April 27, 1954 L. M. BACK 2,676,503

PIVOTED DENT REMOVING HAND TOOL

Filed March 4, 1950

FIG. 1

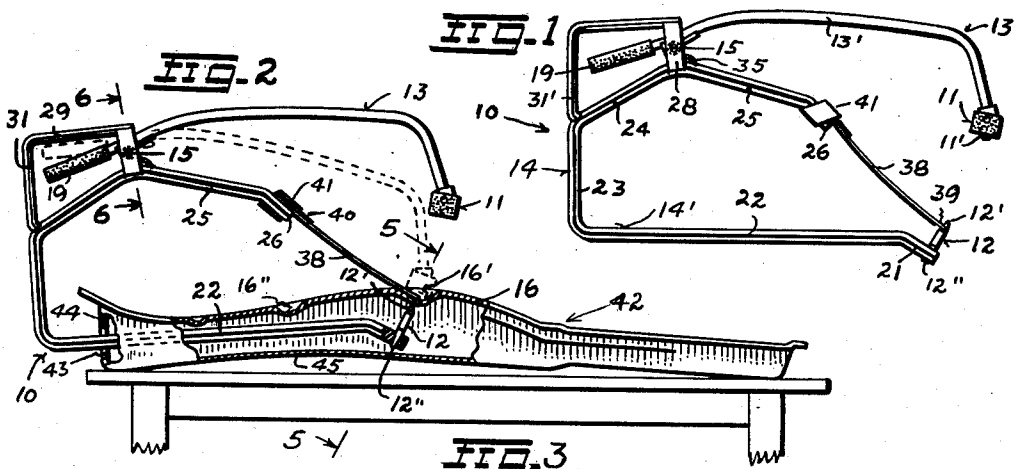


FIG. 2

FIG. 3

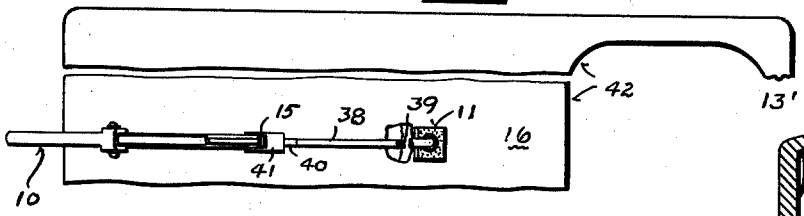


FIG. 4

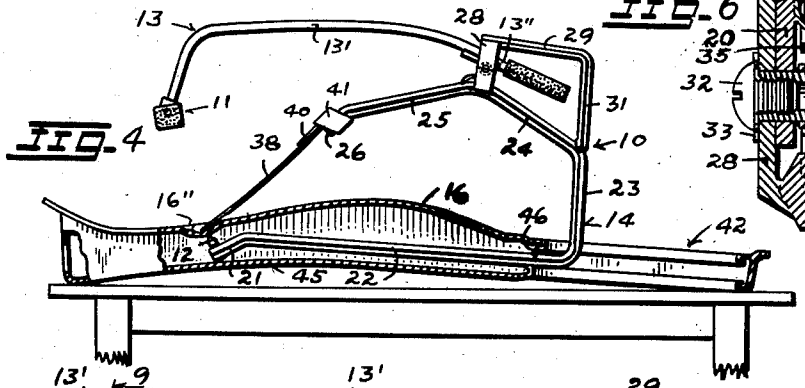


FIG. 6

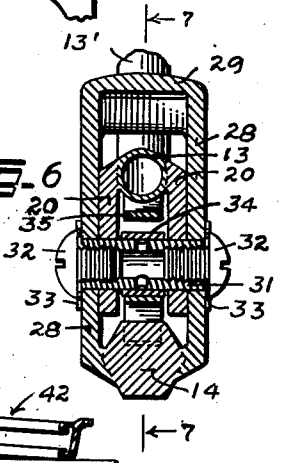


FIG. 8

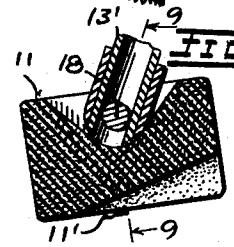


FIG. 9

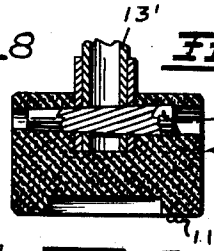


FIG. 5

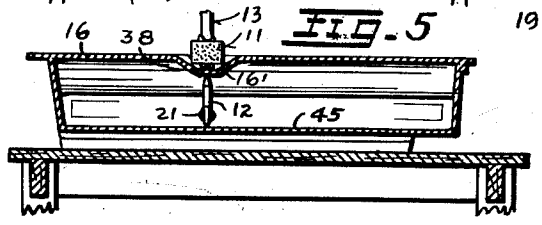
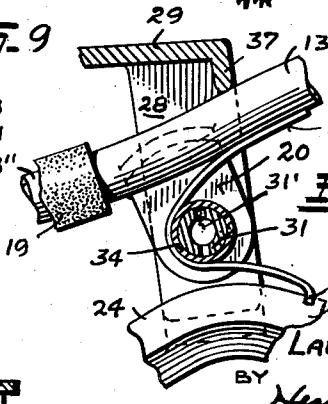


FIG. 7



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PIVOTED DENT REMOVING HAND TOOL

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1 Claim. (Cl. 81—15)

1

The invention relates to a hand tool for removing dents and other malformations from elements of sheet material comprising parts of fabricated structures.

An object of the invention is to provide a tool of the character described which is particularly adapted for removing dents from the outside members of the doors and bodies of automobiles, and other more or less curved sheet members having portions which are transversely accessible from only one side.

Another object is to provide a dent-removing tool which has a particularly effective sighting means for the usually invisible working point of the hammer element of the tool.

A further object is to provide a dent-removing tool in which the working point of the hammer element is arranged to be held against the work-piece during a working application of the tool, whereby said point is operative in a minimum, and frequently limited, space adjacent its functioning point.

An added object is to provide for the most effective application of a movable anvil element of yielding material at the dented face of a work-piece whereby to prevent any surface damage at said face while the anvil element cooperates with the hammer element which is held against the inside of the dent.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth, or be apparent, from the following description of a typical embodiment thereof, and in the accompanying drawings, in which,

