CLAIMS

1. A drawing device for drawing a drawable material, the drawing device comprising

at least a pair of tapered rollers each having a taper ratio in a range of 0.035 to 0.50,

wherein the taper ratio is represented by $(\beta - \alpha)/2L$,

where β denotes a maximum diameter of the roller, α denotes a minimum diameter of the roller, and L denotes a length of a tapered portion of the roller; and

wherein the pair of tapered rollers are arranged such that an angle θ formed between center axes of rotation shafts of the pair of rollers is in a range of $20° \geq \theta \geq 0.001°$.

2. The drawing device according to claim 1, wherein the length L of the tapered portion is in a range of 300 mm $\leq L \leq$ 1200 mm.

3. The drawing device according to claim 1 or claim 2, wherein a ratio β/α between the maximum diameter β and the minimum diameter α of the tapered roller is in a range of 1.2 to 5.0.

4. The drawing device according to any one of claims 1 to 3, wherein the tapered roller includes non-tapered straight portions at a drawable material introduction portion and a drawable material delivery portion.

5. The drawing device according to any one of claims 1 to 4, wherein a surface of each of the tapered rollers is heated at a predetermined temperature.

6. The drawing device according to claim 5, wherein the surface of each tapered roller is heated by internal heating or by external heating.

7. The drawing device according to claim 5 or claim 6, wherein each of the tapered rollers includes a plurality of heating zones partitioned along a lengthwise direction of the roller, and temperatures of the respective heating zones are individually settable.

8. The drawing device according to any one of claims 1 to 7, wherein a plurality of the pairs of tapered rollers are provided such that multi-stage drawing of the drawable material can be performed a plurality of times.

9. The drawing device according to any one of claims 1 to 8, wherein the drawable material is a yarn.

10. The drawing device according to claim 9, wherein the yarn is a monofilament or a multifilament.

11. The drawing device according to claim 9 or claim 10, wherein the pair of tapered rollers are arranged adjacent to a spinning device such that a spun yarn can be drawn directly without winding the yarn after the spinning.

12. The drawing device according to any one of claims 1 to 8, wherein the drawable material is a thermoplastic resin tape or a thermoplastic resin sheet.

13. A drawing method for a drawable material, comprising:

spanning a pair of rollers of a drawing device with a drawable material, the device including at least the pair of tapered rollers each having a taper ratio represented by $(\beta - \alpha)/2L$ in a range of 0.035 to 0.50, where β denotes a maximum diameter of the roller, α denotes a minimum diameter of the roller, and L denotes a length of a tapered portion of the roller; wherein the pair of tapered rollers are arranged such that an angle θ formed between center axes of rotation shafts of the pair of rollers is in a range of $20° \geq \theta \geq 0.001°$; and

drawing the drawable material by running the drawable material while spanning the rollers with the drawable material a plurality of times from a small-diameter side of the tapered rollers to a large-diameter side of the tapered rollers.

14. The drawing method according to claim 13, wherein the drawable material is a yarn.

15. The drawing method according to claim 14, wherein the yarn is introduced onto the tapered rollers without winding the yarn after spinning.

16. The drawing method according to claim 14 or claim 15, wherein the tapered rollers are heated, and the yarn is drawn while heating the yarn by the heated rollers.

17. The drawing method according to any one of claims 13 to 16, wherein the plurality of times is equal to or greater than 6 times.

18. The drawing method according to any one of claims 14 to 17, wherein the multi-stage drawing is performed a plurality of times on the yarn by a drawing device including a plurality of pairs of tapered rollers.

19. The drawing method according to claim 13, wherein the drawable material is a thermoplastic resin tape or a thermoplastic resin sheet.