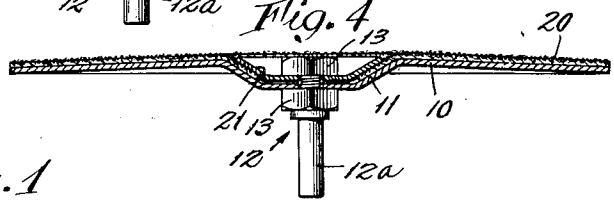
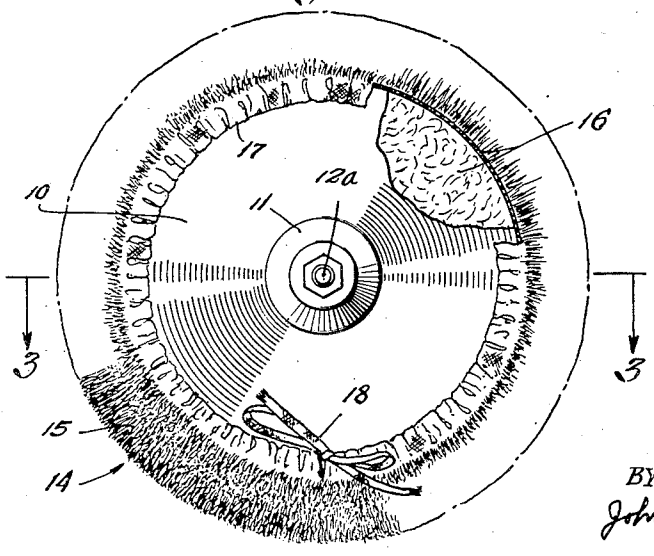


Fig. 1

Fig. 2



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ABRASIVE AND POLISHING HEAD

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1 Claim. (Cl. 51—197)

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This invention relates to abrasive and polishing disks or heads.

An object of the invention is to provide an improved economical and lightweight abrasive or polishing head which is especially adapted for universal use with portable tools such as electric drills, powered flexible shafts and the like, without requiring the use of tools, special fittings, adaptors, etc.

Another object of the invention is to provide an improved abrasive or polishing head as above, which is extremely simple in construction, and effective and reliable in use, and economical to manufacture.

A further object of the invention is to provide an abrasive or polishing head in which the working element may be quickly and conveniently removed and replaced with a new element, when this is necessary.

A still further object of the invention is to provide an improved abrasive head which mounts renewable abrasive disks in such a manner that a flat abrasive surface devoid of protuberances or projections is presented to the work, the said head being so organized that replacement of the abrasive disks may be quickly and conveniently carried out.

These objects are accomplished, according to the invention, by the provision of a novel head structure comprising a rotary metal supporting disk having a dished central portion providing a recess in its working face, the said portion mounting a short stub spindle. The spindle is of such size that it may be readily gripped in the chuck of an electric drill, flexible shaft or the like, and therefore the head structure is universally usable with such portable devices without requiring special fittings, tools, adaptors and the like.

The recess formed in the face of the disk carries a clamping collar or washer which lies wholly below the disk surface, and which clamps an abrasive paper or cloth disk to the metal supporting disk without any parts of the clamping device projecting beyond the disk face. Thus a completely flat abrasive surface is presented to the work at all times, which is advantageous when finishing surfaces of car bodies and the like.

The metal supporting disk is preferably of thin, flexible and resilient hard sheet aluminum alloy.

We have found that when the disk is formed of the hard, tough and resilient alloy commonly employed in airplanes and in one form known commercially as "24-ST," it may be quickly and economically fabricated by simple forming and

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stamping operations which are few in number, without resorting to additional operations such as annealing, hardening and tempering, which add expense to the fabrication process, or without resorting to the use of more expensive metals such as spring bronze and similar alloys, which while not requiring annealing or tempering, represent a high material cost. By the use of a suitable aluminum alloy, the supporting disk may be made very thin and may be extremely lightweight, while at the same time possessing the required strength, toughness and flexibility to satisfactorily function for supporting and rotating at high speed an abrasive or polishing element. As a result, any likelihood of the supporting disk suffering permanent deformation or distortion during use is considerably minimized.

