

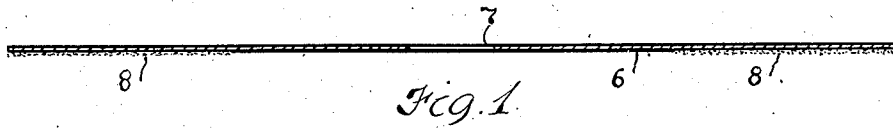
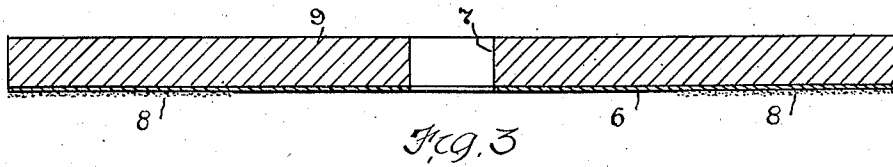
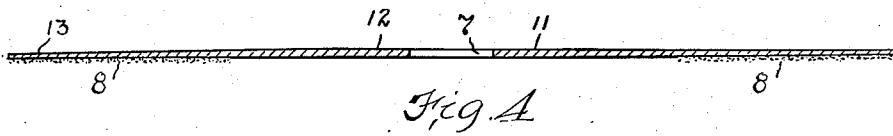
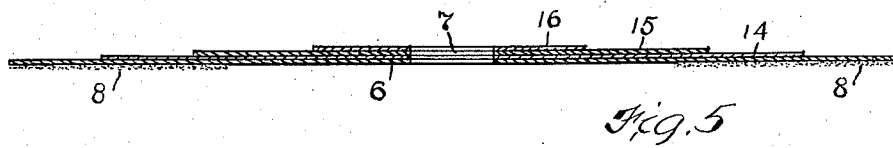
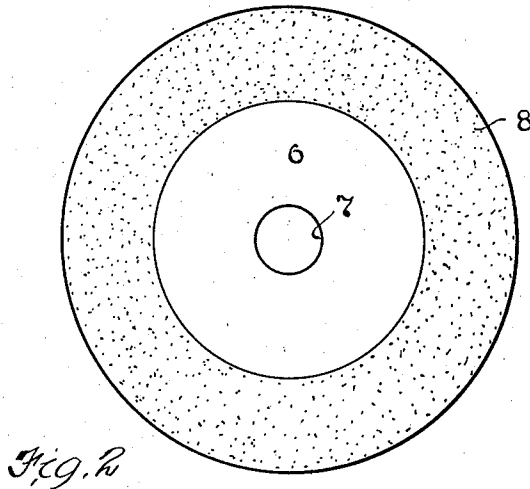
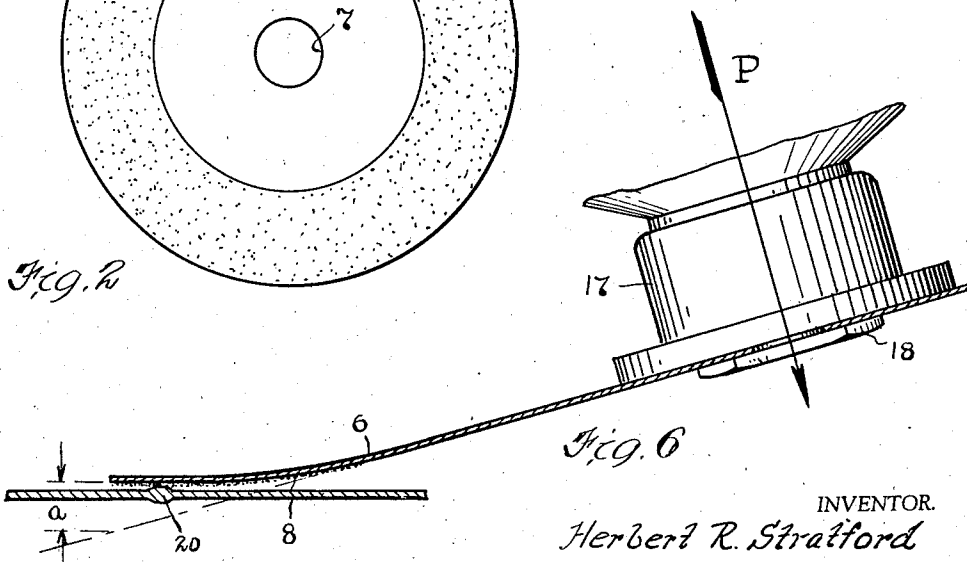
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SURFACING APPARATUS

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SURFACING APPARATUS

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7 Claims. (Cl. 51—197)

The present invention relates to a surfacing apparatus and, more particularly, to a new and improved abrasive element for use in surfacing or abrading wood and metal panels and panels coated with various materials, and the like. This application is a continuation in part of my pending application Serial No. 644,605, filed November 28, 1932.