Figure 1 is a side view of a dent-removing tool embodying the present features of my invention.

Figure 2 is a side view of the tool as operatively applied with respect to a dented portion of the outer side panel of a vehicle door disposed in prone position on a work-bench, the arm of the tool carrying the hammer element having been inserted through a hole at the bottom of the door.

Figure 3 is a fragmentary plan view showing the tool as applied in Figure 2.

Figure 4 shows the tool as operatively applied from the top of the door through the usual glassed opening thereof.

Figure 5 is a partly sectional view taken at the line 5—5 in Figure 2, an anvil of the tool being operatively applied.

Figure 6 is an enlarged sectional view taken at the line 6—6 at a hinge of the tool.

Figure 7 is a section taken at the line 7—7 in Figure 6.

Figure 8 is an enlarged sectional view taken in the plane of the tool at an anvil member thereof.

Figure 9 is a section taken at the line 9—9 in Figure 8.

As particularly illustrated, the features of my invention are incorporated in the structure of a unitary dent-removing tool 10 providing cooperative anvil and hammer members 11 and 12 re-

2

spectively at free ends of arms 13' and 14' comprising parts of coplanar elements 13 and 14 which are intermediately connected at a hinge assembly 15. The arms 13' and 14' are mutually spaced in a common plane in which they are relatively swingable about a hinging axis perpendicular to said plane. The hinge assembly 15 permits a mutual separation of the anvil 11 and hammer 12 to receive a dented member of a work-piece plate 16 between them for their relative swinging application to a dent, or offset, portion 16' for pushing out the portion to conform with the surface of the undented plate part.

