

[54] **ABRADING TOOL UTILIZING A SELF ADHESIVE ABRADING SHEET**

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[58] Field of Search **51/170 R, 170 TL, 175, 51/358, 370, 380, 391, 392, 406**

[56] **References Cited**

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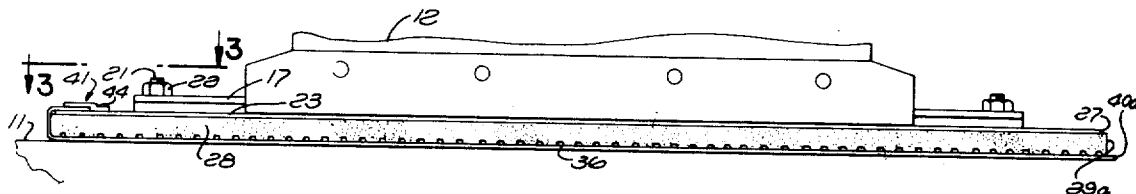
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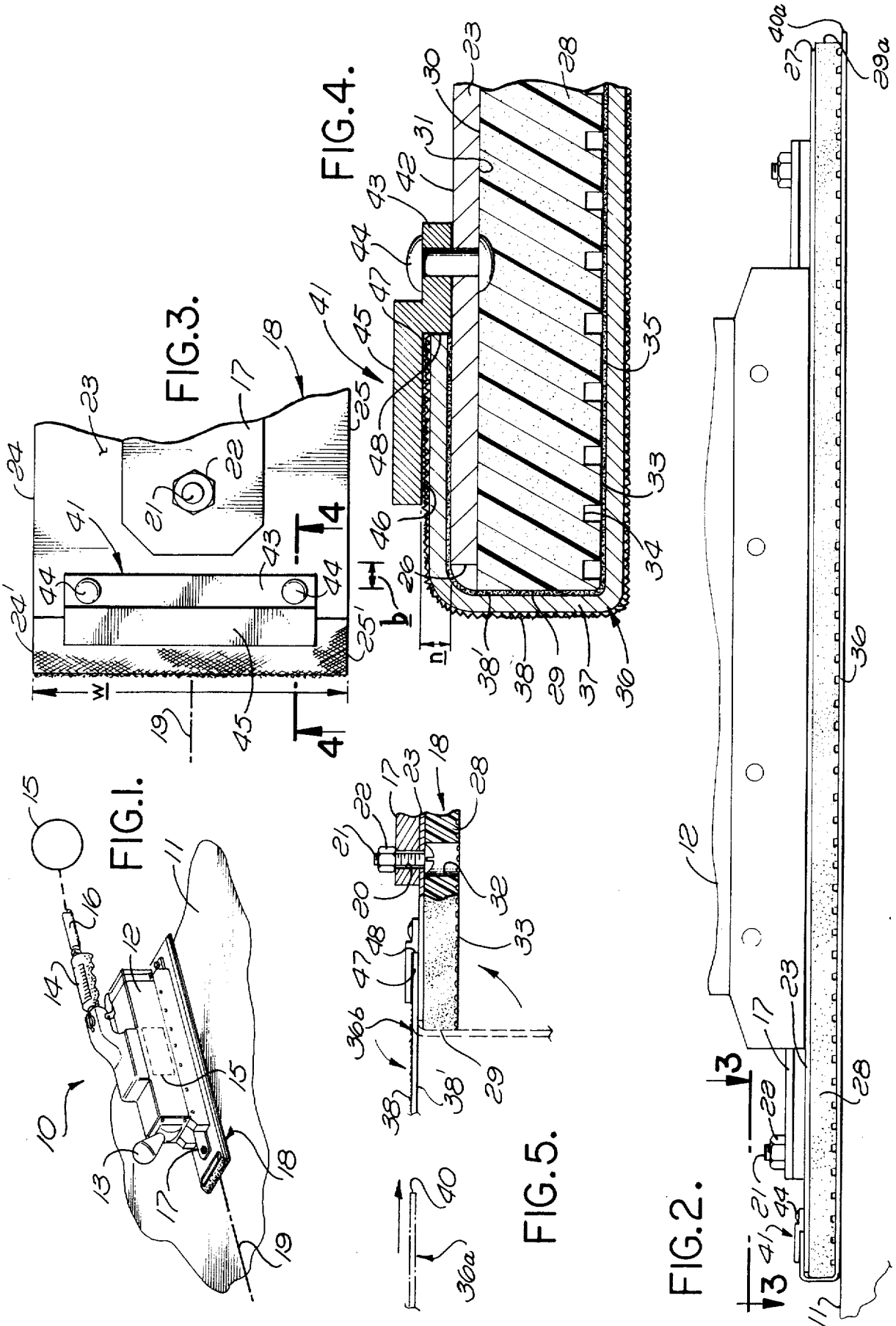
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[57] **ABSTRACT**

