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(54) IMPROVEMENTS RELATING TO HAND TOOLS

(71) We, ELLIOTT-LUCAS LIMITED, of Churchbridge Works, Cannock, in the County of Stafford, a British Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to hand tools of the kind comprising a pair of lever members pivoted together to provide a pair of handle portions and extending beyond the pivot to form a pair of jaw portions, as for example, pliers, nippers, pincers, and wire cutters, the jaw portion of each lever member being integral with the respective handle portion and the handle portions being adapted by their size and disposition to be grasped collectively in one hand by the user. Such tools are herein called "of the kind referred to".

The best quality hand tools of the kind referred to are made by producing a pair of forgings, cropping the flash from the same, and then machining, grinding and polishing the cropped forgings over a very large part of their surface. The handles in particular, and also to some extent the jaws tend to be of ever-changing contour, width, thickness and curvature, along their length, and for these reasons the machining, grinding and polishing are largely hand operations involving operator skill and experience.

It is known to make lower quality tools where the grinding and polishing are dispensed with and also in some cases e.g. electricians' pliers, the handles are covered with insulation thus eliminating the need for the techniques referred to, but nevertheless there is a very substantial demand for the best quality tools and the need to provide the same at less cost and with less skilled labour content, not only because of the cost of the labour but also difficulties in obtaining such labour under today's conditions.

In accordance with the invention we provide a hand tool of the kind referred to in

which the lever members are formed as metal forgings and the external lateral surface of the handle portion of each lever member has a transverse profile of constant, convexly curvilinear configuration along the length of the respective handle portion.

Hence, the whole of the length of the so-provided handle portions may be ground and polished by contoured tools thereby substantially eliminating operator skill in this operation.

In a preferred embodiment, the internal lateral surface of the handle portion of each lever member also has a transverse profile of constant, convexly curvilinear configuration along the length of the respective handle portion.

Preferably the conventional handle shape—which is slightly curved over the whole length of the handle—is modified in that each said external and/or internal lateral surface may have no curvature longitudinally of the respective handle portion for a major part of the length of the respective handle portion from the pivot towards the free end thereof, each said external and/or internal lateral surface being curved longitudinally of the respective handle portion only over a minor part of its length disposed at the free end of the respective handle portion and conveniently being shaped so that the longitudinally curved part thereof is of constant radius.

The aforesaid lateral surfaces of the handle portions may therefore be machined, or ground or polished, by a relative linear movement between the handle and the treatment or finishing tool. This may be effected in various ways, for example: the handle may be supported on a carriage which is moved past a grinding tool, with a cam for displacing the handle as the straight part leaves the tool and the curved part reaches the tool; or the tool may be cam displaced to like effect; or one or other of tool and handle may be spring or air displaced to maintain a contact pressure therebetween and

cause the tool to follow the longitudinal contour.

The longitudinally curved parts of said external and/or internal lateral surfaces are such that the surfaces converge towards one another in a direction away from said pivot.

The external lateral surface of the jaw portion of each lever member may have a transverse profile of constant, convexly curvilinear configuration over at least a part of the length of the respective jaw portion and conveniently the external lateral surface of the jaw portion of one lever member is collinear with the external lateral surface of the handle portion of the other lever member.

When the internal and external lateral surfaces have profiles as aforesaid, each lever member may be of constant thickness (in a plane containing the pivot axis) and the remaining two faces, i.e. the front and rear surfaces extending between said lateral surfaces, of each lever member may be finished by planar grinding and polishing so that the front and rear surfaces are parallel to one another and the front surfaces and the rear surfaces respectively of at least the handle portions of the said lever members are coplanar with one another.

According to another aspect of the invention there is also provided a method of making a hand tool of the kind referred to, including the steps of forming each lever member as a metal forging, holding each lever member in a clamp and translating the clamp relative to one or more profiling tools so that those lateral surfaces which, in the assembled tool, constitute external lateral surfaces of at least the handle portions of the lever members are formed with a transverse profile of constant, convexly curvilinear configuration along the length of the respective handle portion.

The profiling tools may comprise abrasive belts held to the desired profiles by resilient pads over the contact area, the pads being of rubber, foamed plastics or the like, and the tool parts may be moved by mounting the clamps on reciprocating carriages. The location of the clamp relative to a datum surface may be adjusted during the reciprocation, for example to deal with the curvature of the handle portions, by a cam plate against which a follower on the carriage or clamp is urged. Hence by interchange of cam plates, and/or interchange of pads, and/or adjustment of the reciprocation stroke length, different tools may be dealt with on the same apparatus.