In the treatment of the surfaces of certain classes of work, such as the surfaces of automobile panels, it is necessary to grind down weld seams and remove other irregularities before a coating of lacquer, paint, etc. can be applied. In cutting down welds, it has been customary to use a grinding wheel by applying the periphery thereof, while rotating at a high rate of speed, to the metal to be removed. The action of the wheel applied in this manner results in the scalloping of the surface which is undesirable and also results in gouging of the adjacent panel surfaces since it is not possible to determine when a revolving wheel has cut the weld metal flush with the surface. For these reasons, among others, weld-grinding with abrasive wheels has not been satisfactory and efforts have been directed to finding a more satisfactory substitute for such wheels. The surfaces of the panels themselves have been abraded and smoothed preparatory to receiving coats of lacquer by applying a rotating disc thereto, such discs generally being made of paper or cloth or a combination of these supported by a flexible and/or compressible pad, but these paper or composite discs wear down rapidly and must be replaced frequently. An apparatus which would do better work than an abrasive wheel in cutting down welds and which would also replace paper discs by a more permanent abrading surface is obviously desirable and the present invention contemplates supplying such a device to the art.

The surfacing apparatus or abrasive disc embodying the principle of the present invention has therefore been designed for the purpose of eliminating the disadvantages and retaining the advantages and benefits of these two above discussed prior types of abrading devices. That is to say, applicant's abrasive disc has been designed and conceived in order to embody the proper amount of flexibility together with desired strength and durability.

It is, accordingly, an object of the present invention to provide an element which may be used as a disc to do the heavy abrading work now performed by grinding wheels and to do this work in a more satisfactory manner. Another object

of the invention is to provide an abrasive article which is more permanent in nature than abrasive discs now used for surfacing operations of a lighter character. Still another object of the invention is to provide an abrasive disc of such strong construction that there is no danger of the disc being disrupted by centrifugal force with consequent danger to the user. A further object of the invention is to provide an abrasive disc having strength and stiffness combined with an optimum degree of flexibility under pressure normally applied by the operator in actual practice, as to abrasive operations of the nature as above pointed out.

To the accomplishment of the foregoing and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims.

The annexed drawing and the following description set forth in detail certain mechanism embodying the invention, such disclosed means constituting, however, but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawing:

Fig. 1 is a vertical section through one of the improved discs; Fig. 2 is a plan view of the disc shown in Fig. 1; Fig. 3 is a vertical section through a disc similar to that shown in Fig. 1, but provided with a supporting pad; Fig. 4 is a vertical section through another modification of the invention; Fig. 5 is a vertical section through still another modification of the invention; and Fig. 6 is a partial central vertical section showing the improved disc assembled with driving shaft and illustrating the desired flexible action.

Referring to Fig. 1, there is shown a disc 6 of thin flexible metal, preferably of steel although other metals can also be used. This metal disc has a central aperture 7 by means of which it can be attached to a rotatable head of a portable surfacing tool of well known type. Adjacent the periphery of the metal disc 6 a layer of abrasive 8 is attached by means of adhesive, it being understood that this layer can be of varying thickness and may be either a single coat of grains attached by means of glue, or may be a composition of bakelite, overcured rubber, or the like, through which abrasive grains are distributed, and which includes sawdust, woodflour, or other filler increasing the friability of the mass. The abrasive is preferably applied in an annular ring around the periphery of the disc to the extent of an inch or more in width since this is, ordinarily, the only part of the disc which is used, or

the abrasive may be distributed over the entire surface of the disc up to the margin of the central aperture 7.