An abrading tool having a power driven shoe which includes a backing plate and a cushion at the underside of the plate, and with a sheet of self adhesive sandpaper or other abrading sheet material extending along the underside of the cushion and adhered thereto and then extending upwardly at a forward end of the shoe and being turned generally rearwardly at the top of the backing plate and into a locating recess in a relation effectively retaining the end of the sheet in the discussed upwardly turned and rearwardly deflected condition without the necessity for clamping of the end of the sheet by a spring clip or the like.

18 Claims, 5 Drawing Figures





ABRADING TOOL UTILIZING A SELF ADHESIVE ABRADING SHEET

BACKGROUND OF THE INVENTION

This invention relates to improved abrading tools for utilizing sandpaper or other abrasive sheet material in performing a work abrading operation.

There have in the past been devised various types of sanding tools having power driven shoes to which a sheet of abrasive material is connected, with the shoe sometimes including an upper backing plate and a more flexible cushion connected to the underside of the backing plate. One way of attaching a sheet of abrasive material to such a shoe has been by means of a pair of spring clips carried by the upper side of the shoe at its opposite ends, so that the ends of the abrasive sheet can be turned upwardly and then clamped by the clips to hold the sheet on the shoe. In other instances, the abrasive sheet has been secured to the cushion by an adhesive material, which has for certain purposes had the advantage of holding the sheet more effectively against shifting movement relative to the cushion, but in other respects has not retained or confined the ends of the sheet as well as a clip arrangement. In some cases, users have employed both clips and an adhesive material, but this dual retention has rendered inconvenient and cumbersome the attachment and removal of the abrasive sheets, and has been considered impractical for regular use by most persons engaged in occupations requiring a great deal of sanding, such as for example in automobile body repair work.

SUMMARY OF THE INVENTION

The present invention provides an improved arrangement for securing an abrasive sheet to a sanding shoe or the like, in a manner enabling very rapid attachment and removal of the sheet as desired, while at the same time retaining the sheet very effectively in fixed position on the shoe during a sanding operation. The device allows the forward end of the abrasive sheet to be retained in a position in which it extends upwardly at the forward end of the shoe and can be conveniently utilized for abrading contoured surfaces on a work piece, but without requiring provision of a spring clip or the like to positively clamp the upwardly turned portion of the sheet in position.

These results are achieved by employment of a unique combination of adhesive effects and clampless locating means, in which the two different types of retention coact to attain improved handling characteristics not possible with any prior arrangement of which I am aware.

In an assembly embodying the invention, I utilize a self adhesive abrasive sheet which extends across the underside of the cushion of a sanding shoe and then extends upwardly at the forward end of the shoe, and then is turned rearwardly into a locating recess of fixed dimension formed at the top of the backing plate of the shoe. This recess has an upper wall which confines the contacted end portion of the abrasive sheet against upward movement, and which in this way coacts with the adhesive retention of the portion of the sheet at the bottom of the shoe to effectively constrain the end of the sheet against movement from its desired position of extension about the front of the shoe. Preferably, the adhesive backing of the abrading sheet adhere also to a forward end face of the cushion as the sheet extends

upwardly past the cushion to the top of the shoe. The locating recess at the top of the backing plate may be formed by a retaining bracket, having a first portion secured to the upper side of the backing plate and having a second portion spaced above that plate to define the recess therewith. The upper and lower walls of the recess may be parallel to one another, and in the optimum arrangement are spaced apart a distance just sufficient to closely confine the sheet therebetween, while still allowing sliding insertion of the sheet into the recess and sliding removal from the recess.

To facilitate accurate positioning of the abrasive sheet on the shoe, the locating recess may have a rear wall, at the back of the recess, adapted to engage and locate a transverse end edge of the abrasive sheet to automatically align the sheet relative to the shoe. The abrasive sheet may then be connected to the shoe by first sliding the end of the sheet into the locating recess and to a position of engagement with the discussed rear end wall, following which the remainder of the sheet may be curved downwardly across the front end of the shoe and then rearwardly at the underside of the shoe to thus easily complete the attachment of the sheet to the shoe in proper orientation.

