June 20, 1944. V. E. ROBBINS 2,352,009

METALWORKING DEVICE

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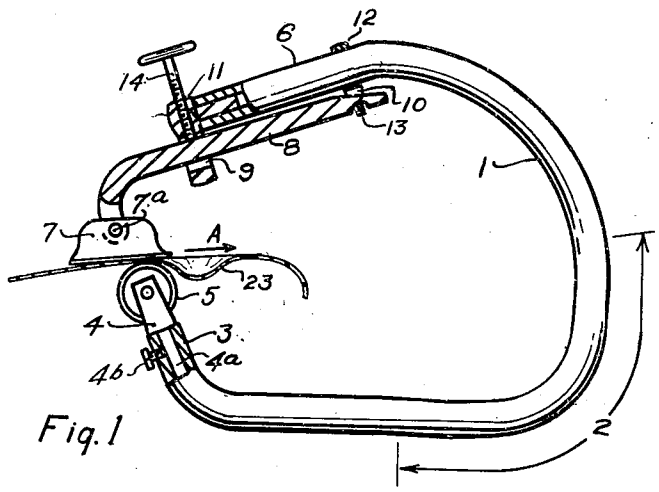


Fig. 1

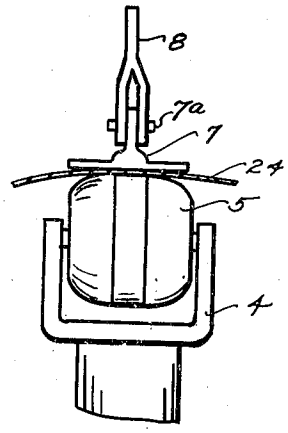


Fig. 2

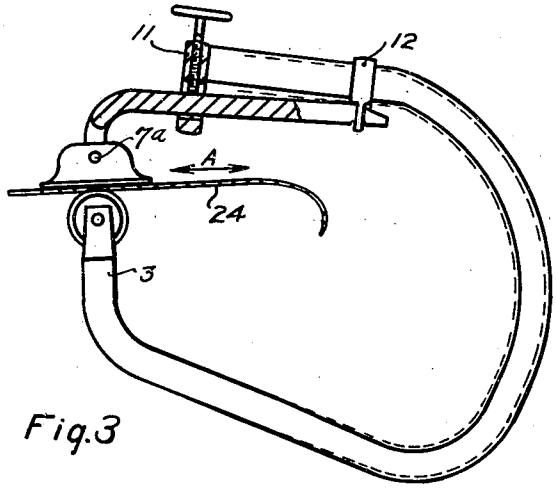


Fig. 3

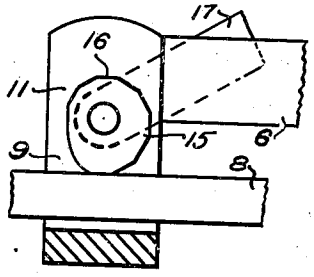


Fig. 5

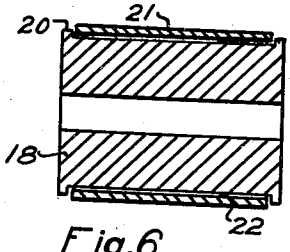


Fig. 6

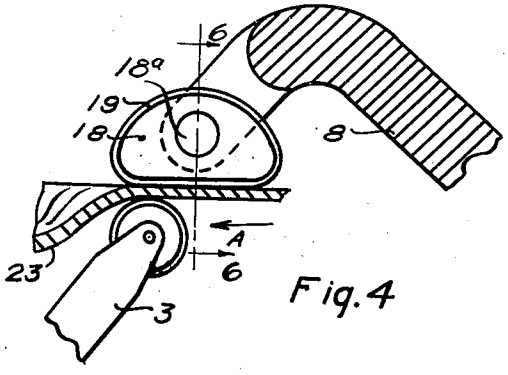


Fig. 4

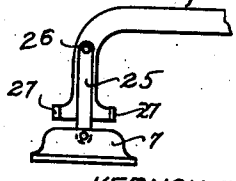


Fig. 7

VERNON E. ROBBINS
INVENTOR

Ernie M. Johnson
ATTORNEY

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METALWORKING DEVICE

Vernon E. Robbins, Berkeley, Calif.

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9 Claims. (Cl. 81—15)

The present invention relates to a metal working device of the class particularly adapted for restoring curved metal surfaces such as automobile fenders and the like to their original contours after deformation by impact.

Prior practices in this field have included hammering out dents in a manner necessarily leaving a rough surface which was reduced to approximate smoothness by filing. Such operations not only left deformed areas stretched and hammer-marked, but also left very thin sections in the areas filed, rendering complete fracture upon a subsequent impact much more likely.

