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P. E. SCHAFFNER

2,767,524

FINISHING APPARATUS

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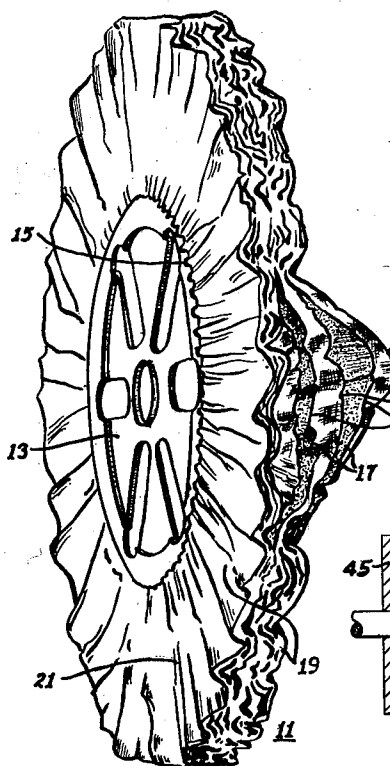


FIG. 1.

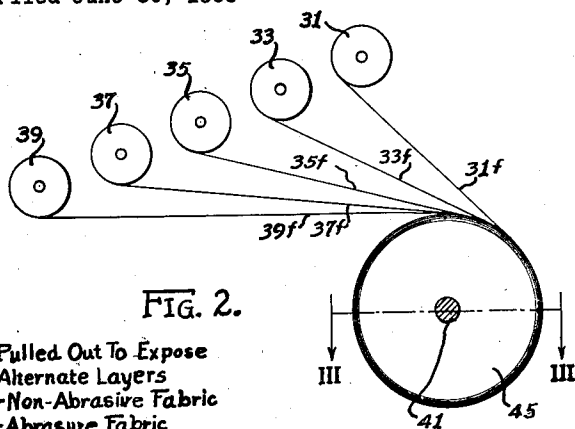


FIG. 2.

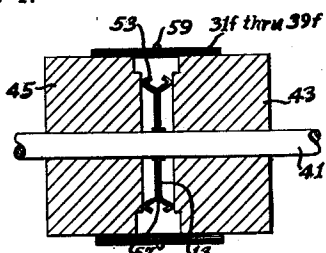


FIG. 3.

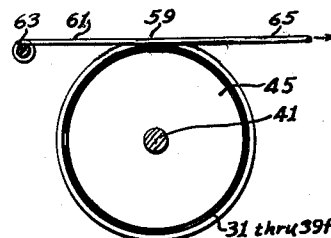


FIG. 4.

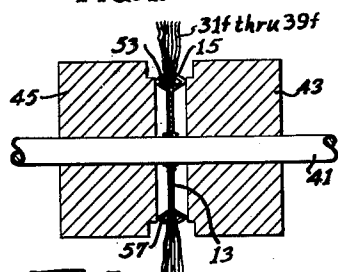


FIG. 5.

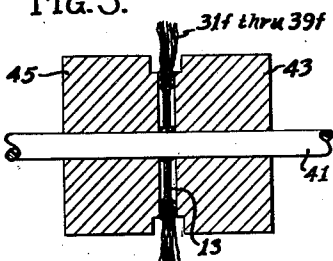


FIG. 6.

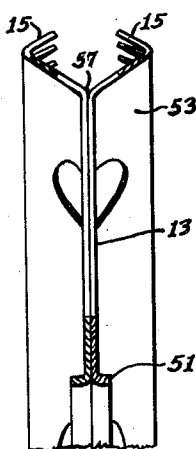


FIG. 7.