BRIEF DESCRIPTION OF THE DRAWING

The above and other features and objects of the invention will be better understood from the following detailed description of the typical embodiment illustrated in the accompanying drawing in which:

FIG. 1 is a perspective view of a power operated portable sanding tool constructed in accordance with the invention;

FIG. 2 is an enlarged fragmentary side view of the FIG. 1 tool;

FIG. 3 is a fragmentary plan view taken on line 3—3 of FIG. 2; and

FIG. 4 is greatly enlarged fragmentary vertical section taken on 4—4 of FIG. 3.

FIG. 5 is a fragmentary view similar to FIG. 4 showing the insertion of the sandpaper sheet into the locating recess.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The tool 10 shown in FIG. 1 is a portable power operated sander which is typically illustrated as it appears when sanding an upwardly facing horizontal work surface 11. The tool 10 has a main rigid body 12 which is adapted to be held and manipulated by a pair of handles 13 and 14. When the tool is in use and thus held by the handles 13 and 14, the handle 13 faces in a forward direction, that is, in a direction away from the person holding the tool, while the handle 14 is at the back of the tool and nearer the operator. Body 12 contains a power driven motor 15, typically energized by compressed air delivered to the tool through an air supply line 16, and acting when energized to reciprocate an elongated movable element 17 and carried shoe 18 relative to body 12. The axis 19 of reciprocation of element 17 and shoe 18 extends in a front to rear direction with respect body 12, and is horizontal and parallel to work surface 11 in the FIG. 1 position of the tool.

The part 17 may take the form of an essentially flat plate, extending horizontally in the FIG. 1 position, and having edges at its opposite sides which are received within appropriate guideways or the like to guide ele-

ment 17 for only the desired reciprocating movement relative to body 12 only axis 19. This part 17 may have a plurality of openings 20 extending vertically there-through, typically two such openings at opposite ends of the element 17 and if desired additional openings therebetween, so that screws 21 may extend upwardly through the shoe 18 and through these openings 20 for connection at their upper ends to nuts 22 to secure the shoe to part 17.

Shoe 18 includes an upper backing plate 23 which is rectangular in horizontal outline, being defined by two parallel opposite side edges 24 and 25 disposed parallel to longitudinal axis 19 of the tool, and two transverse parallel front and rear edges 26 and 27 perpendicular to edges 24 and 25. The plate 23 is essentially rigid to give substantial stiffness to the overall shoe assembly, and may be of uniform thickness across its entire extent. This plate is in most instances preferably stamped from sheet metal, optimally sheet aluminum.

At its underside, backing plate 23 carries a resiliently deformable cushion 28, having approximately the same rectangular peripheral outline configuration as plate 23, except that cushion 23 desirably projects slightly beyond the front and rear end edges 26 and 27 of the backing plate. This is brought out clearly in FIGS. 4 and 5, in which the forward vertical end face 29 of cushion 28 lies in a plane perpendicular to that of plate 23, and also perpendicular to the opposite side edges 24 and 25 of the top plate, but is spaced forwardly of the forward transverse end edge 26 of plate 23 the distance *b* of FIG. 4; and the rear end face 29*a* of the cushion is similarly located beyond plate edge 27. The upper essentially planar surface 30 of cushion 28 is bonded tightly and permanently to the horizontal planar undersurface 31 of top plate 23, as by a suitable bonding cement. Cushion 28 may have openings 32 at the locations of the various screws 20, to allow access to the heads of those screws for securing the shoe to and removing it from part 17.

The undersurface 33 of cushion 28 may lie generally within a horizontal plane parallel to the undersurface 31 of backing plate 23, except that surface 33 of the cushion is desirably irregularized, to provide across its horizontal area a large number of alternate recesses 34 and peaks or lands 35. Cushion 28 may be formed of an elastomeric material, such as an appropriate rubber, and for best results neoprene of a type having closed pores at undersurface 33 to facilitate removable attachment of a self adhesive sandpaper sheet to that surface.

