

SPECIFICATION

Manufacture of rotatable ignition files or flint wheels

This invention is concerned with the manufacture of rotatable ignition files or flint wheels, for example for lighters.

In accordance with the present invention, I provide a method of manufacturing rotatable ignition files or flint wheels, for example for lighters, comprising the steps of: cutting elongate wire stock of gauge appropriate to the desired diameter of the wheel into blanks of suitable size; and applying a series of press operations to the blanks by means of respective punches and dies to champfer or round off the peripheral edges of the blanks, to provide axial mounting holes, and to harden the respective surfaces of the blanks; and the circumferential surfaces of the respective blanks being formed as friction surfaces.

Preferably the series of press operations comprise the following steps in order: guiding the cut blank into a die hole and applying pressure thereto by a pair of opposed punches to initially shape the blank; champfering or rounding off the peripheral edge of the blank at one axial end surface thereof by charging the shaped blank into a second die hole having a bottom formed with a chamfer or rounded peripheral edge and applying pressure to the blank by means of a co-operating punch; thereafter champfering or rounding off the peripheral edge of the blank at its other axial surface and simultaneously providing a central recess in each axial end surface of the blank by inverting the blank and charging it into a die hole having a bottom with a chamfered or rounded peripheral edge and a small diameter guide channel for a small diameter punch opening in the centre of the said bottom, and applying pressure to the inverted blank in the bottom of the said die hole between a co-operating punch formed with a forward end protrusion on its axial centre line and the said small diameter punch; and thereafter forming a through aperture along the axial centre line of the blank by means of a punch die.

It should be appreciated that the above sequence of steps is merely that which we prefer and alternative steps are feasible, as are additional steps, as desired.

The invention is hereinafter more particularly described by way of example only with reference to the accompanying drawings, in which:—

Fig. 1 is a perspective view of a raw cut blank;

Fig. 2 is a sectional view illustrating the step of initially shaping the blank;

Fig. 3 is a sectional view through the initially shaped blank;

Fig. 4 is a sectional view illustrating a subsequent stage of champfering or rounding off one peripheral edge of the blank;

Fig. 5 shows the blank in section after application of the step illustrated in Fig. 4;

Fig. 6 illustrates a subsequent step of champfering or rounding off the other peripheral edge surface and forming recesses in the opposite

axial faces of the blank;

Fig. 7 shows the blank at the end of the operation illustrated in Fig. 6;

Fig. 8 illustrates a yet subsequent stage in which an axial hole is punched through the blank;

Fig. 9 shows in section the blank at the end of the operation illustrated in Fig. 8;

Fig. 10 shows two alternative embodiments of blank at the end of the operation illustrated in Fig. 8, the blanks being shown in section taken along the line A—A in Fig. 9;

Fig. 11 shows a perspective view of the finished rotatable ignition file or flint wheel; and

Fig. 12 shows the wheel of Fig. 11 in section.

Elongate wire stock (such as iron wire) of gauge appropriate to the desired diameter of the finished wheel is first cut into blanks 1 of suitable size. The blank 1 is charged into hole 4a of a die 3a having a pair of cooperating punches 2a, 2a for applying pressure to the blank 1 to give it an initial shape suitable for subsequent working. As will be seen from Fig. 3, the initial shape has respective recesses 1a in each axial end surface.

The thus initially shaped blank is charged into a second die having a die hole 4b, and pressure is applied to the blank by means of a co-operating punch 2b. The bottom surface 4b' has a champfered or rounded peripheral edge so that after the operation illustrated in Fig. 4 when the blank 1 is pushed out of the die by means of a pin 5, it has the configuration shown in Fig. 5, from which figure it will be seen that the blank has a rounded or champfered peripheral edge 1b.

The blank is then inverted and charged into the die hole 4c of a further die also formed with a champfered or rounded peripheral edge to its bottom surface 4c'. In this case, an aperture of relatively small diameter in which is received a punch 2c' of relatively small diameter opens into the centre of bottom surface 4c'. The punch 2c' also has an axial protrusion in its end surface. Pressure is applied to the blank 1 in the bottom of the die hole 4c between the main punch 2c and the small diameter punch 2c' so that the second axial end surface of the blank is formed with a champfered or rounded periphery at 1b' and respective recesses 1c are formed in the centre of the respective axial end surfaces (Fig. 7).

The blank 1 is next charged into the die hole 4d of a conventional punch die 3d and a round, or alternatively square, cross-sectioned hole 1d is punched through the blank at the position of the recesses 1c by means of cooperating hole making punches 2d, 2d.

The blank 1 may then be quenched and a friction surface is formed at the periphery of the wheel, for example by forming file cuts 1e, to complete formation of the wheel.

As will be appreciated from the foregoing description. The series of co-operating punches and dies 2a, 3a; 2b, 3b; 2c, 3c; and 2d, 3d may be operated by relatively unskilled personnel. The presently described method avoids the need for skilled cutting of blanks, avoids the need for skilled cutting of the peripheral edges of the blanks by

means of chamfering tooling, which avoids the creation of cut chips of the material, and avoids any need to drill the so-formed chamfered blanks.