The accompanying drawings illustrate examples of the invention, wherein:—

Figures 1—3 show three different sizes of engineers' pliers, and

Figure 4 is a perspective view to the nose of the same;

Figures 5—7 are three sections taken at

different points along the length of the handle portion of one lever member, on the lines 5—5, 6—6, 7—7 of Figure 1;

Figure 8 and Figure 9 show a pair of wire cutters; and

Figure 10 shows a pair of snipe nose pliers.

In the drawings, the tools are identical in external lateral profile over the length indicated by the dimension x on each of Figs. 1—3, 8 and 10, although it will be appreciated that the profile applied to one tool may be different to that applied to another. In the case of Fig. 8, the profile is modified over the jaw section in that the width progressively decreases, but the profile present may match the like portions of the profile elsewhere in the tool.

In the case of Fig. 10, the profile is varied over the final portion of the jaws but lies wholly within the profile over the area x , and hence the reciprocation stroke may be x^1 , with a further step required to shape the jaws over that final area.

The lateral internal profiles over the length x^2 are likewise constant for each tool.

Similarly the tools may be planished over the whole of the dimension x in Figs. 1—3 and 8, and over the dimension x^1 of Fig. 10.

Figs. 5—7 show a typical profile, and it will be noted that the dimension of width or thickness a , and of the radii r^1 , r_2 are constant for any one handle (at least) the dimension b between the loci of the radii varying as the lateral dimension varies.

WHAT WE CLAIM IS:—

1. A hand tool of the kind referred to in which the lever members are formed as metal forgings and the external lateral surface of the handle portion of each lever member has a transverse profile of constant, convexly curvilinear configuration along the length of the respective handle portion.

2. A hand tool according to Claim 1 in which each said external lateral surface has no curvature longitudinally of the respective handle portion for a major part of the length of the respective handle portion from the pivot towards the free end thereof.

3. A hand tool according to Claim 2 in which each said external lateral surface is curved longitudinally of the respective handle portion only over a minor part of its length disposed at the free end of the respective handle portion.

4. A hand tool according to Claim 3 in which said longitudinally curved part of each said external surface has a constant radius of curvature.

5. A hand tool according to Claim 3, or Claim 4, in which the longitudinally curved parts of said external lateral surfaces are such that the surfaces converge towards one another in a direction away from said pivot.

6. A hand tool according to any one of

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cause the tool to follow the longitudinal contour.

The longitudinally curved parts of said external and/or internal lateral surfaces are such that the surfaces converge towards one another in a direction away from said pivot.

5 The external lateral surface of the jaw portion of each lever member may have a transverse profile of constant, convexly
10 curvilinear configuration over at least a part of the length of the respective jaw portion and conveniently the external lateral surface of the jaw portion of one lever member is
15 collinear with the external lateral surface of the handle portion of the other lever member.

When the internal and external lateral surfaces have profiles as aforesaid, each lever member may be of constant thickness (in a plane containing the pivot axis) and the re-
20 maining two faces, i.e. the front and rear surfaces extending between said lateral surfaces, of each lever member may be finished by planar grinding and polishing so that
25 the front and rear surfaces are parallel to one another and the front surfaces and the rear surfaces respectively of at least the handle portions of the said lever members are co-
planar with one another.

According to another aspect of the in-
30 vention there is also provided a method of making a hand tool of the kind referred to, including the steps of forming each lever member as a metal forging, holding each
35 lever member in a clamp and translating the clamp relative to one or more profiling tools so that those lateral surfaces which, in the assembled tool, constitute external lateral
40 surfaces of at least the handle portions of the lever members are formed with a transverse profile of constant, convexly curvilinear configuration along the length of the respec-
tive handle portion.

The profiling tools may comprise abra-
45 sive belts held to the desired profiles by resilient pads over the contact area, the pads being of rubber, foamed plastics or the like, and the tool parts may be moved by mounting the clamps on reciprocating carriages.
50 The location of the clamp relative to a datum surface may be adjusted during the reciprocation, for example to deal with the curvature of the handle portions, by a cam plate against which a follower on the carriage or clamp is urged. Hence by inter-
55 change of cam plates, and/or interchange of pads, and/or adjustment of the reciprocation stroke length, different tools may be dealt with on the same apparatus.

The accompanying drawings illustrate ex-
60 amples of the invention, wherein:—

Figures 1—3 show three different sizes of engineers' pliers, and

Figure 4 is a perspective view to the nose of the same;

65 Figures 5—7 are three sections taken at

different points along the length of the handle portion of one lever member, on the lines 5—5, 6—6, 7—7 of Figure 1;

Figure 8 and Figure 9 show a pair of wire cutters; and

Figure 10 shows a pair of snipe nose pliers.

