Cartridge holder assembly for Drug Delivery Devices

Description

Field of the Invention

The present invention relates to the field of drug delivery devices and in particular to injection devices such like pen-type injectors for administering a predefined dose of a liquid medicament.

Background and Prior Art

Drug delivery devices allowing for multiple dosing of a required dosage of a liquid medicament, such as liquid drugs, and further providing administration of the medicament to a patient, are as such well-known in the art. Generally, such devices have substantially the same purpose as that of an ordinary syringe.

Drug delivery devices of this kind have to meet a number of user specific requirements. For instance in case of those with diabetes, many users will be physically infirm and may also have impaired vision. Therefore, these devices need to be robust in construction, yet easy to use, both in terms of the manipulation of the parts and understanding by a user of its operation. Further, the dose setting must be easy and unambiguous and where the device is to be disposable rather than reusable, the device should be inexpensive to manufacture and easy to dispose. In order to meet these requirements, the number of parts and steps required to assemble the device and an overall number of material types the device is made from have to be kept to a minimum.

Typically, the medicament to be administered is provided in a cartridge that has a moveable piston or bung mechanically interacting with a piston rod of a drive mechanism of the drug delivery device. By applying thrust to the piston in a distal direction, a predefined amount of the medicinal fluid is expelled from the cartridge.

In particular for elderly or physically infirm users, the overall handling of the device in a home medication environment should be simple and highly reliable. As for instance illustrated in Figures 1 to 3, drug delivery devices and in particular pen-type injectors typically comprise a multi-component housing 10. Here, a distal end section typically serves as a cartridge holder 12. The cartridge holder 12 comprises a threaded socket 16 at its distal end to receive a needle assembly 18 having a correspondingly threaded needle hub 20 and a double tipped injection needle 22.

The cartridge holder 12 further comprises an insert portion 26 at its proximal end section, by way of which the cartridge holder 12 can be at least partially inserted into a correspondingly shaped distal receptacle of a proximal housing component 14 of the drug delivery device, typically denoted as body 14. The body 14 serves to accommodate a drive mechanism having a piston rod to become operably engaged with a piston of a cartridge to be disposed and fixed in the cartridge holder 12. By way of the inspection window 24, the fluid or filling level of the cartridge can be visually inspected.

The known device 10 as illustrated in Figures 1 to 3 is of disposable type. Cartridge holder 12 and body 14 are adapted to be interconnected in a non-releasable way. For this purpose, the insert portion 26 of the cartridge holder 12 comprises several circumferentially distributed through openings 28 of substantially rectangular shape. Correspondingly and as illustrated in Figure 3, the receiving side wall portion 32 of the body 14 comprises radially inwardly protruding pegs or prongs 34 adapted to mate with the through openings 28 of the cartridge holder as soon as the cartridge holder 12 is appropriately inserted into the body 14 with its insert portion 26.

Radially inwardly protruding prongs 34 further comprise a bevelled surface 36 towards their distal end in order to facilitate mutual engagement of prongs 34 and through openings 28. Furthermore, the insert portion 26 of the cartridge holder 12 is delimited in distal direction by a circumferential and radially outwardly extending

rim 30, which in a final assembly configuration abuts against a distally located end face 38 of the body 14.

The housing components 12, 14 are typically manufactured as injection moulded plastic components, which, by virtue of appropriately selected thermoplastic materials feature a sufficient elasticity in order to support the snapping in and a resulting positive interconnection of cartridge holder 12 and body 14.

However, since such drug delivery devices 10 are predominately intended for home medication, the device has to fulfil highest possible standards in terms of failure safety and robustness, especially in view of mechanical impact.

If for instance the device 10 drops down from a considerably height, a mechanical load-distribution may rise above a critical level in the interconnection of cartridge holder 12 and body 14. Point stresses or point loading acting on the through opening 28 and/or on the prongs 34 may exceed a critical level and the interconnection of cartridge holder 12 and body 14 may break down, the housing components 12, 14 may release and the device 1 would be no longer of use.

Objects of the Invention

It is therefore an object of the present invention to provide a drug delivery device comprising a robust, reliable and mechanically resistant interconnection of cartridge holder and body. The interconnection should be easily integrable in existing housing designs of drug delivery devices. It should also be easily implementable, both, in terms of production costs and assembly work. Moreover, the interconnection of body and cartridge holder should be intuitive and easy to establish.