Various metal working devices superficially similar to that of the present invention have been proposed for the purpose of avoiding the foregoing difficulties, but so far as I am aware, all have employed elements comparable in their effect to the hammers previously employed, and incapable of restoring a curved sheet metal surface accurately to its original contours without weakening or stressing the metal.

The principal object of the present invention is to restore deformed metal surfaces to their original contours without weakening or stretching the metal.

A further and more specific object of the invention is to provide a convenient portable device by means of which such operations may be carried out, and generally to improve devices of the same general class to which that of the present invention belongs.

The novel features characterizing a device embodying the present invention are set forth with particularity in the appended claims. The invention itself, however, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments thereof, when read with reference to the accompanying drawing, in which:

Figure 1 is a side elevation, partially in section showing an apparatus for practicing the invention, and illustrating an initial step of a method of the invention;

Figure 2 is an enlarged fragmentary elevation from the left of Figure 1, the work being shown in section;

Figure 3 is an elevational view of the apparatus of Figure 1 illustrating a second step in the practice of the invention;

Figure 4 is a fragmentary view of a varied form of the apparatus of Figure 1, and also illustrating the method of attack of both modifications when the mechanism is presented to the deformity from an opposite direction to that illustrated in Figure 1;

Figure 5 is a detail of an alternate adjusting means; and

Figure 6 is a detail view in section of the pivotally mounted element 18 and track 19 shown in Figure 4; the section being taken on the line 6—6 of Figure 4.

Figure 7 is a fragmentary elevational view of a detailed modification.

The device of the present invention attains the foregoing objects by providing a rockably mounted anvil having a substantially flat face supported for tangential contact with a roller so that the sheet metal surface to be restored may be engaged at opposite points by the anvil and roller respectively; the support for the anvil and roller being such as to permit relative movement of the latter elements, the roller moving along the flat face of the anvil.

This arrangement is such that an "ironing" of the deformed sheet metal between the roller and pivoted anvil may be effected by moving the anvil and roller, so that the resulting surface will conform to the original curvature thereof rather than to the flat anvil face.

As illustrated in the drawing the apparatus employed comprises a tubular metallic member 1 treated in such manner as to have an intermediate curved portion 2 of a springy character while the remainder of member 1, including the remaining curved portions, is relatively rigid and inflexible. The end portion 3 of the tubular member 1 is provided with a recess in which is received the cylindrical stem 4a of a roller holder 4 in which is rotatably mounted, as shown in Figure 2, a hardened metal roller 5. Roller holder 4 is adjustable by rotational movement of stem 4a in its recess and is held in properly adjusted position, with the axis of roller 5 parallel to the axis of pivotal movement of anvil 7, by a releasable set screw 4b. Roller 5 is somewhat barrel shaped but the mid-portion thereof is preferably cylindrical and preferably so about one third of its length.

Pivotally secured to the other end portion 6 of member 1, by means such as pivot pin 7a, is an anvil 7 having a substantially perfectly flat surface juxtaposed in adjustable spacial relation to the roller and pivotal about an axis parallel to that of the roller.

In operative relation the anvil and roller are so close together as to frequently prohibit positioning on the work except for provisions made to permit spacing these members apart while

placing them in position. To this end the anvil is mounted on a removable member 8 which is slipped into the slots 9 and 10 of holders 11 and 12. Member 8 also constitutes an adjustable support for the anvil in that it takes the form of a lever fulcrumed on the fulcrum 13 of member 12 and adjustable therearound as by means of an adjustable screw bearing thereagainst through the member 11, or adjustable by a self locking eccentric 15, the areas of flat sides 16 of which are unsymmetrically disposed on either side of a normal radial plane, so that the areas progress inwardly. A suitable lever 17 serves to operate the latter described adjustment means.

A modified form of the anvil employed in the device of the present invention is illustrated in Figures 4 and 6 as comprising a body portion 18 pivotally mounted on member 8 at 18a and provided with peripheral flanges 20 serving as guides and retaining means for an endless metal band 21 encircling the body portion 18 between said flanges and slidable around the body portion in the direction of movement of the latter in operation. In order to facilitate such sliding movement the maintenance of proper lubrication between the band 21 and the body member 18, by means such as a lubricant film 22, is desirable.

In operation, the device is assembled in operative relation to the work, as shown in Figure 1, with the pivotal axes of roller 4 and anvil 7 offset as indicated in this view. This offsetting of the axes is important because it makes possible the exertion of an enhanced force by the roller 4 and anvil 7, respectively, when a deformity extending below or above the normal plane of the work is encountered by one or the other. Thus, when the device as a whole is moved in the direction of the arrow A in Figure 1, and the roller 4 encounters a deformity such as that indicated at 23, the entire device acts as a lever of the second class having its fulcrum at the point of the work nearest the anvil pivot 7a, a power arm of the length of the diameter of the C-shaped yolk 1 and a work arm of the length of the offset of the roller pivot from pivot 7a. The ratio of the power arm to the work arm being large, the force exerted in restoring the deformity to its normal plane is many times that exerted by the operator. The same type of operation takes place when a deformity extending above the normal plane of the work is encountered by the anvil 7, except that under such conditions the device functions as a lever of the first class, having its fulcrum at the point of the work nearest the roller pivot, a power arm of the diameter of the yolk, and a work arm of the length of the offset of pivot 7a from the roller pivot.