For performing the actual abrading operation, there is provided an abrading sheet 36, preferably sandpaper. This sandpaper sheet includes the usual layer of relatively heavy backing paper 37, having a coating of abrasive particles 38' applied to its undersurface and secured tightly thereto by an appropriate cement or the like. At its opposite side, the backing sheet 37 has a layer of pressure sensitive adhesive 38' extending across the entire area of that side of the sheet, for adhesively securing the sandpaper to shoe 18. The sandpaper sheet 36 is rectangular and of a width corresponding to the width *w* of shoe 18 between the opposite edges 24 and 25. The length of the sandpaper sheet is somewhat greater than the length of shoe 18, to allow the sheet to be deflected upwardly and then rearwardly at the front of the shoe as illustrated in FIG. 4. The forward end edge 40 of the sandpaper sheet is straight, and perpendicular to the opposite side edges 24' and

25' of the sheet, as is also the rear edge 40*a* of sheet 36.

For retaining the forward portion of the sandpaper sheet in the FIG. 4 condition, backing plate 23 of the reciprocable shoe carries a bracket element 41 which is rigidly secured in fixed position to the upper planar surface 42 of plate 23. This bracket 41 has a first portion 43 received against top surface 42 of plate 23, and secured rigidly thereto as by a pair of rivets 44. Projecting forwardly from this portion 43, the bracket 41 has an elevated portion 45, with an undersurface 46 which is planar and parallel to and spaced a distance *n* above the top horizontal surface 42 of plate 23. Thus, these surfaces 46 and 42 define together a rectangular recess 47 into which the forward end portion of the sandpaper sheet 36 is slidably insertable. The back of this recess is defined by a rear wall 48 which is vertical and perpendicular to surfaces 42 and 46, and disposed transversely with respect to axis 19 and the opposite side edges 24 and 25 of the backing plate. As viewed in plan, the bracket 41 may be rectangular as seen in FIG. 3, and for maximum simplicity this part may be stamped from an appropriate essentially rigid sheet metal, typically the same type of aluminum utilized in making top plate 23. The vertical dimension *n* of gap or recess 47 is great enough to allow sliding insertion of the end portion of the sandpaper sheet into that recess, but preferably is sufficiently small to render the sandpaper sheet a fairly close fit within the recess. In the preferred arrangement, the sandpaper sheet occupies the entire vertical dimension *n*, so that the adhesive of that sheet is engageable with upper surface 42 of the backing plate 23 at the same time that the upper abrasive particles 38 are contacting the undersurface 46 of bracket 41.

To now describe the manner of application of sheet 36 to shoe 17, assume that the sandpaper sheet is initially flat as represented at 36*a* in FIG. 5, and is inverted in front of the recess 47 with the abrasive particles 38 facing upwardly and the pressure sensitive adhesive 38' facing downwardly. With the tool and sandpaper in this relative position, the sheet 36 is moved rearwardly from the position represented at 36*a* in FIG. 5 to the second position represented at 36*b*, to slide the sandpaper sheet rearwardly into the recess 47 and to a position in which end edge 40 of the sandpaper sheet engages and abuts against rear wall 48 of the recess. During this movement, the opposite side edges 24' and 25' of the sandpaper are held in longitudinal alignment with the opposite side edges 24 and 25 of backing plate 23. After end edge 40 has contacted the shoulder or recess wall 48, the person installing the paper holds the paper against plate 23 at opposite sides of bracket 41 and then bends the paper downwardly across and into contact with the forward face 29 of cushion 28, and then rearwardly across the underside of the cushion, pressing the paper against surface 29 and undersurface 33 of the cushion to adhere tightly thereto. The rear edge 40*a* of the paper projects very slightly rearwardly beyond the back of the cushion 28 as seen in FIG. 2, and for best results is not curved upwardly at the back of the tool or in any other way secured by a clip or the like.

The tool may then be employed to perform a sanding operation on a surface such as the work surface 11 of FIG. 1, by reciprocation of shoe 18 and the carried sandpaper relative to body 12 under the influence of compressed air driving motor 15. The engagement of

the sandpaper sheet with undersurface 46 of the bracket prevents that portion of the sandpaper from swinging upwardly away from the upper surface 42 of the backing plate 23. Thus, the confinement of the forward end portion of the sandpaper within recess 47 co-acts with the adhesive attachment of the sandpaper sheet to the forward face and undersurface of the cushion to effectively hold the forward portion of the sandpaper sheet in the illustrated FIG. 4 condition without the necessity for the usual spring clips or other clamping means ordinarily required on sanders. Further, when concave or other contoured regions of the work surface 11 are encountered, the front portion of the sandpaper which extends upwardly about and encloses the front end of shoe 18 can be moved against those contours in a manner effectively smoothing them, again without any danger of detachment of the forward portion of the sandpaper from the clip. Since there ordinarily is no desire to similarly move the rear end of the tool against a contoured surface in this manner, the unconfined retention of the rear end edge 41a of the sandpaper sheet is entirely adequate in use.

