A press tool (12) has a spacer matrix (22) formed from two sets of spaced parallel spacer plates (23, 24) located between two support plates (21a, 21b). One set of spacer plates is arranged perpendicular to the other set and is interengaged with it by means of slots which extend from different side edges of the matrix. A die (20) is secured to one of the support plates (21a) to form the press tool (12). In the example shown, the spacer plates (23, 24) are all identical and are formed by laser cutting from sheet steel.
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*FOR THE PURPOSES OF INFORMATION ONLY*

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A Press Tool Spacer Block

This invention relates to a press tool spacer block for use as a means for spacing a die or similar press tool from an operating surface of a press. It also relates to a kit of parts for making such a spacer and to a method of making such a spacer.

It is well known to use a cast iron spacer block to allow a panel or blank to be located at the correct height between the operating surfaces of a press. This cast spacer block is both time consuming and expensive to produce as a pattern has to first be produced for the spacer and this pattern then has to be used to cast the spacer block. After casting, it is necessary to machine the surfaces of the spacer block that abut the operating surfaces of the press and the rear surface of the die. It is not unusual for the manufacturing process to take 6 to 8 weeks from conception to delivery of the finished spacer block. In addition such a spacer block is relatively heavy and is not easy to manipulate when attaching it to the press.

It is an object of this invention to provide an improved press tool spacer block that is cheaper and quicker to manufacture.

According to one aspect of the invention there is provided a press tool spacer block comprising two sets of generally flat spacer plates each having two longitudinal substantially parallel edges, the spacer plates of each set being spaced in a parallel formation and arranged with the spacer plates of one set perpendicular to and interengaged with the spacer plates of the other set to form a matrix having spaced parallel edges corresponding to the longitudinal edges of the spacer plates.

Preferably, each of the spacer plates has a number of slots extending perpendicularly from a respective one of the longitudinal edges, in which case the
slots in one set of spacer plates may be interengaged with a plate of the other set to connect the plates together to form the matrix. Each of the spacer plates of one set may have slots extending from one edge of the matrix and each of the spacer plates of the other set may have slots extending from the other edge of the matrix. Preferably, each slot in the spacer plates of one set is aligned with a corresponding one of the slots in the spacer plates of the other set.

In some cases, all of the spacer plates can be substantially identical before assembly.

The spacer block may further comprise a first support plate arranged transversely of the spacer plates against one of the edges of the matrix and may also further comprise a second support plate arranged transversely of the spacer plates against the other edge of the matrix. At least some of the spacer plates may each have one or more lugs formed on one longitudinal edge for engagement with corresponding recesses in the respective support plate. The or each support plate may be held onto at least some of the spacer plates by welding. Welding may also be used to hold the spacer plates in interengagement. The or each support plate may be formed by laser cutting from sheet material and the spacer plates may also be formed by this method.

Since the plates may be formed in one location and assembled in another location, the fact that they are generally flat makes it relatively easy to transport them prior to assembly. Hence, according to a second aspect of the invention there is provided a kit of parts for making a press tool spacer block and comprising two sets of generally flat spacer plates according to said one aspect of the invention. Such a kit may include first or second support plates as previously described.
The invention also provides a novel method of making a press tool spacer block so that according to a third aspect of the invention there is provided a method of making a press tool spacer block comprising the steps of providing two sets of generally flat spacer plates each having two longitudinal substantially parallel edges, arranging the spacer plates of each set in spaced parallel formation, arranging the spacer plates of one set perpendicular to the spacer plates of the other set and interengaging the spacer plates of one set with the spacer plates of the other set to form a matrix having spaced parallel edges corresponding to the longitudinal edges of the spacer plates. Other aspects of the method will be apparent from the options mentioned above in relation to said one aspect of the invention.

The invention will now be described by way of example with reference to the accompanying drawing, of which:

Fig. 1 is a front view of a press having upper and lower press tool spacer blocks according to the invention;

Fig. 2 is a perspective view of parts of one of the spacer blocks shown in Fig. 1; and

Fig. 3 is a scrap view based on Fig. 2 showing parts of a second embodiment of a press tool spacer block according to the invention.

With reference to Fig. 1 there is shown a press in the form of a hydraulic power press 10 to which is secured an upper press tool comprising an upper die 16 and a lower press tool comprising a lower die 20. The upper die 16 is fastened to a hydraulic ram 14 by means of a flat plate 19 which forms an upper operating surface and an upper spacer block 11 comprising a spacer matrix 17 sandwiched between two support plates 18.

The lower die 20 is supported on a bolster 15 forming a lower operating
surface. A lower die 20 is attached to the bolster 15 by means of a spacer block 12 comprising a spacer matrix 22 sandwiched between two support plates 21. As is normal practice threaded fasteners (not shown) are used to attach the spacer blocks 11, 12 and the dies 16, 20 to the press 10.