Due to its simplicity and few small parts, the entire assemblage including the stub spindle is of very light weight, especially adapting it for use in portable tools, and is rugged in use.

Other features and advantages will hereinafter appear.

In the accompanying drawings:

Figure 1 is an edge elevation of the improved head structure of the present invention, applying a polishing element to a workpiece and being carried on an electric hand drill.

Fig. 2 is a rear elevation of the head structure, a peripheral portion of the polishing element being broken away and shown in section to more clearly illustrate the structure.

Fig. 3 is a diametric section of the head structure and polishing element taken on the line 3—3 of Fig. 2, and

Fig. 4 is a diametric section of the head structure mounting an abrasive disk element.

Referring to Figs. 2 and 3, the abrasive or polishing element supporting head comprises a disk 10 which is of very thin and lightweight sheet metal, the said disk being preferably of the flexible and resilient hard aluminum alloy commonly used in aircrafts, and having a laterally offset, dished center portion 11 which is apertured to receive the driving member for the disk.

As clearly shown in Fig. 3 the portion of the disk 10 surrounding the central offset is preferably slightly crowned, the front or working face being the convex side.

The disk 10 may be fabricated in various ways. For instance, it may be blanked and drawn in a press operation, or it may be spun from a flat disk. In either circumstance we have found that when such a disk is used to support either a polishing element or an abrasive element, it resists per-

manent distortion or deformation to a considerable degree, especially when being rotated at high working speed. Heretofore supporting disk structures were not formed of aluminum or its alloys for the reason that it was thought the structure would not be strong enough to withstand severe use. However, by employing the hard aluminum alloy known as "24–ST" and comprising 4.4% copper, 0.5% manganese, 1.5% magnesium and balance aluminum, which has been specially adapted for aircraft use, or a similar aluminum alloy which has considerable resiliency, toughness and hardness or resistance to bending, and by forming such metal in the shape shown with a central dished portion and a slight crown, an extremely practical, rotatable supporting head structure is obtained which has the necessary strength for the purpose required, and is at the same time extremely lightweight so that it is well adapted for use in portable tools. In addition, it is economical to fabricate, since the material cost is low as compared with the cost of the bronzes or carbon steel. In the case of the latter material there is present the hardening and tempering operations which of themselves add to the cost. Where a hardened steel disk is used as a supporting head structure, there is always the likelihood of the steel cracking or breaking, whereas in accordance with the present invention by the use of the aluminum alloy referred to above, it is impossible for the disk to crack or break during usage.

According to the invention the disk 10 is provided with a stub shaft or spindle 12 having a shank 12*a* which is preferably smooth and is of such size and shape that it may be inserted and gripped in all types of drill chucks commonly employed with electric drills, powered flexible shafts, and the like. The stub shaft 12 has a threaded portion extending through the aperture in the disk 10 and carrying nuts 13 which between them securely clamp the center of the disk and support the latter for rotation.

A projecting annular shoulder 12*b* disposed between the shank 12*a* and threaded portion of the spindle limits insertion of the shank in the chuck as shown in Fig. 1.

By the provision of the stub spindle 12 with shank 12*a* it is possible to quickly mount the supporting head structure in the chuck of any hand drill, flexible shaft or the like without the use of special wrenches, fittings or adaptors, and this is an important advantage since it enables the disk to have universal and widespread use with existing equipment. In addition, transferring of the disk from one portable tool to another does not involve disassembly of any of the parts of the disk, and the latter may therefore remain intact. It will be seen that during the assembly of the stub shaft 12 to the disk 10 the nuts 13 may be pulled up very tightly with suitable wrenches and secured against loosening so that during usage, and in spite of severe vibration, flexing of the disk etc., no failure will result due to loosening of threaded members as has been the case heretofore in prior supporting disk structures.