Summary of the Invention

The present invention relates to a drug delivery device for administering a predefined dose of a medicament. The drug delivery device, typically designed as pen-type injector comprises a housing having at least two components, a proximally located body to accommodate a drive mechanism and a distally located cartridge holder to accommodate a cartridge having a piston slidably disposed therein in an axial direction. The drive mechanism to be arranged in the body typically has a displaceable piston rod, which is adapted to operably engage with the piston of the cartridge. This way, the piston rod can exert distally directed thrust to the piston for expelling a predefined amount of the medicament from the cartridge via a distally located seal, which is typically to be penetrated by an injection needle.

Cartridge holder and body are to be directly interconnected by way of an interconnection. The interconnection is preferably of positive-engaging type and has at least one displaceable or resiliently deformable latch element which is adapted to mate and to engage with a corresponding bearing. The latch element is displaceable or deformable in a direction (z, w) extending substantially parallel to a circumferential side wall of body or cartridge holder. Typically, body and cartridge holder are of substantially cylindrical or tubular shape. The at least one latch element is therefore adapted to establish a positive interlock between cartridge holder and body by way of which a snap-in- or engaging motion can exclusively take place in the plane defined by the circumferential side walls of body or cartridge holder.

Such circumferentially directed displacement or deformation of the at least one latch element is beneficial in that mutually corresponding insert portions or receptacle portions of body and cartridge holder do no longer have to provide a through opening in a circumferential side wall portion that is to engage with radially inwardly or outwardly extending prongs or the like. Hence, the circumferential displacement or deformation of the at least one latch element supports a modified and more robust design of side wall portions of cartridge holder and body. Consequently, side wall sections of said housing components that form the

interconnection of cartridge holder and body can be designed free of through openings and/or latch elements.

Also, respective side wall portions of cartridge holder and body can be designed as substantially closed surfaces inherently providing increased mechanical strength, reliability and failure safety in the event of considerable mechanical impact.

Preferably, the interconnection is established by a plurality of mutually corresponding and mutually mating latch elements and bearings, that are preferably integrated or integrally formed with said housing components, cartridge holder and body.

In a preferred embodiment, cartridge holder and/or body, in particular the interconnection between cartridge holder and body comprise an insert portion and a corresponding receptacle portion for establishing an at least partially interleaved interconnection of cartridge holder and body. This way, a cartridge holder portion for instance acting as insert portion can be inserted into a receptacle portion of the body. Respective insert and receptacle portions then at least partially overlap in radial direction when a final assembly configuration is attained.

Preferably, the cartridge holder comprises the insert portion at a proximal end section and the body comprises the receptacle portion at a distal end section. This way, the cartridge holder can be at least partially inserted into the body in order to establish a positive interconnection of said housing components. However, the design of the drug delivery device is not limited to such configurations. It is generally conceivable, that the cartridge holder comprises a receptacle portion adapted to receive an insert portion of the body.

According to a further embodiment, the insert portion comprises the at least one latch element extending in longitudinal direction (z) and having at least one resiliently deformable spreading piece extending in circumferential direction (w). It may be of further benefit, when the latch element longitudinally extends from a

distal end of the insert portion. Preferably, a plurality of latch elements is provided at the distal end face of the insert portion in order to intercept or to distribute mechanical impact across the circumference of the insert portion.

In a further preferred aspect, the receptacle portion comprises the at least one bearing, which extends in a lateral plane (x, y) with respect to a tubular shape of cartridge holder and/or body. Preferably, the bearing extends substantially perpendicular to the longitudinal extent of body, cartridge holder and/or insert portion and respective latch elements.

The bearing is preferably integrally formed with the receptacle portion of the body and may further delimit the receptacle portion in proximal direction. Therefore, the at least one bearing, typically extending radially inwardly from an inside facing side wall section of the body and/or of its receptacle is preferably integrally formed with the body. By way of the bearing extending in the lateral plane, any longitudinally or axially directed force effect transferred via the longitudinally extending latch element can be transferred to the bearing and may further conducted and transferred to the closed shape side wall structure of the body.

In a further preferred aspect, the bearing comprises at least one axial through opening to receive the at least one latch element of the insert portion. Preferably, the latch element may resiliently deform in order to pass through the bearing's through opening. Thereafter, circumferentially extending spreading pieces of the latch element may appropriately spread, thus preventing to retract the latch element. The latch element may also comprise an arrow-like design, wherein respective bevelled shaped spreading barbs substantially inhibit a release of the interconnection of latch element and bearing. In a relaxed configuration, the through opening of the bearing is therefore smaller than the circumferential extent of the latch element. The latch element, in particular its spreading pieces or barbs have to be resiliently squeezed in order to pass through the bearing's through opening or receptacle.