The element 13 providing the arm 13' is of circular cross-section, may be tubular, and mounts the anvil element 11 in angularly adjustable relation to it. As is particularly brought out in Figures 8 and 9, the anvil 11 comprises a block of relatively dense sponge rubber which is directly hinged to the free arm end by means of a hinge pin 18 extending through it and the arm extremity in a line perpendicular to the tool plane, whereby the working face 11' of the anvil block 11 may be adjusted for its best working disposal with respect to the hammer 12 with which it is cooperative. The pivot pin 18 is held in its mounted position by its wedged engagement with the arm extremity and is preferably so engaged in the block 11 that the anvil is frictionally held in variably adjusted angularity to the working line of the anvil, whereby the working face 11' of the anvil may be set, or set itself, to fit flat against a work-piece face around a dent; preferably, and as shown, the anvil face 11' is obliquely relieved rearwardly of its front edge whereby solely front and side portions thereof may bear against an opposed work-piece face. The end portion 13'' of the element 13 at the opposite side of the hinge 15 mounts a suitable rubber grip 19, and spaced opposed ears 20 extend integrally from the arm adjacent the forward end of said grip for receiving therethrough the hinge pin of the hinge assembly 15.

It will now be particularly noted that the present element 14 is shaped of a bar of polygonal section having successive straight portions 21 and 22 and 23 and 24 and 25 and 26, all of said portions lying in a common plane. The portion 21 is relatively short and mounts the hammer element 12 and makes an acute angle of approximately thirty degrees with the relatively long portion 22. The portions 22 and 23 are substantially perpendicular to each other, and the portion 24 makes an acute angle of approximately sixty degrees with the portion 23 at the same side of the portion 23 as the portion 22. The portion 25 is turned inwardly from the line of the portion 24 to define an acute angle of approximately forty-five degrees therewith while the terminal portion 26 of the element 14 makes an acute angle of approximately thirty degrees with the portion 25; the portion 25, which extends forwardly of the hinge point of the element 14, is adapted for use as a positioning handle

for the element, as is hereinafter brought out, while the portions 21 and 22 and 23 and 24 collectively provide the hammer-mounting arm 14' of the element.

Adjacent its free extremity, the portion 21 of the element 14 is provided with a transverse bore extending in the plane of the element 14 and mounting a hammer element 12 which may comprise any one of a set of hammer elements having different lengths and/or working points 12'; for facilitating the replacement of a hammer element 12 as needed, said elements may have tapered stem portions 12'' for seating in the bore which is complementarily tapered to receive them, the arrangement being indicated in Figure 2.

Mutually opposed cheek-plate members 28 extend fixedly from opposite sides of the element 14 at the corner defined at the juncture of its portions 24 and 25, and outwardly of the area defined within the element, and receive between them the portion of the arm 13 at the ears 20 for providing the hinge assembly 15 thereat, the ears 20 being directed toward said bend. A member 29 extends rigidly from between the outer ends of the plates 28 opposite the grip 19 of the arm 13 to provide a complementary grip, whereby the closing of a hand about the grip 19 and the grip member 29 may effect an operative movement of the anvil 11 toward the hammer 12. As particularly shown, the rearward end of the member 29 is integrally connected with the bend at the juncture of the portions 23 and 24 of the element 14 by a member 31 whereby the portion 24 and the plates 28 and the members 29 and 31 cooperatively define a closed space in which the grip 19 is freely swingable. In the present structure, the members 29 and 30 are parts of a single element which is integrally secured to the element 14 and plates 28, as by welding.

It will now be noted by reference to Figures 6 and 7, that a tubular hinge pin 31 is engaged through aligned bores provided in the ears 20 of the arm element 13 and has extending portions thereof closely fitting complementary bores provided in the plates 28. Screws 32 are threadedly engaged in the bore of the member 31 at opposite ends thereof for securing the member 31 in centered position between the outer plate faces. Suitable spring washers 33 are interposed between the heads of the screws 32 and the opposed outer plate faces, and are operative to hold the mounted pin against turning with respect to the plates whereby the hinge pin may be nonrotatably fixed to and between the plates 28. The space within the member 31 between the opposed screw ends may carry a heavy-bodied lubricant for its gradual distribution to the bearing surfaces of the hinge assembly 15 through an intermediate opening 31' in the member, and a spacer sleeve 34 is mounted on the hinge pin 31 between the ears 20 to serve, in part, as a lubricant-distributing means.