In Fig. 3, a disc similar to that of Fig. 1 is shown having a thin metal sheet 6 carrying an annular ring of abrasive 8 but further provided with a backing pad 9 of felt or other material which is flexible and/or compressible in order that the metal disc 6 may be free to flex. Whether the disc 6 is used without a supporting pad as in Fig. 1 or with a supporting pad as in Fig. 3, this disc is constructed of thin flexible metal of such a strength that the flexibility is limited so as not to exceed a certain amount.

For example, in a disc having a diameter of 8 or 9 inches which is a suitable size for the work which is intended to be done with these discs, the flexibility at the periphery of the disc and adjacent the abrasive layer 8 is in the neighborhood of $\frac{1}{8}$ to $\frac{1}{4}$ of an inch and, preferably, should not exceed the latter figure. That is to say, when a disc of this diameter is rotated at a high rate of speed and applied at an angle to the work in the manner customary where rotating discs are used, and the operator exerts a manual pressure at the center of the disc on the driving shaft, the metal disc 6 should permit a flexing of not more than a quarter of an inch out of the plane of rotation.

The last discussed limited flexibility is further illustrated and defined by reference to Fig. 6. In this latter figure, the metal disc 6 is secured to a driving shaft 17, of the customary form and design, by means of a fastening stud 18 passing through the central aperture of the disc. The operator of course grasps the apparatus by means of suitable handles (not shown) associated with the driving shaft 17 and applies a pressure P axially of the shaft as indicated by the arrow in Fig. 6. The annular ring of abrasive 8 on the periphery of the metal disc 6 is placed in contact with the weld seam 20 and by virtue of the application of the pressure P, the outer edge portion of the metal disc 6 is deflected a distance a out of its normal plane. Actual experience has shown that the amount of manual pressure P which is applied along the axial line of the driving shaft 18 lies within the range of 12 to 13 pounds. Upon the application of such a range of pressure at the central point of support of the metal disc 6, the amount of flexure of the outer edge of the disc is represented by the distance a and will vary from $\frac{1}{8}$ to $\frac{1}{4}$ of an inch.

By thus making the disc of strong material with a limited flexibility, the abrasive surface may be brought against the work with sufficient pressure to cut down irregularities such as weld seams for which a wheel was heretofore thought to be necessary and, at the same time, the small amount of flexibility permits the outer part only of the disc surface to be brought against the work so that curved surfaces may be treated in the manner customary with abrasive discs.

The importance of maintaining the flexibility of a disc intended for the above described purposes within the indicated limits follows from the necessity of having sufficient strength and rigidity in the disc to permit adequate pressure to be brought to bear on metal such as that of weld seams which is very hard and requires heavy cutting. Discs heretofore made, even where prepared of metal, have been so flexible that no appreciable pressure could be brought to bear on the surface being treated and such discs would have no effect on heavy work. Some flexibility must, however, be present since a perfectly rigid

disc would jump over the work and could not be controlled so as to make an even cut and thus reduce the surface to a uniform condition.

The limited flexibility desired may be secured in a disc of uniform thickness as described in connection with Fig. 1, but it is also possible to regulate this flexibility by making the disc of tapered thickness as shown in Fig. 4. In this modification of the invention, the disc 11 is also provided with a central aperture 7 and with an annular ring of abrasive 8, but the metal disc itself has a maximum thickness at 12 adjacent the central aperture and this tapers off to a minimum thickness at the outer periphery 13 of the disc, thus making it possible to provide the necessary flexibility at the outer portion of the disc, which is the working portion, and yet thicken the disc near the central portion so as to provide strength necessary in order that the disc may be caused to do heavy work.

Still another modification of the invention is shown in Fig. 5 wherein a metal disc 6 carries a layer of abrasive 8 at its outer portion, but wherein a modification of flexibility, while providing strength, is secured by a series of stepped plates 14, 15 and 16. All of the plates are pierced by central aperture 7 for attachment to a rotating head and it will be seen that the disc can be given a limited flexibility by proper disposition of the backing plates 14, 15 and 16 while it also provides sufficient strength for heavy work.