When it is desired to remove and replace the sandpaper sheet, the rear edge portion 41a can be stripped downwardly away from undersurface 33 of the cushion, and the sheet can be stripped forwardly away from front end surface 29 of cushion 28, following which the sheet which is then again in the condition illustrated at 36b in FIG. 5 can be slid forwardly out of recess 47 and to the position 36a of FIG. 5 to allow attachment of a replacement sheet to the shoe. The closed pore surface 33 at the underside of the cushion, and the forward face 29 of the cushion, are both of a character enabling effective adherence of the adhesive layer 38' to these surfaces when the tool is in use, but have less attraction for the adhesive than does the paper sheet 36 so that the adhesive 38' can be cleanly stripped from the cushion surfaces with the paper on removal.

For best results, it is desirable in most instances that the cushion 28 have a Shore hardness between about 35 and 90, optimally approximately 45.

While a certain specific embodiment of the present invention has been disclosed as typical, the invention is of course not limited to this particular form, but rather is applicable broadly to all such variations as fall within the scope of the appended claims.

I claim:

1. The combination comprising:

a shoe including a backing plate which is to extend essentially horizontally when abrading an upwardly facing work surface, and a cushion carried at the underside of said backing plate and having an undersurface;

an abrading sheet extending along the underside of said cushion and carrying a layer of pressure sensitive adhesive at its upper side engaging the undersurface of said cushion and adhered thereto;

said undersurface of the cushion being formed of a substance to which said adhesive will adhere tightly in use but from which the adhesive can be stripped with said sheet for replacement;

said sheet extending upwardly at the forward end of said shoe and having a forward end portion doubled back generally rearwardly at the upper side of said backing plate; and

means carried at the upper side of said backing plate near the forward end thereof and defining a locat-

ing recess into which said end portion of the sheet projects generally rearwardly without being clamped therein;

said recess having upper and lower walls between which said end portion of the sheet is received and which are fixed relative to one another at a predetermined spacing which remains the same during an abrading operation as during insertion of said end portion of the sheet into said recess and removal therefrom;

said end portion of the abrading sheet being engageable upwardly against said upper wall of said recess in a manner coacting with the adhesive attachment of said sheet to said undersurface in retaining the sheet about said forward end of the shoe without clamping the sheet within the recess or between said walls.

2. The combination as recited in claim 1, in which said recess has a rear wall facing forwardly at the back of said recess and engageable with a transverse forward end edge of said sheet to locate the sheet for proper alignment with the shoe.

3. The combination as recited in claim 1, in which said recess has a rear wall extending essentially vertically at the back of the recess and facing forwardly and lying essentially in a plane disposed transversely of said shoe to engage a transverse forward end edge of said sheet in a relation locating the sheet in proper alignment with the shoe.

4. The combination as recited in claim 1, in which said lower wall of said recess is an upper planar surface of said plate.

5. The combination as recited in claim 1, in which said upper and lower walls of said recess are essentially planar and disposed essentially parallel to one another.

6. The combination as recited in claim 1, in which said upper and lower walls of said recess are essentially planar and disposed essentially parallel to one another, said recess having a planar rear wall extending perpendicular to said upper and lower walls at the back of the recess and disposed transversely of said shoe at a location to engage and locate a transverse end of said sheet.

7. The combination as recited in claim 6, in which said planar upper and lower walls are spaced apart a distance confining said sheet closely therebetween while permitting sliding insertion of said end portion of the sheet into and sliding removal from the recess, said sheet having an abrasive material engaging said upper wall of the recess while said adhesive material engages the lower wall of the recess.

8. The combination as recited in claim 1, in which said cushion has a forward end surface engaged by said adhesive as the sheet extends upwardly at the front of the shoe.

9. The combination as recited in claim 1, in which said cushion has a forward portion projecting slightly beyond a forward edge of said backing plate and having a forwardly facing surface engaged by said adhesive as said sheet extends upwardly at the front of the shoe.

10. The combination as recited in claim 1, in which said abrading sheet has a rear end edge facing rearwardly at essentially the level of the undersurface of said cushion and which is secured to the shoe only by said adhesive.