In order to effect a smooth application of force to the deformities to be removed, it is desirable to make the yolk 1, or a substantial portion thereof, resilient, so that when a deformity is encountered by either the roller 4 or anvil 7, the yolk 1 may be stressed. Such stressing increases the offset of the roller and anvil axes but applies a resilient pressure tending to simultaneously restore them to their original offset relationship and to effect relative movement of the roller and anvil which irons the deformity between these members without applying excessive force which might rupture the metal or strain it beyond its limit of elasticity.

The operation of the device therefore involves no particular skill on the part of the operator, requiring only that he reciprocate the device as indicated by the arrow A in Figure 2 over such deformities as it is desired to remove. The construction of the device is such that, during such reciprocation, the above described actions take place automatically.

As the deformity becomes smaller, the clearance between anvil and roller may be decreased gradually by the adjustment 14 or by a single step, depending in some degree upon the thickness of the metal and the character of the deformity, and ultimately the adjustment is such that the spring portion of member 1 is stressed as illustrated in Figure 3 so that the roller and anvil are actually in compression against opposed surfaces of the metal and in which relation the finishing of the metal to substantially perfect smoothness and in substantially exact restored condition is effected.

By means of the construction in Figure 4 the additional result is accomplished of preventing any sliding of the work with reference to the tractor tape 21, thus reducing the resistance to restorative forces and protecting the metal surface against scraping action.

Having described the invention and explained the principle of its operation both in the method and in preferred embodiments of apparatus for carrying out that method in accordance with the statute, it will be apparent that other variations of the invention may be resorted to by those skilled in the art for the purpose of accomplishing one or more of the useful results flowing therefrom without departing from the spirit of the invention. It is therefore to be understood that the disclosed embodiments are illustrative only and the following claims are referred to for a definition of that for which the inventor is secured protection hereby.

In the construction of Figure 7 the anvil 7 is shown to be suspended and pivoted to the free end of a pitman 25 pivotally secured to the arm 8 and limited for movement around pivot 26 by a pair of stops 27. This construction permits the yoke 1 to be held up or down irrespective of the direction of attack A, as in Figure 1 or as in Figure 4, since the centerline of thrust may be shifted forwardly or backwardly of the roller in preparing for the first step above outlined.

I claim:

1. A metal working tool comprising a yoke member having a roller mounted on one terminus thereof, an anvil, means for removably securing said anvil in adjustable relation to the other terminus, and means for adjusting said first named means comprising a multiple-flat-sided eccentric member pivotally mounted on said latter terminus and adapted for contacting any one of its flat surfaces against a flat portion of said first named means.

2. A metal working tool comprising a yoke-like member having termini, a roller mounted on one terminus, an anvil mounted on the other terminus, said anvil comprising a body portion forming a flat area and providing a trackway over said area, and a flexible flat member supported against said flat area in sliding engagement therewith and extending between said flat area of said roller.

3. A device as set forth in claim 2, said flat member being an endless flat band lying in said trackway, said trackway extending around said body.

4. A metal working tool comprising a yoke-like member having termini, a roller mounted on one terminus, an anvil mounted on the other terminus, said anvil comprising a body portion

forming a flat area and providing a trackway over said area, and a flat member supported against said flat area in sliding engagement therewith, said flat member being an endless flat band lying in said trackway, said trackway extending around said body.

5. In a device of the character described, a yoke member having termini, a roller member trunnioned on one terminus and disposed toward the other terminus, means providing a slot disposed toward said roller and endwise of said other terminus secured to said other terminus, means providing an anchor fulcrum on said yoke member and a slot aligned with said first slot, a lever member disposed through said slots and fulcrumed on said anchor fulcrum, means for adjustably positioning said lever member with respect to said roller, and a flat sided anvil member pivoted to said lever member with its flat side disposed toward said roller.

6. A device as set forth in claim 5, said adjusting means comprising an adjusting screw and said screw being disposed in said first slot.

7. A device as set forth in claim 5, said adjusting means comprising a flat sided cam.

8. A device as set forth in claim 5, said adjusting means comprising an adjusting screw, and said anvil member being connected to said lever by a link pivoted to both.

9. A device as set forth in claim 5, said adjusting means comprising a flat sided cam member adapted to lock against said lever, and said anvil having an endless band therearound.

VERNON E. ROBBINS.