Means are preferably provided for yieldingly urging a limited separated relation of the anvil 11 from the hammer 12. As particularly shown, a generally U-shaped leaf spring 35 has its bend portion receiving the sleeve member 34 on the hinge pin 31 while its arm portions respectively engage the opposed inner faces of the elements 13 and 14 at points thereof forwardly of the hinge pin 31; in the present structure, the end of the spring which bears against the portion 25 has an out-turned terminal portion 35' which anchors the spring to the arm 14 by reason of its engagement in a complementary cross-notch which is provided in the portion. A suitable stop means is provided for limiting the spacing of the anvil 11 from the hammer 12 under the influence of the spring 35; as particularly shown, an outer point of the arm 13' forwardly of the hinge axis is arranged to engage a stop bar 37 extending between the plates 28 and, in the present instance, comprising an inturned forward end portion of the member 29.

Understanding that the point 12' of the hammer element 12 may be held against the inner (convex) side of a dent to be removed while the anvil 11 is moved against the work-piece in a working stroke, means are provided for accurately locating the hammer in desired operative position with respect to the dent without the necessity of viewing the hammer-engaged point of the work-piece. As particularly shown, a flexible pointer or finger 38 extends longitudinally from the portion 26 of the element 14 to have its free end so positioned with respect to the point of the hammer 12 that a disposal of its index point opposite a dent to be removed will indicate the location of the tool point at the opposite side of the dent. Preferably, and as shown, the finger 38 comprises a strip of suitable spring material having a notch 39 provided at its free end for use in locating the finger end opposite a dent point to be operated upon, and thus indicating the location of the working point of the hammer for positioning it where desired.

As particularly shown, the resiliently flexible strip providing the finger 38 is extended along and fixed to the terminal portion 26 of the element member 14 as by welding, and extends from the portion 26 to such a distance that the finger 38 will position the notch 39 to receive the working point 12' of a mounted hammer 12 before a work-piece is engaged between it and the hammer point. A short leaf-spring 40 is preferably extended from the portion 26 for a short distance along the finger 38 for backing the rear portion of the spring finger 38, and may be held in position by a sleeve 41 which receives the rearward end of the spring 40 for clamping it to the portion 26; the bore of the sleeve 41 complementarily and tightly receives the portion 26 and the rear portions of the finger 38 and spring 40, and may be shrunk into its operative relation to the secured members. The sleeve 41 and spring 40 are understood to distribute the bending action upon the secured end of the finger 38 for prolonging the life and maintaining the set positioning of the finger.

It will now be particularly noted that the relation of the relatively short portion 21 of the generally J-shaped element 14 to the straight arm portion 22 which extends to the rear end of the tool is such that the hammer member 12 mounted in the portion 21 in angular relation to the portion 22 will be in general alignment with the inner line of the latter portion; this arrangement provides for the insertion of the portions 21 and 22 within a relatively thin hollow structure, such as that of a vehicle door 42, from an edge opening thereof to operatively dispose the hammer point 12' as desired behind a dented-in portion 16' of the work-piece 16 which comprises the outer wall member of the door assembly 42. As particularly shown in Figure 2, the portion 23 of the member 14 is engaged in a hole 43 provided through the bottom edge part 44 of the door which connects its outer panel 16 with its inner panel 45. The hole 43 may

comprise a usual drainage opening in doors of the present structure, or may be provided especially for the insertion and removal of a hammer 12 and the portions 21 and 22 of the element 14.

Having the positioning-handle portion 25 of the element 14 pulled transversely outwardly of the door panel 16 by an operator's hand to dispose the working end of the hammer against the convex dent face at the point indicated by the finger end which engages the opposite, and outer, face of the door panel 16, the anvil 11 may be swingably applied with the required impact to push the dent portion 16' against the point 12' to provide a counter-dent. The actuation of the anvil 11 is arranged to be effected by closing the other hand of the operator about the relatively swingable operating-handle portions 29 and 13'' of the elements 13 and 14 respectively while pressing inwardly on the handle 29 for aiding the holding of the hammer against the dent.