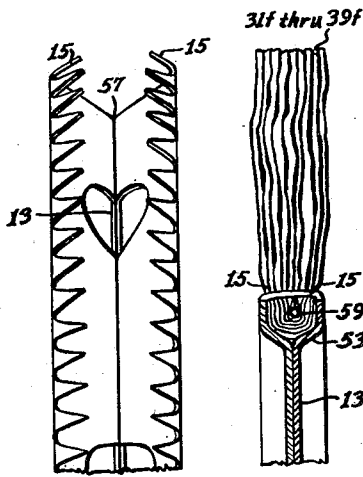


FIG. 8.

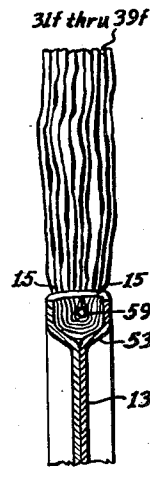


FIG. 9.

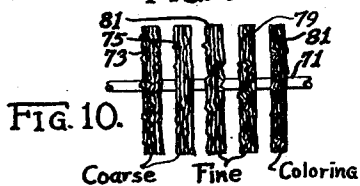


FIG. 10.

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FINISHING APPARATUS

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2 Claims. (Cl. 51—193)

This application relates to metal finishing apparatus and has particular relation to apparatus for polishing and buffing.

In the finishing art, the word polishing means an operation by which surface imperfections such as tool and die marks, parting lines, pits or deep scratches are removed from the surface of metal, wood, plastic (phenolic condensation products) or the like and the surface is caused to acquire a smooth, uniform finish. The word buffing means the operation of producing a smooth uniform and lustrous surface on objects of metal and similar material. Where a higher and brighter finish is required, there is an advanced buffing operation called coloring.

In polishing, the finishing of smooth surfaces must be considered in a different category from the treatment of surfaces which have ridges or are otherwise of irregular contours. In the polishing of the former, it is only necessary to remove the surface imperfections which project from the surfaces and to achieve this object it is only necessary to apply the polishing operation directly to the surface. Where the surface has irregularities, it is necessary to remove the surface imperfections without removing the ridges or irregularities which are essential for the purpose for which the work has been produced.

In accordance with the teachings of the prior art, polishing and buffing operations are carried out with so-called polishing and buffing wheels. Such wheels are in general made of fabric materials, such as cloth, felt or leather. Preparatory to a polishing operation, the edge or face of the polishing wheel is coated with an adhesive and rolled in a pan of abrasive grain. The wheel with the abrasive adhering to it is then rotated in engagement with the surface to be polished. A like operation is carried out in the case of buffing but in this case a buffing compound designed to produce the uniform lustrous surface is applied to the buffing edge of the wheel in lieu of the grit compound. Typical buffing compounds are described in Catalogue 54 of Schaffner Manufacturing Co., Inc., of Emsworth, Pa. Such compounds include a lubricant and an abrasive. Coloring is in effect a buffing operation in which a milder and dryer compound, that is, one with a finer abrasive and less lubricant, is used than in the ordinary buffing operation. It is essential that during a finishing operation the compounds remain in engagement with the work and it is necessary that the periphery of the buffing wheel retain a large portion of the compound applied to it.

A polishing operation is usually carried out in several steps. First, there is a roughing out operation in which the polishing is effected with a coarse grit. After this roughing out operation is completed, progressively finer grits are applied until the desired surface smoothness is achieved. Thus, in effect, both the polishing and buffing operations are carried out in several steps involving radically different treatment of the surface material.

The prior art apparatus just described has not proved satisfactory. Its principal difficulty has been that both the polishing and the buffing operation consume excessive

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time and are costly. In addition, prior art wheels do not afford sufficient flexibility to carry out polishing and buffing operations effectively.

In an attempt to overcome the problems raised by the generally available buffing and polishing apparatus, the so-called sisal bias buff wheel has been made available. This wheel is used primarily for buffing but because it is composed of sisal, a coarse material, it has been asserted that it is capable of removing the surface imperfections which is essential in polishing. But, in practice, the operation of the sisal bias buff wheels has not yielded appreciably higher polishing speed than prior art apparatus because it does not effectively remove stock and cannot be adapted to remove larger or lesser amounts of stock as may be required by the work.

