CLAIMS

1. A process for producing a 3D article (6) by additive manufacture, wherein the method includes the steps of:

forming a meltpool on an already-existing part of the article (6) using heat supplied to the article by a gas metal arc welding device (1) having one or more consumable electrodes (4), and moving the meltpool relative thereto;

simultaneously feeding into the moving meltpool: (i) the one or more consumable electrodes (4) of the gas metal arc welding device (1) to provide a first material feed rate into the meltpool, and (ii) a non-electrode, supplementary feedstock (10) to provide a second material feed rate into the meltpool, whereby a layer of material is deposited and fused on the already-existing part; and

repeating the forming and moving, and the feeding steps to build up successive layers of material, and thereby produce the 3D article (6);

wherein the second material feed rate is varied for a given first material feed rate to vary the ratio of the first material feed rate to the second material feed rate in performance of the feeding step, while simultaneously the travel speed of the meltpool is varied so that the ratio of the sum of the first material feed rate and the second material fed rate to the travel speed is kept constant.

2. The process of claim 1, wherein the total feed rate is the sum of the first material feed rate and the second material fed rate, exterior parts of the article being built up at relatively low total feed rates and interior parts of the article being built up at relatively high total feed rates.

3. A process for surface cladding an article, wherein the method includes the steps of:

forming a meltpool on the surface of the article using heat supplied to the article by a gas metal arc welding device having one or more consumable electrodes, and moving the meltpool relative thereto; and

simultaneously feeding into the moving meltpool: (i) the one or more consumable electrodes of the gas metal arc welding device to provide a first material feed rate into the meltpool, and (ii) a non-electrode, supplementary feedstock to provide a second material feed rate into the meltpool, whereby a cladding layer of material is deposited and fused on the surface of the article;

wherein the second material feed rate is varied for a given first material feed rate to vary the ratio of the first material feed rate to the second material feed rate in performance of

the feeding step, while simultaneously the travel speed of the meltpool is varied so that the ratio of the sum of the first material feed rate and the second material fed rate to the travel speed is kept constant.

4. The process of any one of the previous claims, further including measuring a local temperature of the article, wherein the ratio of the first material feed rate to the second material feed rate is varied based on the measured local temperature.

5. The process of any one of the previous claims wherein, during the moving of the meltpool, cooling fluid is applied to the article.

6. The process of any one of the previous claims, further including preheating the supplementary feedstock to a predetermined temperature before feeding into the meltpool.

7. The process of claim 6, wherein, during the moving of the meltpool, the predetermined temperature is varied.

8. A system for producing a 3D article (6) by additive manufacture in which a meltpool is formed on an already-existing part of the article using heat supplied to the article by a gas metal arc welding device (1) having one or more consumable electrodes (4), the meltpool is moved relative to the already-existing part 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:

the gas metal arc welding device (1) having the one or more consumable electrodes (4) which provide a first material feed rate into the meltpool;

a feedstock directing arrangement (8) for feeding a non-electrode, supplementary feedstock (10) into the meltpool simultaneously with the one or more consumable electrodes (4), the supplementary feedstock providing a second material feed rate into the meltpool; and

a computer controller (11) configured to control movement of the gas metal arc welding device (1) and the feedstock directing arrangement (8) relative to the already-existing part, and to control the first and second feed rates;

wherein, to control the first and second feed rates, the computer controller (11) is further configured such that the second material feed rate is varied for a given first material feed rate to vary the ratio of the first material feed rate to the second material feed rate , and wherein the computer controller (11) is further configured to simultaneously vary the travel

speed of the meltpool so that the ratio of the sum of the first material feed rate and the second material fed rate to the travel speed is kept constant.

9. The system of claim 8, further comprising:

a measuring device (12) for measuring a local temperature of the article, wherein the computer controller (11) is further configured such that the ratio of the first material feed rate to the second material feed rate is variable based on the measured local temperature.

10. The system of claim 8 or 9, further comprising:

a cooling device for applying cooling fluid to the article, wherein the computer controller (11) is further configured to control the cooling device.

11. The system of any one of claims 8 to 10 further comprising:

a heating device (13) for preheating the supplementary feedstock to a predetermined temperature before feeding into the meltpool, wherein the computer controller (11) is further configured to control the heating device.