~~What is claimed is:~~

1. A method of applying a pattern onto a web of indefinite length material comprising:
   applying a micro-contact printing stamp to a roll supported for rotation by at least one air bearing, wherein the roll comprises a sleeve positioned over a core and is supported for rotation by a layer of air between the sleeve and core;
   contacting the roll with the web; and
   translating the web while in contact with the micro-contact printing stamp so as to repeatedly imprint a pattern onto the web.

2. A method according to claim 1 wherein the contact between the web and the roll drives the roll while the web is being translated.

3. A method according to claim 1 wherein the sleeve is primarily composed of nickel.

4. A method according to claim 1 wherein the sleeve is from 3 mils (0.076 mm) to 15 mils (0.381 mm) thick.

5. A method according to claim 1 wherein the roll has a rotational inertia less than 150 lb-in^2 (4300 N-cm^2).

6. A method according to claim 1 wherein the web is conveyed so that a free span of the web is in contact with roll.

7. A method according to claim 6 wherein the web is in contact with the micro-contact printing stamp for less than 25% of the circumference of the roll.

8. A method according to claim 6 wherein the web is in contact with the micro-contact printing stamp for at least 3 – 5 milliseconds.

9. A method according to claim 1 wherein the web contacts the roll at a nip.

10. An apparatus for applying a pattern onto a web of indefinite length comprising:
a roll comprising a sleeve positioned over a core with the sleeve supported for rotation by a layer of air between the sleeve and core;
a micro-contact printing stamp mounted onto an outer surface of the sleeve, the micro-contact printing stamp saturated with thiol ; and
a web path along which the web is guided such that the web contacts the micro-contact printing stamp and rotates the sleeve.

11. An apparatus according to claim 10 wherein the sleeve is from 5 mils (0.127 mm) to 15 mils (0.381 mm) thick.

12. An apparatus according to claim 10 wherein the web path comprises an entry roller and a take-off roller, such that a free span of the web contacts the micro-printing stamp.

13. An apparatus according to claim 12 wherein the free span is in contact with the sleeve for less than 25% of the circumference of the sleeve.

14. An apparatus according to claim 12 wherein the web is in contact with the micro-contact printing stamp for at least 3 – 5 milliseconds.

15. An apparatus according to claim 10 wherein the web path comprises a positioning roller, such that the web contacts the micro-contact stamp at a nip between the positioning roller and the sleeve.

16. An apparatus according to claim 15 wherein the positioning roller is mounted on a pivot arm, and wherein the contact force between the positioning roller and the sleeve is controlled by a force controller.

17. An apparatus according to claim 16 comprising a position stop for limiting the movement of the positioning roller towards the sleeve.

CLAIMS

1. A method of applying a pattern onto a web of indefinite length material comprising:

   applying a micro-contact printing stamp to an outer surface of a roll supported for rotation by at least one air bearing, wherein the roll comprises a sleeve positioned over a core and the air bearing comprises a layer of air between the sleeve and core such that the sleeve is supported for rotation;

   contacting the micro-contact printing stamp-with the web; and

   translating the web while in contact with the micro-contact printing stamp so as to repeatedly imprint a pattern onto the web such that the sleeve supported over the core by the layer of air rotates.

2. A method according to claim 1 wherein the contact between the web and the roll drives the roll while the web is being translated.

3. A method according to claim 1 wherein the sleeve is primarily composed of nickel.

4. A method according to claim 1 wherein the sleeve is from 3 mils (0.076 mm) to 15 mils (0.381 mm) thick.

5. A method according to claim 1 wherein the roll has a rotational inertia less than 150 lb-in^2 (4300 N-cm^2).

6. A method according to claim 1 wherein the web is conveyed so that a free span of the web is in contact with the roll.

7. A method according to claim 6 wherein the web is in contact with the micro-contact printing stamp for less than 25% of the circumference of the roll.

8. A method according to claim 6 wherein the web is in contact with the micro-contact printing stamp for at least 3 – 5 milliseconds.

9. A method according to claim 1 wherein the web contacts the roll at a nip.

10. An apparatus for applying a pattern onto a web of indefinite length comprising:
    a roll comprising a sleeve positioned over a core with the sleeve supported for rotation by a layer of air between the sleeve and core;
    a micro-contact printing stamp mounted onto an outer surface of the sleeve, the micro-contact printing stamp saturated with thiol and being configured to contact the web such that the contact between the web and the micro-contact printing stamp rotates the sleeve supported by the layer of air and positioned over the core; and
    a web path along which the web is guided into contact with the micro-contact printing stamp along at least a portion of the outer surface, wherein the contact between the web and the micro-contact printing stamp rotates the sleeve.

11. An apparatus according to claim 10 wherein the sleeve is from 5 mils (0.127 mm) to 15 mils (0.381 mm) thick.

12. An apparatus according to claim 10 wherein the web path comprises an entry roller and a take-off roller, such that a free span of the web contacts the micro-printing stamp.

13. An apparatus according to claim 12 wherein the free span is in contact with the sleeve for less than 25% of the circumference of the sleeve.

14. An apparatus according to claim 12 wherein the web is in contact with the micro-contact printing stamp for at least 3 – 5 milliseconds.

15. An apparatus according to claim 10 wherein the web path comprises a positioning roller, such that the web contacts the micro-contact stamp at a nip between the positioning roller and the sleeve.

16. An apparatus according to claim 15 wherein the positioning roller is mounted on a pivot arm, and wherein the contact force between the positioning roller and the sleeve is controlled by a force controller.

17. An apparatus according to claim 16 comprising a position stop for limiting the movement of the positioning roller towards the sleeve.