A wheel of the recent prior art of an entirely different type from the sisal bias buff wheel is disclosed in patent 2,355,667 to Melton and Ball. This wheel is made up of a plurality of superimposed rings of abrasive fabric. Wheels of this type are not suitable for the polishing of irregular surfaces. The difficulty arises from the fact that the abrasive wheel disclosed in the Melton patent, removes stock from the surface being finished at a substantial rate which cannot be readily controlled and does not dovetail itself into an irregular surface so that there is a tendency to remove or flatten and distort the normal ridges and irregularities of the surface of work having such irregularities.

A further deficiency of the Melton wheel is that it fails to retain the polishing compounds applied during an operation.

It is accordingly broadly an object of this invention to provide a metal finishing wheel with which the buffing and polishing operations shall be carried out in less time than is consumed with prior art wheels.

Another object of this invention is to provide a finishing wheel which shall afford the high flexibility necessary for effective and expeditious finishing.

This invention arises from the realization that what is essential for effective and expeditious finishing is a wheel that shall perform both polishing and buffing operations, and it is, accordingly, a specific object of this invention to provide a wheel that shall serve effectively both for polishing and buffing.

It is a further specific object of this invention to provide a wheel that shall serve both for polishing and buffing, and that shall lend itself to polishing and buffing of irregular surfaces without removing or distorting the ridges or irregularities of the surfaces and that shall permit the completion of finishing operations at a higher rate than with prior art wheels.

In accordance with this invention, a combined polishing and buffing wheel is provided which includes a number of plies of pleated fabric, certain of which are abrasive and the remainder non-abrasive. The fabric is held together by a central hub, the diameter of which is substantially smaller than the outer diameter of the fabric so that the fabric extends loosely from the hub. The abrasive fabric may be abrasive cloth, abrasive paper or abrasive screen. Thus, the abrasive fabric may be of the material disclosed in the Melton and Ball patent. The non-abrasive fabric may be composed of cloth of different types, depending on the service which the fabric is to perform. Thus, the non-abrasive fabric may be muslin, canvas, felt, walrus, leather, sisal or the like. While the use of fabric abrasive on both surfaces has important advantages in the practice of this invention, in accordance with the broader aspects of this invention, the abrasive fabric may be abrasive on both or on only one of its surfaces.

It is an important feature of this invention that between each abrasive ply and the adjacent abrasive ply

there is at least one ply of non-abrasive fabric. This is of particular advantage in situations in which the abrasive fabric is abrasive on both surfaces. This can be understood by considering the Melton wheel. When this wheel is in engagement with work, the pressure is exerted by the work on the wheel and tends to cause adjacent fabrics to engage and rub against each other. If this fabric is abrasive on both surfaces, there is considerable wear of the fabric and the life of a wheel of the Melton type is considerably reduced. In the wheel in accordance with this invention the abrasive fabric engages only non-abrasive fabric and in this way the damage produced by the engagement of abrasive fabric with other abrasive fabric is eliminated.

The wheel disclosed herein has the advantage that it retains the buffing compounds. Since there are at least two plies of non-abrasive fabric adjacent each ply of abrasive fabric, the buffing compound remains effective both for the abrasive and the non-abrasive plies.

The novel features considered characteristic of this invention are set forth above. This invention itself both as to its organization and its method of operation, together with additional objects and advantages thereof, will be understood from the following description of a specific embodiment when read in connection with the accompanying drawings, in which

Figure 1 is a view in perspective of a combined buffing and polishing wheel in accordance with this invention;

Fig. 2 is a diagrammatic view showing apparatus for making the wheel shown in Fig. 1;

Fig. 3 is a view in section taken along line III—III of Fig. 2;

Fig. 4 is a diagrammatic view illustrating an advanced step in the making of the wheel in accordance with this invention;

Fig. 5 is a view similar to Fig. 3 but in an advanced stage of the making of the wheel;

Fig. 6 is a view in section similar to Figs. 3 and 5 but in a further advanced stage of the making of the wheel;

Fig. 7 is a view in fragmentary cross section of the hub as it is before it is combined in a wheel;

Fig. 8 is a view in fragmentary elevation of the hub;

Fig. 9 is a fragmentary view showing a portion of the hub of the wheel and the plies extending from it; and

Fig. 10 is a diagrammatic view showing an array of wheels in accordance with this invention used in a buffing-polishing operation.