Fig. 2 shows the lower spacer block 12 in greater detail. The support matrix 22 is formed by two sets of generally flat spacer plates 23, 24 arranged vertically, the plates of each set being parallel to each other with the plates 23 of one set being perpendicular to the plates 24 of the other set. All of the spacer plates 23, 24 are substantially identical and are produced by laser cutting from steel sheet of the required thickness, the thickness and number of the spacer plates depending upon the load to which the press tool is subjected to in use. In general the plates will be between two millimetres and twenty millimetres in thickness.

Each of one set of spacer plates, conveniently referred to as the upper spacer plates 23, has an upper edge 25 and a parallel lower edge 27. Two slots 29 extend perpendicularly inwardly from the lower edge for approximately half the vertical height of the spacer plate 23. The width of each of the slots 29 is only slightly greater than the thickness of the support plates of the other set, conveniently referred to as the lower set 24, this width being just enough to provide assembly clearance. The upper edge 25 of each of the upper support plates 23 each has two lugs 31 extending therefrom for engagement with corresponding recesses in the form of apertures 33 in the top support plate 21a, the lugs 31 being used to locate the spacer plates 23 relative to the upper support plate 21a. As can be seen, each of the spacer plates 23, 24 is considerable longer in the longitudinal direction along an axis L-L than is the height in the vertical direction along an axis T-T. This helps to ensure that, when assembled, the spacer plates form a matrix or lattice structure which is very resistant to compressive loads applied parallel to the axis T-T and does not readily buckle or collapse.
The lower support plates 24 also each have an upper edge 26 and a parallel lower edge 28, two slots 30 extending perpendicularly inwardly from the upper edge 26 for approximately half the vertical height of the spacer plate 24. Again, the width of each of the slots 30 is only slightly greater than the thickness of the upper support plate 23. The lower edge 28 of each of the lower plates 24 each has two lugs 32 extending therefrom for engagement with corresponding recesses in the form of apertures 34 in the bottom support plate 21b. The lugs 32 are used to locate the spacer plates 24 relative to the lower support plate 21b.

To form the spacer matrix the upper and lower spacer plates 23 and 24 are brought together so that the slots 29 are aligned with the slots 30. The plates are pressed together until the lower edges 27 of the upper spacer plates 23 lies flush with the lower edges of the lower spacer plates 24. The upper and lower spacer plates are then held together by tack welding. In this form the matrix has upper and lower edges corresponding to the upper and lower edges of the spacer plates 23, 24. The upper and lower support plates 21a and 21b are then located in place by means of the lugs 31, 32 and recesses 33, 34 and secured to the matrix 22 by tack welding. The lower die 20 is then fastened to the upper support plate 21a by threaded fasteners (not shown).

The terms “upper” and “lower” have been used herein for ease of explanation and if related to the spacer block 11 would be reversed. For example in that case the upper die 16 is fastened to the lower support plate 18. It is not necessary that the upper and lower spacer plates are identical. For example, the thickness of one set of spacer plates could be different to that of the other set and the width of the slots 29 or 30 would then correspond with the relevant thickness of the plate which is engaged in it.

It will be appreciated that a matrix structure as described above can be both
relatively light and easy to fabricate. If the spacer plates and the support plates are produced by laser cutting, little or no additional machining is required. In some cases it may be convenient to produce the spacer plates and the support plates as a kit of parts which can be assembled near or on the press. This is particularly convenient since the plates take up relatively little space before assembly.

Although the invention has been described with reference to the use of four spacer plates it is not limited to this number of plates. In practice the number of plates required will be determined by the strength required to resist the load applied to the tool during its use in the power press. In some cases more plates may be required locally or the thickness of the plates in different positions may be different to account for uneven loading of the tool. In addition, it will be appreciated that the support plates could form part of a tool used for piercing or bending operations or could form part of a die block. Also, the number of lugs 32 on each spacer plate 23, 24 can be varied to give more or less than the two shown on each longitudinal edge.

The spacer plates may be of different widths to provide a stepped spacer block. This is shown in Fig.3 where there are three support plates 121a, 121b and 121c, the height of the intermediate support plate 121a above the lower support plate 121b being less than the height of the upper support plate 121c above the lower support plate 121b. A heel box 128 is formed from the spacer plates 123, 124 and wear faces 129 are bolted to the upwardly extending ends of the spacer plates 123, 124. The upper support plate 121c has a number of threaded apertures 126 which provide attachment for piercing and trimming tools or for a die corresponding to the die 20.
CLAIMS

1. A press tool spacer block comprising two sets of generally flat spacer plates each having two longitudinal substantially parallel edges, the spacer plates of each set being spaced in a parallel formation and arranged with the spacer plates of one set perpendicular to and interengaged with the spacer plates of the other set to form a matrix having spaced parallel edges corresponding to the longitudinal edges of the spacer plates.