- 5 We have found that there is less wastage of material by employing the series of punch operations as described hereinabove than there would be in seeking to perform similar operations by cutting tools. Moreover, even with relatively unskilled personnel, the resultant blanks prior to the cutting operation are relatively more uniform so that the file cuts 1e can be more readily formed and there is less likelihood of sharp edges to those cuts being created which would tend to lacerate the finger of the user of a lighter.

- 10 The series of punch operations further has the effect of forming an outer hardened layer 1f (see Fig. 12) on the wheel having better hardness properties, tensile strength and yield point and a wear resistance which may be two to three times more than for flint wheels formed by other processes.

CLAIMS

- 25 1. A method of manufacturing rotatable ignition files or flint wheels, for example for lighters, comprising the steps of: cutting elongate wire stock of gauge appropriate to the desired diameter of the wheel into blanks of suitable size; and applying a series of press operations to the blanks by means of respective punches and dies to chamfer or round off the peripheral edges of the blanks, to provide axial mounting holes, and to harden the respective surfaces of the blanks; and the circumferential surfaces of the respective
- 30 blanks being formed as friction surfaces.

- 35 2. A method according to Claim 1, wherein the

friction surface is provided on each blank at the end of the press operations.

- 40 3. A method according to Claim 1 or Claim 2, wherein the press operations comprise the following steps in order: guiding the cut blank into a die hole and applying pressure thereto by a pair of opposed punches to initially shape the blank; chamfering or rounding off the peripheral edge of the blank at one axial end surface thereof by
- 45 charging the shaped blank into a second die hole having a bottom formed with a chamfer or rounded peripheral edge and applying pressure to the blank by means of a co-operating punch; thereafter chamfering or rounding off the peripheral edge of the blank at its other axial surface and simultaneously providing a central recess in each axial end surface of the blank by inverting the blank and charging it into a die hole
- 50 having a bottom with a chamfered or rounded peripheral edge and a small diameter guide channel for a small diameter punch opening in the centre of the said bottom, and applying pressure to the inverted blank in the bottom of the said die hole between a co-operating punch formed with a forward end protrusion on its axial centre line and the said small diameter punch; and thereafter forming a through aperture along the axial centre line of the blank by means of a punch die.

- 60 4. A method according to any preceding Claim, wherein said wire stock consists of iron wire.

- 65 5. A method of manufacturing rotatable ignition files or flint wheels, for example for lighters, substantially as hereinbefore described with reference to the accompanying drawings.

- 70 6. An ignition file or flint wheel, for example for a lighter, whenever produced by a method according to any preceding claim.

means of chamfering tooling, which avoids the creation of cut chips of the material, and avoids any need to drill the so-formed chamfered blanks.

- 5 We have found that there is less wastage of material by employing the series of punch operations as described hereinabove than there would be in seeking to perform similar operations by cutting tools. Moreover, even with relatively unskilled personnel, the resultant blanks prior to the cutting operation are relatively more uniform so that the file cuts 1e can be more readily formed and there is less likelihood of sharp edges to those cuts being created which would tend to lacerate the finger of the user of a lighter.

- 10 The series of punch operations further has the effect of forming an outer hardened layer 1f (see Fig. 12) on the wheel having better hardness properties, tensile strength and yield point and a wear resistance which may be two to three times more than for flint wheels formed by other processes.

CLAIMS

1. A method of manufacturing rotatable ignition files or flint wheels, for example for lighters, comprising the steps of: cutting elongate wire stock of gauge appropriate to the desired diameter of the wheel into blanks of suitable size; and applying a series of press operations to the blanks by means of respective punches and dies to chamfer or round off the peripheral edges of the blanks, to provide axial mounting holes, and to harden the respective surfaces of the blanks; and the circumferential surfaces of the respective blanks being formed as friction surfaces.

2. A method according to Claim 1, wherein the

friction surface is provided on each blank at the end of the press operations.

3. A method according to Claim 1 or Claim 2, wherein the press operations comprise the following steps in order: guiding the cut blank into a die hole and applying pressure thereto by a pair of opposed punches to initially shape the blank; chamfering or rounding off the peripheral edge of the blank at one axial end surface thereof by charging the shaped blank into a second die hole having a bottom formed with a chamfer or rounded peripheral edge and applying pressure to the blank by means of a co-operating punch; thereafter chamfering or rounding off the peripheral edge of the blank at its other axial surface and simultaneously providing a central recess in each axial end surface of the blank by inverting the blank and charging it into a die hole having a bottom with a chamfered or rounded peripheral edge and a small diameter guide channel for a small diameter punch opening in the centre of the said bottom, and applying pressure to the inverted blank in the bottom of the said die hole between a co-operating punch formed with a forward end protrusion on its axial centre line and the said small diameter punch; and thereafter forming a through aperture along the axial centre line of the blank by means of a punch die.

4. A method according to any preceding Claim, wherein said wire stock consists of iron wire.

5. A method of manufacturing rotatable ignition files or flint wheels, for example for lighters, substantially as hereinbefore described with reference to the accompanying drawings.

6. An ignition file or flint wheel, for example for a lighter, whenever produced by a method according to any preceding claim.