In the drawings, the tools are identical in external lateral profile over the length indicated by the dimension x on each of Figs. 1—3, 8 and 10, although it will be appreciated that the profile applied to one tool may be different to that applied to another. In the case of Fig. 8, the profile is modified over the jaw section in that the width progressively decreases, but the profile present may match the like portions of the profile elsewhere in the tool.

In the case of Fig. 10, the profile is varied over the final portion of the jaws but lies wholly within the profile over the area x , and hence the reciprocation stroke may be x^1 , with a further step required to shape the jaws over that final area.

The lateral internal profiles over the length x^2 are likewise constant for each tool.

Similarly the tools may be planished over the whole of the dimension x in Figs. 1—3 and 8, and over the dimension x^1 of Fig. 10.

Figs. 5—7 show a typical profile, and it will be noted that the dimension of width or thickness a , and of the radii r^1 , r_2 are constant for any one handle (at least) the dimension b between the loci of the radii varying as the lateral dimension varies.

WHAT WE CLAIM IS:—

1. A hand tool of the kind referred to in which the lever members are formed as metal forgings and the external lateral surface of the handle portion of each lever member has a transverse profile of constant, convexly curvilinear configuration along the length of the respective handle portion.

2. A hand tool according to Claim 1 in which each said external lateral surface has no curvature longitudinally of the respective handle portion for a major part of the length of the respective handle portion from the pivot towards the free end thereof.

3. A hand tool according to Claim 2 in which each said external lateral surface is curved longitudinally of the respective handle portion only over a minor part of its length disposed at the free end of the respective handle portion.

4. A hand tool according to Claim 3 in which said longitudinally curved part of each said external surface has a constant radius of curvature.

5. A hand tool according to Claim 3, or Claim 4, in which the longitudinally curved parts of said external lateral surfaces are such that the surfaces converge towards one another in a direction away from said pivot.

6. A hand tool according to any one of



Claims 1 to 5 in which the external lateral surface of the jaw portion of each lever member has a transverse profile of constant, convexly curvilinear configuration over at least a part of the length of the respective jaw portion.

7. A hand tool according to Claim 6 in which the external lateral surface of the jaw portion of one lever member is collinear with the external lateral surface of the handle portion of the other lever member.

8. A hand tool according to any one of Claims 1 to 7 in which the internal lateral surface of the handle portion of each lever member has a transverse profile of constant, convexly curvilinear configuration along the length of the respective handle portion.

9. A hand tool according to Claim 8 in which each said internal lateral surface has no curvature longitudinally of the respective handle portion for a major part of the length of the respective handle portion from the pivot towards the free end thereof.

10. A hand tool according to Claim 9 in which each said internal lateral surface is curved longitudinally of the respective handle portion only over a minor part of its length disposed at the free end of the respective handle portion.

11. A hand tool according to Claim 10 in which said longitudinally curved part of each said internal lateral surface has a constant radius of curvature.

12. A hand tool according to Claim 10, or Claim 11, in which the curved parts of said internal lateral surfaces are such that the surfaces converge towards one another in a direction away from said pivot.

13. A hand tool according to any one of the preceding Claims in which the internal and external lateral surfaces of each handle portion are more widely spaced adjacent the pivot than at the free end of the handle portion.

14. A hand tool according to any one of

the preceding Claims in which the front and rear surfaces extending between the external and internal lateral surfaces of at least the handle portion of each lever member are each of planar configuration and are parallel to one another.

15. A hand tool according to Claim 14 in which the front surfaces and the rear surfaces respectively of at least the handle portions of the said lever members are coplanar with one another.

16. A hand tool of the kind referred to, substantially as hereinbefore described with reference to, and as shown in, Figures 1, 5, 6 and 7, or Figure 2 or Figures 3 and 4 or Figures 8 and 9 or Figure 10 of the accompanying drawings.

17. A method of making a hand tool of the kind referred to, including the steps of forming each lever member as a metal forging, holding each lever member in a clamp and translating the clamp relative to one or more profiling tools so that those lateral surfaces which, in the assembled tool, constitute external lateral surfaces of at least the handle portions of the lever members are formed with a transverse profile of constant, convexly curvilinear configuration along the length of the respective handle portion.

18. A method according to Claim 17 in which the or each profiling tool comprises an abrasive belt held to the desired profile by resilient pads, and the lever members are moved relative to the belts by mounting the clamps on reciprocating carriages.

19. A method according to Claim 17, substantially as hereinbefore described with reference to the accompanying drawings.

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