SUMMARY

Embodiments~~It is an object~~ of the present invention seek to provide an improved dose setting mechanism suitable for reusable (i.e., resettable) or disposable (i.e., non-resettable) drug delivery devices.

This advantage~~object~~ is provided~~solved~~ by a spindle as defined in one embodiment~~claim 1~~. The spindle according to an embodiment of the present invention has two overlapping helical grooves. One of said grooves may be coupled to or engaged with a driver such that when a user sets a dose by rotating a rotating sleeve (like a dose dial sleeve), said driver also rotates. The other of said grooves may be coupled to or engaged with a part of the drug delivery device body (like an internal or external housing). Preferably, the spindle is manufactured with a simple open and shut (molding) tool without a threaded core pin.

According to an exemplary embodiment, a spindle for driving a bung of a cartridge comprises a generally circular shaft having an outer surface. The generally circular shaft extends from a distal end to a proximal end of the circular shaft. A first helical groove is provided along a first portion of the outer surface. The first helical groove having a first pitch. A second helical groove provided along a second portion of the outer surface of the generally circular shaft. The second helical groove overlapping the first helical groove. The second helical groove having a second pitch.

The first helical groove of the spindle may be a helical female groove. Further, the second helical groove may be a helical female groove. In addition, said first helical groove and/or said second helical groove may extend along an outer surface of the shaft from about said distal end of said spindle to about said proximal end of said spindle.

For interaction with said spindle, a dose setting mechanism is provided with a driver for driving said spindle and/or a drug delivery body (like a housing). The driver may comprise a helical groove form that engages said first helical groove of said spindle and the drug delivery body may comprise a helical groove form that engages said

Claims

1. A spindle ~~(242; 414; 542; 642)~~ for driving a bung ~~(218)~~ of a cartridge ~~(220)~~, said spindle comprising:

a generally circular shaft having an outer surface ~~(560)~~, said generally circular shaft extending from a distal end to a proximal end of said circular shaft;

a first helical groove ~~(219; 519; 619)~~ provided along a first portion of said outer surface ~~(560)~~ of said generally circular shaft, said first helical groove having a first pitch; and

a second helical groove ~~(221; 521; 621)~~ provided along a second portion of said outer surface ~~(560)~~ of said generally circular shaft, said second helical groove ~~(221; 521; 621)~~ overlapping said first helical groove ~~(219; 519; 619)~~, said second helical groove having a second pitch.

2. The spindle of claim 1 wherein said first helical groove ~~(219; 519; 619)~~ comprises said first pitch of a first hand; and

said second helical groove ~~(221; 521; 621)~~ comprising said second pitch of an opposite hand to said first hand of said first helical groove ~~(219; 519; 619)~~.

3. The spindle of claims 1 or 2 wherein said first pitch of said first helical groove ~~(219; 519; 619)~~ is equivalent to said second pitch of said second helical groove ~~(221; 521; 621)~~.

4. The spindle of any of claims 1 to 3 wherein said second helical groove ~~(221; 521; 621)~~ provided along said second portion of said outer surface ~~(560)~~ of said generally circular shaft overlaps substantially all of said first helical groove ~~(219; 519; 619)~~.

5. The spindle of any of claims 1 to 4 wherein said first helical groove ~~(219; 519; 619)~~ and/or said second helical groove ~~(221; 521; 621)~~ comprises a helical female groove.

6. The spindle of any of claims 1 to 5 wherein said first helical groove ~~(219; 519; 619)~~ and/or said second helical groove ~~(221; 521; 621)~~ extends along said outer surface ~~(560)~~ of said generally circular shaft from about said distal end of said spindle ~~(242; 414; 542; 642)~~ to about said proximal end of said spindle.

7. The spindle of any of claims 1 to 6 wherein said first pitch of said first helical groove ~~(219; 519; 619)~~ provided along said first portion of said outer surface ~~(560)~~ has a first diameter and
said second pitch of said second helical groove ~~(221; 521; 621)~~ provided along said second portion of said outer surface ~~(560)~~ has a second diameter,
wherein said first diameter is generally equally to said second diameter.

8. A dose setting mechanism for use with a drug delivery device comprising a spindle ~~(242; 414; 542; 642)~~ according to any of claims 1 to 7 and further comprising a driver ~~(230; 409; 530)~~ for driving said spindle, with said driver comprising a helical groove form that engages said first helical groove ~~(219; 519; 619)~~ of said spindle.

9. A dose setting mechanism for use with a drug delivery device comprising a spindle ~~(242; 414; 542; 642)~~ according to any of claims 1 to 7 and further comprising a drug delivery body ~~(240; 404, 408; 516)~~ with a helical groove form that engages said second helical groove ~~(221; 521; 621)~~ of said spindle.

10. The dose setting mechanism of claims 8 or 9 wherein said helical groove on said driver and/or on said drug delivery body comprises a partial groove form, preferably a helical groove of less than one turn.

11. The dose setting mechanism of any of claims 8 to 10 wherein said helical groove on said driver and/or on said drug delivery body comprises a male helical groove.

12. The dose setting mechanism of any of claims 9 to 11 wherein said helical groove form on said drug delivery device body comprises an inner body ~~(408)~~ and/or an outer body ~~(240; 404; 516)~~.

13. A dose setting mechanism for use with a drug delivery device, preferably according to any of claims 8 to 12, said mechanism comprising:
a housing ~~(240; 404, 408; 516)~~;
a rotating sleeve ~~(210; 406)~~ in rotatable engagement with respect to said housing;
a driver ~~(230; 409; 530)~~ releasably coupled to said rotating sleeve; and
a spindle ~~(242; 414; 542; 642)~~ having two overlapping helical grooves ~~(219, 221; 519, 521; 619, 621)~~, said spindle operatively coupled to said driver, such that when a user sets a dose by rotating said rotating sleeve, said driver also rotates.

14. The dose setting mechanism of claim 13 where said dose setting mechanism comprises a resettable dose setting mechanism, wherein said driver ~~(230; 409)~~ comprises a first component ~~(244; 412)~~ and a second component ~~(246; 407)~~, said first and said second component being operatively coupled together so that they rotate together when said user sets said dose.

15. The dose setting mechanism of claim 13 wherein said dose setting mechanism comprises a non-resettable dose setting mechanism.