11. The combination as recited in claim 1, in which said means include a fixed bracket part having a first portion engaging the upper side of said backing plate

and secured thereto, and having a second portion with an undersurface spaced above and parallel to said backing plate and comprising said upper wall of the recess, said bracket part having a vertical shoulder at the juncture of said two portions facing forwardly and disposed transversely of the shoe for engaging an end edge of said sheet.

12. The combination as recited in claim 1, including a tool body above said shoe, a motor carried by said body for reciprocating said shoe in a front to rear direction relative to the body, and handle means on said body for holding it in a position in which said forward end of the shoe faces away from the person holding the tool.

13. The combination comprising:
 a shoe including a flat backing plate which is to extend essentially horizontally when abrading an upwardly facing work surface, and a cushion carried at the underside of said backing plate and having an irregularized undersurface;
 an abrading sheet extending along the underside of said cushion and carrying a layer of pressure sensitive adhesive at its upper side engaging said irregularized undersurface of said cushion and adhered thereto;
 said undersurface of the cushion being formed of a substance to which said adhesive will adhere tightly in use but from which the adhesive can be stripped with said sheet for replacement;
 said cushion having a forward portion extending forwardly slightly beyond a forward end edge of said backing plate and having a forwardly facing end surface;
 said abrading sheet extending upwardly at the forward end of said shoe past said forward end surface of said cushion and said forward end edge of said backing plate and having a forward end portion doubled back generally rearwardly at the upper side of said backing plate;
 said adhesive on said sheet being adhered to said forward end surface of said cushion;
 said plate having a planar upper surface; and
 a bracket carried at the upper side of said plate near the forward end thereof and having a first portion received adjacent said upper surface of said plate and secured rigidly thereto and a second portion forwardly of said first portion and spaced above said upper surface of the backing plate and having an undersurface parallel thereto and defining therewith a recess of fixed vertical dimension into which said end portion of the abrading sheet projects rearwardly without being clamped therein;
 said recess having the same fixed dimension during an abrading operation as during insertion of said end portion of the sheet into said recess and removal therefrom;
 said end portion of the abrading sheet having abrasive material engaging upwardly against said under-

surface of said second portion of said bracket while said adhesive is engageable against said upper surface of said plate within the recess;

said bracket having a vertical shoulder disposed transversely of said shoe at the back of said recess for engaging a transverse end edge of said abrading sheet in locating relation.

14. The combination comprising:

a shoe including a backing plate which is to extend essentially horizontally when abrading an upwardly facing work surface, and a cushion carried at the underside of said backing plate and having an undersurface to which a layer of adhesive on a self adhesive abrading sheet can detachably adhere;

said undersurface of the cushion being formed of a substance to which said adhesive will adhere tightly in use but from which the adhesive can be stripped with said sheet for replacement;

said cushion having a forward end face past which said abrasive sheet can extend upwardly at said forward end of the shoe and to which said adhesive of the abrasive sheet can adhere; and

means carried at the upper side of said backing plate near the forward end thereof and defining a locating recess into which a forward end portion of the abrasive sheet can project generally rearwardly without being clamped therein;

said recess having upper and lower walls between which said end portion of the sheet can be received and which are fixed relative to one another at a predetermined spacing which remains the same during an abrading operation as during insertion of said end portion of the sheet into said recess and removal therefrom.

15. The combination as recited in claim 14, in which said cushion projects forwardly slightly beyond the forward end of said backing plate.

16. The combination as recited in claim 14, in which said recess has a rear wall disposed essentially transversely of said shoe and engageable with an end edge of said abrading sheet in locating relation.

17. The combination as recited in claim 14, in which said means include a bracket having a first portion secured rigidly to said plate and having a second portion projecting forwardly therefrom at a location spaced above and essentially parallel to said plate to define said recess therewith.

18. The combination as recited in claim 14, in which said means include a bracket having a first portion secured rigidly to said plate and having a second portion projecting forwardly therefrom at a location spaced above and essentially parallel to said plate to define said recess therewith, said bracket having a vertical shoulder at the juncture of said portions and disposed transversely of said shoe for engaging a transverse end edge of the abrading sheet in locating relation.

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Dedication

3,892,091.—*Alma A. Hutchins*, Pasadena, Calif. ABRADING TOOL UTILIZING A SELF ADHESIVE ABRADING SHEET. Patent dated July 1, 1975. Dedication filed June 17, 1976, by the assignee, *Minnesota Mining and Manufacturing Company*.

Hereby dedicates said patent to the Public.

[*Official Gazette August 17, 1976.*]