2. A spacer block as claimed in claim 1 in which each of the spacer plates has a number of slots extending perpendicularly from a respective one of the longitudinal edges.

3. A spacer block as claimed in claim 2 in which the slots in one set of spacer plates are interengaged with a plate of the other set to connect the plates together to form the matrix.

4. A spacer block as claimed in claim 3 in which each of the spacer plates of one set has slots extending from one edge of the matrix and each of the spacer plates of the other set has slots extending from the other edge of the matrix.

5. A spacer block as claimed in claim 4 in which each slot in the spacer plates of one set is aligned with a corresponding one of the slots in the spacer plates of the other set.

7. A spacer block as claimed in any preceding claim in which all of the spacer plates are substantially identical before assembly.

8. A spacer block as claimed in any preceding claim and further comprising a first support plate arranged transversely of the spacer plates against one of the edges of the matrix.
9. A spacer block as claimed in claim 8 and further comprising a second support plate arranged transversely of the spacer plates against the other edge of the matrix.

10. A spacer block as claimed in claim 8 or claim 9 in which at least some of the spacer plates each has one or more lugs formed on one longitudinal edge for engagement with corresponding recesses in the respective support plate.

11. A spacer block as claimed in any of claims 8 to 10 in which the or each support plate is held onto at least some of the spacer plates by welding.

12. A spacer block as claimed in any of claims 8 to 11 in which the or each support plate is formed by laser cutting from sheet material.

13. A spacer block as claimed in any preceding claim in which the spacer plates are held in interengagement by welding.

14. A spacer block as claimed in any preceding claim in which the spacer plates are formed by laser cutting from sheet material.

15. A kit of parts for making a press tool spacer block and comprising two sets of generally flat spacer plates according to any preceding claim.

16. A kit of parts as claimed in claim 15 and further comprising a first support plate as claimed in any of claims 8 to 14.

17. A kit of parts as claimed in claim 15 or 16 and further comprising a second support plate as claimed in any of claims 9 to 14.
18. A method of making a press tool spacer block comprising the steps of providing two sets of generally flat spacer plates each having two longitudinal substantially parallel edges, arranging the spacer plates of each set in spaced parallel formation, arranging the spacer plates of one set perpendicular to the spacer plates of the other set and interengaging the spacer plates of one set with the spacer plates of the other set to form a matrix having spaced parallel edges corresponding to the longitudinal edges of the spacer plates.

19. A method as claimed in claim 18 including providing each of the spacer plates with a number of slots extending perpendicularly from a respective one of the longitudinal edges.

20. A method as claimed in claim 19 including interengaging the slots in one set of spacer plates with a plate of the other set to connect the plates together to form the matrix.

21. A method as claimed in claim 20 including providing each of the spacer plates of one set with slots extending from one edge of the matrix and each of the spacer plates of the other set with slots extending from the other edge of the matrix.

22. A method as claimed in claim 21 including arranging each slot in the spacer plates of one set in alignment with a corresponding one of the slots in the spacer plates of the other set.

23. A method as claimed in any of claims 18 to 22 in which all of the spacer plates are substantially identical before assembly.
24. A method as claimed in any of claims 18 to 23 and further providing a first support plate arranged transversely of the spacer plates against one of the edges of the matrix.

25. A method as claimed in any of claims 18 to 24 and further providing a second support plate arranged transversely of the spacer plates against the other edge of the matrix.

26. A method as claimed in claim 24 or claim 25 including providing at least some of the spacer plates with a number of lugs formed on one longitudinal edge, providing corresponding recesses in the respective support plate and engaging the lugs with the corresponding recesses.

27. A method as claimed in any of claims 24 to 26 including welding the or each support plate onto at least some of the spacer plates.

28. A method as claimed in any of claims 24 to 26 including laser cutting the or each support plate from sheet material.

29. A method as claimed in any of claims 18 to 28 including welding at least some of the spacer plates to each other.

30. A method as claimed in any of claims 18 to 29 including laser cutting the spacer plates from sheet material.

31. A spacer block substantially as described herein with reference to the accompanying drawings.

32. A method of producing a spacer block substantially as described herein with reference to the accompanying drawings.
### A. CLASSIFICATION OF SUBJECT MATTER

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According to International Patent Classification (IPC) or to both national classification and IPC.

### B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols):
- IPC 7 B21D B30B B23Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched.

Electronic data base consulted during the international search (name of data base and, where practical, search terms used):

### C. DOCUMENTS CONSIDERED TO BE RELEVANT

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- "Z" document member of the same patent family.

Date of the actual completion of the international search: 18 October 1999

Date of mailing of the international search report: 26/10/1999

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