The improved abrasive element herein described can also be used to replace ordinary paper discs mounted on a supporting pad and attached to a rotatable driving head. Due to the fact that the abrasive layer 8 is attached directly to the face of the metal disc 6, there is no intervening layer of paper or cloth which would require to be removed when consumed. The disc consists therefore only of the metal plate and of the layer of abrasive and it is found that such an element stands up longer in use and will give more service than a disc in which the abrasive is mounted on a paper backing instead of a metal backing and is backed by a supporting pad. Discs made entirely of metal and carrying the abrasive directly on the metal can be used for much rougher and heavier work than paper discs since the metal is not torn by the work as would be the case with cloth or paper discs. When the abrasive is consumed, the metal disc can either be thrown away or recoated for further use. Another advantage resulting from the use of metal discs is that this material is strong and is not likely to be disrupted by centrifugal force whereas paper and cloth discs often fly apart and the fragments resulting are projected with enormous velocity, being extremely dangerous to the workman who may be struck by them.

By making the metal plate 6 or the equivalent construction shown in Figs. 4 and 5 of limited and graduated flexibility, a disc may be prepared having a definite flexibility in proportion to the distance to the point of support. In the case of a disc, it is found that the metal plate should not flex more than about $\frac{6}{100}$ of an inch out of its own plane for each inch of radial distance from the central point of attachment. Thus a small disc having a flexibility one inch away from its center equal to the flexibility of the herein described disc at a point $4\frac{1}{2}$ inches from the center would not be suitable for heavy work since its total flexibility if increased in size to 9 inches diameter would be so great as not to

permit any appreciable pressure to be applied to the work.

5 The invention is intended to be used for surfacing welded automobile body panels and similar heavy work, it being found that discs having the foregoing characteristics of strength and limited flexibility are particularly suitable for such work. It has been found that welds can be cut down by means of these metal discs much more satisfactorily than with abrasive wheels, 10 the disc standing up well under the tearing effect of the rough weld due to its metallic construction and the weld being reduced flush with the surface of the panels gradually without scalloping and without cutting the panels due to the 15 fact that the operator can tell when a disc has cut the seam flush with the adjacent surfaces whereas this cannot be determined where a wheel is used. The surfaces of the panels can also be 20 abraded much more economically with the described metallic disc since the metal stands up more effectively under the stress of use than does paper or cloth discs.

Other modes of applying the principle of my 25 invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed. 30 I therefore particularly point out and distinctly claim as my invention:—

1. An abrasive device comprising a sheet of thin flexible metal and a layer of abrasive secured by a layer of adhesive directly to said 35 metal sheet, said device having a flexibility under manual pressure of 13 pounds applied at the point of support of said device of not more than one-quarter of an inch at a distance of about four and one-half inches from said point of support. 40

2. An abrasive device comprising a sheet of thin flexible metal and a layer of abrasive secured by a layer of adhesive directly to said metal sheet, said device having a flexibility under 45 manual pressure of 13 pounds applied at the point of support of said device of about six one-hundredths of an inch for each inch of linear distance from said point of support.

3. An abrasive disc comprising a sheet of thin flexible metal and a layer of abrasive secured by a layer of adhesive directly to said metal sheet, said disc having a flexibility under manual pressure of 13 pounds applied at the center of said disc of not more than one-quarter of an inch at 5 four and one-half inches radius.

4. An abrasive disc comprising a sheet of thin flexible metal and a layer of abrasive secured by a layer of adhesive directly to said metal sheet, 10 said disc having a flexibility under manual pressure of 13 pounds applied at the center of said disc of about six one-hundredths of an inch for each inch of radial distance from the center of the disc. 15

5. An abrasive disc comprising a sheet of thin flexible metal and an annular layer of abrasive attached by means of an adhesive directly to said metal sheet adjacent the periphery thereof, said disc having a flexibility under manual pressure 20 in the range of 12 to 13 pounds applied at the center of said disc of between one-eighth and one quarter of an inch at a radial distance of about four and one-half inches from a central point of attachment. 25

6. An abrasive disc consisting of a sheet of thin flexible metal and an annular layer of abrasive attached by means of an adhesive directly to said metal sheet adjacent the periphery thereof, 30 said disc having a flexibility under manual pressure of 13 pounds applied at the center of said disc of about six one-hundredths of an inch for each inch of radial distance from a central point of attachment and having a total flexibility at its periphery of not over one-quarter of an inch. 35

7. An abrasive article comprising a disc of thin flexible metal, a layer of abrasive secured by adhesive directly to said metal sheet, a compressible pad supporting said metal sheet, said 40 abrasive article having a flexibility under manual pressure of 13 pounds applied at the center of said disc of about one-eighth to one-quarter of an inch at a linear distance of about four and one-half inches from a point of support. 45

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