Claims

1. Method for manufacturing a set of embossing rollers for a device for embossing packaging materials that has two rollers,

characterized in that

the embossing roller set comprises

a male roller having a male surface structure including structural elements and/or logo structures and

a female roller having a female surface structure that is associated to the surface structure of the male roller for the common embossing operation with the male roller,

and is designed in view of using the embossing rollers for fine embossing in the on-line process,

whereby

the associated female surface structure is produced independently of a previously produced or physically pre-existing male surface structure,

contours of the male surface structures and the female surface structures are manufactured for a fine embossing process with an overall linear error of less than +/- 10 µm and an angular error of less than 5~~4~~°,

the dimensions of the structural elements of the male roller, on one hand, and the dimensions of the associated structural elements of the female roller, on the other hand, deviate from one another by a determined amount without however impairing their cooperation, and

~~any~~ voluntary deviations of linear dimensions of the structural elements of the rollers from each other are greater than or equal to 15 µm and/or the angles of the edges of the structural elements deviate by 4° or more than 4° from each other.

2. Method according to claim 1, characterized in that the contours of the roller surface structures are manufactured for a fine embossing process with an overall linear error of less than +/- 15 µm and an angular error of less than 4°.

~~3~~2. Method according to claim 1 or 2, characterized in that the female surface structures ~~of the embossing rollers~~ are not inversely congruent with the associated male surface structure~~are shaped~~ such that during on-line embossing of regularly arranged and uniform embossing patterns in a packing line, no residual tensions are created in the packaging material in the direction transversally to the running direction of the rollers.

~~4~~3. Method according to anyone of claims 1 to 3~~or 2~~, characterized in that the surface structures of the embossing rollers are shaped such that the embossed packaging material is provided with a tactually perceptible embossing pattern.

~~5~~4. Method according to claim ~~3~~4, characterized in that the tactually perceptible embossing pattern includes special signs such as Braille or acoustically utilizable signs.

~~6~~5. Method according to anyone of claims 1 to ~~5~~4, characterized in that in order to reduce the transverse tensions in the embossed packaging material, the logo structures of the embossing rollers are arranged and designed such that during the passage of a foil web between the embossing rollers, at least two sections can be embossed on the foil web in such a manner that the logo structures embossed on one section are offset relative to the respective logo structures on the other section in the running direction.

~~7~~6. Method according to anyone of claims 1 to ~~6~~5, characterized in that raised positioning marks (27) are produced on the male roller and associated recessed positioning marks (28) on the female roller, or vice-versa.

87. Method according to anyone of claims 1 to 76, characterized in that the male surface structures and the female surface structures of the embossing rollers are produced by means of a femto- or picosecond laser system.

98. Method according to claim 87, characterized in that on the surface of the rollers a coarse structure and a superposed fine structure are produced.

109. Method according to claim 87, characterized in that on the surfaces of the roller pairs, zones for creating creasings are produced, raised creasing structures being produced on one roller and associated recessed creasing structures on the other roller, the creasing structures being more raised or recessed, respectively, than the other structures.

1110. Method according to any one of claims 1 to 910, characterized in that one of the embossing rollers is manufactured at least on the width of the packaging material web with a diameter that is reduced relative to the remainder of the embossing roller by an amount S, the value of S being greater than 0.02 mm.

1211. Method according to anyone of claims 1 to 1110, characterized in that the packaging material is suitable for packaging foods and pharmaceuticals, or is tipping paper, cigarette paper, innerliner or innerframe paper, hybrid paper, a synthetic foil, or paperboard or cardstock for packaging tobacco products.

1312. Embossing roller set comprising

a male roller (P11, P11B, P11E, P11L, P11W, P23-28, 36, P81-RI-3; LR1-3; LLI-3; K1-3) and

a female roller (M11, M11B, M11E, M11L, M11W, M23-28, 37; M81-R1-3; LR1-3; LL1-3; K1-3),

both manufactured according to the method of any one of claims 1 to 1214,

characterized in that

the structural elements (GP1, GPB, GPE, GPL, GPW, FP-Q,D,Rh,R) on the male roller and the associated structural elements (GM1, GMB, GME, GML, GMW, FM-Q,D,Rh,R) on the female roller are

not inversely congruent and

deviate by a defined amount of more than 15 µm linearly and 4° angularly, and

contours of the male surface structures and the female surface structures exhibit an overall linear error of less than +/- 10 µm and an angular error of less than 54°.

14~~13~~. Embossing roller set according to claim 13~~12~~, characterized in that at least the surface of the rollers consists of metal, hard metal, or ceramics, and the surface is possibly provided with a protective layer.

15~~14~~. Embossing roller set according to claim 13~~12~~ or 14~~13~~, characterized in that one of the embossing rollers is connected to the other embossing roller by synchronizing means, preferably gearwheels (39, 40).

16~~15~~. Embossing roller set according to one of claims 13 to 15~~12-14~~, characterized in that the two embossing rollers (P81-R1-3; LR1-3; LL1-3; K1-3), (M81-R1-3; LR1-3; LL1-3; K1-3) include mutually corresponding zones (82) having raised resp. recessed structures (R, W, L, Z, K) for the creation of creasing zones, these structures being more raised or recessed, respectively, than the other structures.

17~~16~~. Use of an embossing roller set according to claims 13~~12~~ to 16~~15~~ in an embossing device, characterized in that the embossing device is integrated on-line in a packing line either directly or via a robot.

18~~17~~. Use according to claim 17~~16~~, characterized in that the rollers are arranged at a determined mutual distance of preferably more than 0.02 mm.

19~~18~~. Use according to claim 17~~16~~ or 18~~17~~, characterized in that the embossing roller set is arranged in a quick-change device (30, 59, 64, 70) that is designed such that the embossing rollers (36, 37) are exchangeable individually and independently of each other.

20~~19~~. Use according to claim 19~~18~~, characterized in that the embossing rollers (36, 37) are rotatably retained in respective roller supports (34, 35; 65, 66) and the roller supports are fastened in unequivocal positions in a quick-change housing and are individually and independently removable, one end of the male roller support (34) being supported in a needle bearing (42) and its other end in a ball bearing (43).

21~~20~~. Use according to claim 19~~18~~ or 20~~19~~, characterized in that the lower part of one of the roller supports (34, 65) has a key (49) and the bottom of the housing (31, 60, 67) a corresponding groove (48).

22~~21~~. Use according to claim 21~~20~~, characterized in that the upper part of the other roller support (66) has a key (49) and in the upper part of the housing (67) is arranged a groove (48), or the edges (53) of its upper side form a T-shaped key and the upper side of the housing (60) has a T-groove.

23~~22~~. Use according to claim 20~~19~~, characterized in that the quick-change device (70) comprises a housing (71) with two opposed walls (72, 73) each having two openings (74, 75) with fastening means for receiving and fastening the axles (76, 77) of the rollers (36, 37).