The wheel shown in Fig. 1 includes a plurality of plies of fabric 11 secured to a central hub 13. This hub 13 is usually composed of a metal such as aluminum or steel and is provided with teeth 15 (or staples) which engage the fabric 11 firmly. The fabric consists of a number of plies 17 of abrasive fabric and a number of plies 19 of non-abrasive fabric. The plies 19 are made up from fabric strips cut on a bias and the plies 17 may or may not be cut on a bias. The plies 17 and 19 have pleats 21, the number of pleats per unit area of fabric being determined by the purpose which the wheel is to serve.

It is an important feature of this invention that each abrasive ply 17 is separated from the nearest abrasive plies 17 by non-abrasive plies 19. It is another important specific feature of this invention that the abrasive fabric 17 is abrasive on both surfaces, although within the broader aspects of this invention, fabric which is abrasive only one one surface may be included in a wheel.

Within the above described framework the wheel, according to this invention, may vary in structure over a reasonable range to meet the various finishing problems which confront the industry. But the variations should take into consideration the circumstance that the wheel serves both for polishing and buffing.

The wheel may have any reasonable number of pleats 21 and any reasonable proportion of the number of abrasive and non-abrasive plies. The pleats lend resiliency to the wheel and where the wheel is to be very soft, for

example, for use in polishing and buffing, irregular surfaces or surfaces with ridges, the fabric should have a large number of pleats. The number of plies of abrasive fabric 17 and the number of plies of non-abrasive fabric 19 interposed between each pair of abrasive plies are also determined by the purpose which the wheel is to serve. Where the wheel is to perform primarily a buffing operation, and in addition, is to remove very small irregularities, or where the wheel is to be used with substantial quantities of buffing compound, the proportion of abrasive plies should be small. Where the stock is to be removed to a substantial extent, for example, in the case of a surface having large imperfections, the proportion of the abrasive plies should be higher. The quality of the fabric should also be governed by the purpose for which the wheel is to be served. For example, where the wheel is to be used for roughing out the abrasive fabrics may be coarse. Where the wheel is to perform the final polishing operation, or the finishing operation, the abrasive fabric need be fine. Coloring wheels should have a relatively small number of abrasive plies of fine abrasive quality. Coarse and fine abrasive fabric may be combined in one wheel.

Apparatus for making a wheel, in accordance with this invention, is shown in Figs. 2 through 9. A plurality of spools 31, 33, 35, 37 and 39 of fabric are mounted on rotatable pay-off pins or shafts. Certain of the spools 31, 35, 39 carry non-abrasive fabric and the remainder 33 and 37 abrasive fabric. The spools are arranged in an array corresponding to the ply arrangement of the fabric. Thus, as shown in Fig. 2 two spools 33 and 37 of abrasive fabric may be interposed between three spools 31, 35, 39 of non-abrasive fabric.

The apparatus for making the wheel, in accordance with this invention, also includes a mandrel mounted on a rotatable shaft 41. The mandrel is made up of a pair of drums 43 and 45 between which the hub 13 of the wheel is mounted. Prior to being combined in the wheel, the hub 13 comprises a flanged ring having a bearing 51 at the center. The flange 53 is of claw-shaped cross section, the claws terminating in the teeth 15, and being open so that the fabric may be inserted between the teeth 15.

