CLAIMS

1. An embossing apparatus comprising:

a feed-in mechanism comprising an input nip roller having an input nip roller axis;

a heating mechanism;

an embossing mechanism comprising a middle roller having a middle roller axis substantially parallel to the input nip roller axis, the middle roller having a diameter substantially equal to a diameter of the input nip roller;

a cooling mechanism; and

a feed-out mechanism comprising an output nip roller having an output nip roller axis substantially parallel to the input nip roller axis, the output nip roller having a diameter substantially equal to the diameter of the input nip roller;

wherein the embossing apparatus is configured to receive a substrate so that the substrate is pressed between the input nip roller and the middle roller and further pressed between the output nip roller and the middle roller;

wherein the input nip roller axis, the middle roller axis, and the output nip roller axis are in a common plane;

wherein the feed-in mechanism further comprises a further input nip roller, the feed-in mechanism configured to receive the substrate between the input nip roller and the further input nip roller;

wherein the feed-out mechanism further comprises a further output nip roller, the feed-out mechanism configured to output the substrate between the output nip roller and the further output nip roller;

wherein the embossing mechanism further comprises a further middle roller so that the substrate passes through between the middle roller and the further middle roller;

wherein the embossing mechanism further comprises a flexible belt mold held by the further input nip roller and the further output nip roller, the flexible belt mold passing between the middle roller and the further middle roller, the flexible belt mold having a pattern for embossing the substrate; and

wherein the embossing apparatus further comprises a supporting belt held by the input nip roller and the output nip roller, the supporting belt passing between the middle roller and the further middle roller such that the supporting belt cooperates with the flexible belt mold to sandwich the substrate, the sandwiched substrate pressed between the input nip roller and the further input nip roller, between the middle roller and the further middle roller, and between the output nip roller and the further output nip roller, thereby embossing the substrate.

2. The embossing apparatus according to claim 1,

wherein the embossing mechanism comprises an embossing roller motor configured to drive at least one of the middle roller and the further middle roller.

3. The embossing apparatus according to claim 2,

wherein the feed-in mechanism comprises a feed-in roller motor configured to drive at least one of the input nip roller and the further input nip roller.

4. The embossing apparatus according to claim 3,

wherein the feed-out mechanism comprises a feed-out roller motor configured to drive at least one of the output nip roller and the further output nip roller.

5. The embossing apparatus according to claim 4,

a control mechanism electrically coupled to the embossing roller motor, the feed-in roller motor and the feed-out roller motor.

6. The embossing apparatus according to claim 5,

wherein the control mechanism is configured to control a first speed of rotation of at least one of the first middle roller and the further middle roller, a second speed of rotation of at least one of the input nip roller and the further input nip roller, and a third speed of rotation of at least one of the output nip roller and the further output nip roller.

7. The embossing apparatus according to claim 6,

wherein the first speed of rotation, the second speed of rotation and the third speed of rotation are substantially equal.

8. The embossing apparatus according to claim 1,

wherein the input nip roller comprises the heating mechanism and the output nip roller comprises the cooling mechanism.

9. The embossing apparatus according to claim 1,

wherein a distance between the input nip roller axis and the middle roller axis is at least substantially equal to the diameter of the input nip roller; and

wherein a distance between the middle roller and the output nip roller axis is at least substantially equal to the diameter of the input nip roller.

10. A method of fabricating an embossing apparatus, the method comprising:

providing a feed-in mechanism comprising an input nip roller having an input nip roller axis;

providing a heating mechanism;

providing an embossing mechanism comprising a middle roller having a middle roller axis substantially parallel to the input nip roller axis, the middle roller having a diameter substantially equal to a diameter of the input nip roller;

providing a cooling mechanism; and

providing a feed-out mechanism comprising an output nip roller having an output nip roller axis substantially parallel to the input nip roller axis, the output nip roller having a diameter substantially equal to the diameter of the input nip roller;

wherein the embossing apparatus is configured to receive a substrate so that the substrate is pressed between the input nip roller and the middle roller and further pressed between the output nip roller and the middle roller;

wherein the input nip roller axis, the middle roller axis, and the output nip roller axis are in a common plane;

wherein the feed-in mechanism further comprises a further input nip roller, the feed-in mechanism configured to receive the substrate between the input nip roller and the further input nip roller;

wherein the feed-out mechanism further comprises a further output nip roller, the feed-out mechanism configured to output the substrate between the output nip roller and the further output nip roller;

wherein the embossing mechanism further comprises a further middle roller so that the substrate passes through between the middle roller and the further middle roller;

wherein the embossing mechanism further comprises a flexible belt mold held by the further input nip roller and the further output nip roller, the flexible belt mold passing between the middle roller and the further middle

roller, the flexible belt mold having a pattern for embossing the substrate; and

wherein the embossing apparatus further comprises a supporting belt held by the input nip roller and the output nip roller, the supporting belt passing between the middle roller and the further middle roller such that the supporting belt cooperates with the flexible belt mold to sandwich the substrate, the sandwiched substrate pressed between the input nip roller and the further input nip roller, between the middle roller and the further middle roller, and between the output nip roller and the further output nip roller, thereby embossing the substrate.