As shown in Figs. 1 through 3, the disk 10 may carry a relatively thick fur-like polishing element 14 of sheepskin; such elements, as is well known, have long woolen fibres 15 emanating from a hide base 16. The polishing element 14 is in the form of a disk having a diameter slightly greater than that of the supporting disk 10, and a tubular cloth ring 17 is secured to and extends along the periphery of the sheepskin disk 14, the said ring carrying a drawstring 18.

When the polishing disk 14 is applied over the supporting disk 10, the peripheral edge portion 19 of the polishing disk will extend over the periphery of the supporting disk, and upon the drawstring 18 being tightened and tied, the said peripheral portion 19 will be folded over the thin bladelike periphery of the disk 10 and will tightly embrace the latter on both sides thereof.

We have found that, this construction, together with the inherent non-slip surface characteristics of the hide base 16, the polishing element 14 is tightly secured to the supporting disk 10 against slippage. Also, due to the toughness of the hide 16, the latter will resist abrasion from the bladelike periphery of the disk to a considerable extent, if for any reason, such as when the tie-string is not tight enough, slippage should occur between the polishing element and the disk.

A polishing head as made in accordance with this invention, when so mounted on an electric hand drill or other portable tool, provides an effective, portable polishing device which may be conveniently applied to a workpiece W as shown in Fig. 1, to brighten and polish the surface thereof.

Due to the hardness or stiffness, and to the resiliency of the supporting disk 10 and the speed at which the disk is driven, considerable pressure may be applied during the polishing operation without resulting in permanent deformation of the disk. During the application of the polishing head to the workpiece W a slight deformation of the disk may occur, as illustrated in Fig. 1, due to the unbalanced lateral pressure on the head. However, this deformation is not permanent because of the resiliency of the supporting disk, and is in fact desirable in enabling the polishing head to conform to various shapes and contours of workpieces.

Referring to Fig. 4 the supporting disk 10 may carry a centrally apertured abrasive disk 20 of any well-known type, the said abrasive disk having either a paper or cloth foundation. The abrasive disk 20 is clamped to the supporting disk 10 by means of a dished frustro-conical clamping washer 21 which is secured under one of the clamping nuts 13. The construction is such that the nut 13 and clamping washer 21 are disposed wholly below the mouth of the dished portion of the disk 10, and below the surface of the abrasive disk 20, and therefore there are no projecting or protruding parts which might interfere with the abrading of a large surface or area.

It will be seen that the center portion of the abrasive disk 20 is clamped under the peripheral edge portion of the washer 21, and by securely tightening the nut 13 holding the washer, the entire inner periphery of the abrasive disk is securely held in place and prevented from pulling out.

The supporting head structure of this invention is thus seen to be extremely simple in construction and economical to manufacture, and to be quickly applicable to various types and sizes of portable tools. When desired, either the abrasive or the polishing element may be quickly and conveniently replaced, either while the supporting head is mounted on the tool, or when the head is removed from the tool. Due to the aluminum alloy material used in forming the disk 10 and due to the thinness and particular shape and structure of the disk, the latter is of light weight

while at the same time having considerable strength for the purpose intended.

Variations and modifications may be made within the scope of this invention and portions of the improvements may be used without others.

We claim:

A supporting head for an abrasive or a polishing element, comprising a lightweight, thin resilient stamped sheet metal disk of hard aluminum alloy consisting of 4.4% copper, 0.5% manganese, 1.5% magnesium, and 93.6% aluminum, said disk having an annular working portion, and a drawn, dished center portion located within and close to said working portion, and said disk being characterized by a total lack of heat treatment after its formation; and a stub driving spindle secured to and at one end passing through the center portion of the disk, said spindle extending axially from the disk and having a shank for insertion into a drill chuck to be gripped thereby, the end of the spindle within the dished portion of the disk lying wholly below the mouth of said portion.

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