By repeating the described anvil-applying process over the convex inner surface of a dent, the outer panel portion thereat may finally be brought to a generally flush relation with the outer panel face as the dent-removing means. If, as is usual, the de-dented panel portion is to be refinished, the material of the original dent is preferably brought slightly outwardly of a flush relation with the normal undented face thereat, and the outer points of the counter-dents are filed away to finally provide a truly smooth restored panel face thereat for refinishing.

Points of an outer door panel 16 which are not reachable by a point 12' of a hammer 12 which has been inserted through a bottom door opening 43 are frequently accessible to the hammer point if the hammer is inserted into the door space from the usual glassed opening at the top thereof, the glass pane having been dismounted to permit the insertion of the hammer through the slot 46 of its lower frame portion; this operative application of the tool with respect to a dent 16'' in the outer door panel 16 is illustrated in Figure 3 wherein a shorter hammer element 12 is shown in use. With a tool so mounted with respect to a door, the anvil 11 may be operatively swung as before. It will be understood that the hammer 12 and the parts 21 and 22 of the arm 14' might be operatively applied through a side edge opening of a door, or some other relatively thin hollow structure such as certain other automobile body parts.

Under some circumstances, and particularly if the material of an outer door panel 16 is relatively thin and/or malleable, the pressure application of the hammer member 12 in the described manner and with the required force may directly provide a desired counter-dent without use of the anvil, the portion 22 then forcibly engaging the inner edge of the door hole 43, or the inner side of the window frame slot 46, as a fulcrum. Such a working application of the working point of the hammer may thus be effected entirely by a steady pull or repeated jerking on the handle portion 25 outwardly from the outer door panel 16, or may be effected by producing the necessarily short blows of the hammer permitted in the limited space between the outer and inner door panels 16 and 45. This utility of the tool, as if it consisted only of the J-shaped element 14 and the pointer finger 38 carried by it for indicating at the exposed face of the panel 16 the location of the working end of the hammer 12 positioned by the element at the other side of the panel, is understood to be important for those work-piece situations in which the element 16 may so function.

With general reference to the functioning of the pointer finger 38, it will be noted that the finger is arranged to be sprung outwardly for placing the work-piece between it and the point of a hammer 12 and is similarly operative during either described type of working application of the tool. Also, the positioning pointer end of the finger is arranged to be spanned by the applied anvil whereby the de-denting action is independent of it.

It will be understood that while the present tool is operative for removing dents from sheet metal work-pieces generally, it has been specifically designed for use in places where working room behind a dent is limited, as is particularly true in the case of vehicle door panels and other parts of vehicle bodies. Also, it will be noted that some de-denting operations on a vehicle door may be performed without necessitating a dismounting of the door from the rest of the vehicle body, and that the present tool is adapted for many applications to non-removable elements of automobile and other structures.

From the foregoing description taken in connection with the accompanying drawings, the advantages of the present dent-removing tool will be readily understood by those skilled in the art to which the invention appertains. While I have described the methods of its use, together with a form of my invention which I now consider to comprise a preferred embodiment thereof, I desire to have it understood that the showing is primarily illustrative, and that such changes and developments may be made, when desired, as fall within the scope of the following claim.

I claim:

In a tool for removing a dent from a dented work-piece of sheet material, a pair of hingedly connected elements providing arms for swinging in a common plane and provided with coactive and normally separated hammer and anvil members at forward ends thereof respectively arranged for direct cooperative engagement with the work-piece at the convex and concave sides of the dent while receiving the work-piece between them, and a working-point indicator carried by a said element and comprising a resiliently flexible finger constantly and yieldingly bearing against a positioned work-piece at the opposite side thereof from the hammer and providing a forked terminal index portion spanning the line of coaction of the hammer and anvil members and spanned by the working face of the anvil member, said anvil member comprising a block of resilient material having its working face provided with a groove which extends solely opposite the opposed finger portion in line with the plane of swinging of the arms and is arranged to freely receive said finger portion while its working face engages the work-piece.

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