In the making of the wheel, the end of the fabric 31f through 39f from each of the spools 31 through 39, respectively, is attached to the mandrel in a position corresponding to the position in the array of the spool. Thus in the structure shown in Fig. 2 two abrasive fabrics 33f and 37f are interposed between three non-abrasive fabrics 31f, 35f, 39f. The fabrics are attached on the mandrel in a position such that the central plane 57 of the hub 13 passes through the center of the fabric. Once the fabric is attached the shaft 41 is rotated and the fabric is built up in a helix on the mandrel. The number of layers of each fabric and the number of fabrics determine the number of plies. Thus the number of plies is equal to the product of the number of layers of fabric by two by the number of fabrics.

Once the required number of layers have been wound onto the mandrel, each of the fabrics is cut or otherwise disconnected. A single loop 59 of wire is then wound about the fabric at its center. One end 61 of this wire is held at a fixed point 63 and the other end 65 is pulled until the fabric has been tightly engaged with the central plane 57 of the hub 13. After the wire 59 has been tightened, it is secured at a point on the hub and the remaining wire is detached. The wire thus forms a holding means for the fabric as shown in Fig. 9. The drums 43 and 45 are then urged against each other under pressure, collapsing the teeth 15 on the fabric and forming the wheel.

The diameter of the drums 43 and 45 determines the number of pleats 21 per unit area in the fabric 11. The greater the diameter of the drums 43 and 45 the more pleated the fabric is. The width of the fabric determines the diameter of the wheel. The diameter of the wheel is

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equal to the diameter of the central plane 57 around which the fabric is secured plus the width of the fabric.

Wheels, in accordance with this invention, are used for polishing and buffing as shown in Fig. 10. In this view a rotatable shaft 71 having a plurality of wheels 73, 75, 77, 79, 81, in accordance with this invention, mounted thereon is shown. The wheels are not all alike. Each of the wheels has properties suitable for the purpose which it is to perform. Thus, at the extreme left there may be a plurality of coarse wheels for performing the roughing out polishing operation. These wheels should have abrasive fabrics with a coarse abrasive and a larger proportion of abrasive cloth to non-abrasive cloth. For fine finishing, the succeeding wheels may be used. These wheels have a smaller proportion of abrasive fabric to non-abrasive fabric and in addition the abrasive fabric is fine. The next wheels provide for coloring. In this case there are only a few plies of abrasive fabric and many plies of non-abrasive fabric and the abrasive fabric has the finest abrasive thereon.

In accordance with this invention, a combined polishing and buffing wheel has been provided which lends itself with facilities to various purposes. This wheel is suitable for polishing and buffing surfaces of any type and particularly irregular or ridged surfaces. In wheels, in accordance with this invention, used for polishing and buffing irregular surfaces, the abrasive fabric may be so related to the non-abrasive fabric and the fabric may be so pleated that the wheel removes the surface imperfections without distorting or removing the irregularities. In addition, the wheel, according to this invention, has the property of retaining the buffing compound on its

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operating surface. It is desirable that to the extent practicable the abrasive plies have abrasive on both surfaces. Where the abrasive fabric has abrasive only on one surface there is a tendency when the wheel is engaged with the work for the abrasive fabric to be bent in a direction such that the non-abrasive surface engages the work, and thus the function of the abrasive surface is not performed. This invention facilitates the provision of a wheel in which the abrasive fabric has abrasive on both surfaces, since between each abrasive surface and the adjacent one, there is at least one non-abrasive ply, thus the engagement of abrasive surfaces is precluded.

I claim as my invention:

1. As an article of manufacture a polishing and buffing wheel comprising a plurality of plies of pleated fabric extending loosely from a central hub, the diameter of the hub being substantially smaller than the outside diameter of said plies, the said wheel being characterized by the fact that certain of the plies are composed of abrasive fabric and the remainder of non-abrasive fabric, the plies of abrasive fabric being separated by at least one ply of non-abrasive fabric.

2. An article according to claim 1 characterized by the fact that both surfaces of each abrasive ply are abrasive.

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