

CLAIMS

1. A method of producing a 3D article by additive manufacture, wherein the method includes the steps of:
 - forming a meltpool in an already-existing part of the article, and moving the meltpool
5 relative thereto;
 - feeding a directed feedstock into the moving meltpool to deposit and fuse a layer of material on the already-existing part; and
 - repeating the forming and moving and feeding steps to build up successive layers of material, and thereby produce the 3D article; and
- 10 wherein, in performance of the forming and moving step:
 - a first energy source is directed onto the already-existing part, the first energy source impinging at a first region which moves with and leads the meltpool, whereby the first energy source initiates the formation of the meltpool; and
 - a second energy source is directed onto the already-existing part, the second energy
15 source impinging at a second region which moves with and follows the first region, whereby the second energy source grows the lateral width of the meltpool before the feedstock is fed therein.
2. The method of claim 1, wherein the first energy source is a plasma transferred arc.
3. The method of claim 1 or 2, wherein the second energy source is one or more lasers.
- 20 4. The method of any preceding claim, wherein the energy profile of the impinging energy of the second energy source is weighted to opposite lateral sides of the meltpool.
5. The method of any preceding claim, wherein the energy profile and/or the power of the impinging energy of the second energy source is adjusted to vary the lateral growth of the meltpool.
- 25 6. The method of any preceding claim, wherein the feedstock is a wire or tape feedstock.
7. The method of any preceding claim which includes the further step of:
 - impinging a third energy source onto the directed feedstock to melt the feedstock as it is fed into the moving meltpool.
- 30 8. The method of claim 7, wherein the third energy source is one or more lasers.

9. The method of claim 7 or 8, wherein the energy profile of the impinging energy of the third energy source is adjusted to compensate for changes in the shape, size and/or feed rate of the feedstock.
10. The method of any of claims 7 to 9, wherein the power of the third energy source is
5 adjusted to compensate for changes in the feed rate of the feedstock.
11. The method of any preceding claim, further including the step of preheating the feedstock.
12. A system for producing a 3D article by additive manufacture in which a meltpool is formed in an already-existing part of the article, and moved relative thereto, a directed
10 feedstock is fed into the moving meltpool to deposit and fuse a layer of material on the already-existing part, and the forming and moving and feeding are repeated to build up successive layers of material, and thereby produce the 3D article, the system comprising:
a first energy source configured to be directed onto the already-existing part;
a second energy source configured to be directed onto the already-existing part;
15 a feedstock directing arrangement; and
a computer controller adapted to control movement of the first energy source, the second energy source and the feedstock directing arrangement relative to the already-existing part such that: the first energy source impinges at a first region which moves with and leads the meltpool whereby the first energy source initiates the formation of the
20 meltpool, the second energy source impinges at a second region which moves with and follows the first region to grow the lateral width of the meltpool before receipt of the directed feedstock into the moving meltpool, and the directed feedstock is fed into the moving meltpool.
13. The system of claim 12, wherein the energy profile and/or the power of the impinging
25 energy of the second energy source is adjustable to vary the growth of the meltpool.
14. The system of claim 12 or claim 13, wherein the system further comprises a third energy source, and wherein the computer controller is further adapted to control movement of the third energy source relative to the already-existing part such that the third energy source impinges the directed feedstock to melt the feedstock as it is fed into the moving
30 meltpool.

15. The system of claim 14, wherein the computer controller is further adapted to adjust the energy profile of the impinging energy of the third energy source to compensate for changes in the shape and/or size of the feedstock.