The through opening of the bearing can be arranged adjacent a circumferential side wall of the receptacle portion. It may also be arranged at a radial distance from the side wall portion.

According to another embodiment, the bearing adjacently extends to an inside facing side wall section of the receptacle portion and further comprises a central through opening to axially guide a piston rod of the drive mechanism. The central through opening may be threaded in order to cooperate with an outer thread of the piston rod. Alternatively, the central through opening of the bearing or web may also comprise a radially extending groove or protrusion to mate with a radially extending rotation inhibiting protrusion or groove of the piston rod.

According to another embodiment, the latch element and the corresponding bearing are integrated in at least one longitudinally extending rib and groove of mutually engaging side wall sections of insert portion and receptacle portion of cartridge holder and body, respectively. When side wall sections of insert portion and receptacle portion are provided with mutually corresponding ribs and grooves, a torsion-resistant interconnection of body and cartridge holder can be attained.

Moreover, by way of mutually corresponding tongues and grooves in or on side wall sections of body and cartridge holder, a mutual interconnection of said housing components requires a respective rotative alignment of body and cartridge holder prior to an insertion of insert portion into the receptacle portion. Additional or adjacent to the above-described latching element, also the groove and the corresponding rib can be equipped with mutually corresponding latch elements and bearings. For instance, the longitudinal groove may comprise a circumferentially extending bearing or a respective recess adapted to mate and to engage with circumferentially extending latch elements of the rib.

Preferably, the rib and/or the groove extend in radial direction with respect to mutually corresponding side wall sections of insert portion and receptacle portion. In particular, the rib or a correspondingly shaped tongue may radially outwardly

protrude from a lateral side wall section of the insert portion. Accordingly or alternatively, the rib may also extend radially inwardly from an inward facing side wall section of the receptacle portion. A corresponding and cooperating groove adapted to receive said rib is provided in the corresponding inner or outer side wall section of the receptacle or the insert portion.

In a further preferred aspect, the bearing adapted to mate with the at least one latch element comprises at least one undercutting circumferentially extending in the groove. The undercutting is designed and configured to cooperate with a spreading piece or barb of the latch element extending in circumferential direction.

It is of further benefit, when according to another embodiment side wall sections of the insert portion and/or of the receptacle portion comprise a substantially closed surface structure, which is substantially free of through openings or comparative structurally weakened areas. This way, side wall sections of insert portion and receptacle portion of body and cartridge holder can be structurally strengthened, such that they become less prone to fracture in response to mechanical impact or shock.

In a further aspect, the interconnection to be established between cartridge holder and body is of non-releasable type. Hence, once an interconnection has been established, a non-destructive release of said housing component is neither intended nor possible. Upon consumption of the medicament provided in a cartridge, the drug delivery device is intended to be discarded in its entirety.

According to another preferred aspect, the drug delivery device is equipped with a pre-filled cartridge arranged in the cartridge holder. The cartridge is at least partially filled with an injectable medicament. Also, the drug delivery device is further equipped with a drive mechanism arranged in the body, ready to exert distally directed thrust to the cartridge's piston for the purpose of precisely expelling a predefined dose or amount of the medicament.

The term „medicament", as used herein, means a pharmaceutical formulation containing at least one pharmaceutically active compound,

wherein in one embodiment the pharmaceutically active compound has a molecular weight up to 1500 Da and/or is a peptide, a proteine, a polysaccharide, a vaccine, a DNA, a RNA, a antibody, an enzyme, an antibody, a hormone or an oligonucleotide, or a mixture of the above-mentioned pharmaceutically active compound,

wherein in a further embodiment the pharmaceutically active compound is useful for the treatment and/or prophylaxis of diabetes mellitus or complications associated with diabetes mellitus such as diabetic retinopathy, thromboembolism disorders such as deep vein or pulmonary thromboembolism, acute coronary syndrome (ACS), angina, myocardial infarction, cancer, macular degeneration, inflammation, hay fever, atherosclerosis and/or rheumatoid arthritis,

wherein in a further embodiment the pharmaceutically active compound comprises at least one peptide for the treatment and/or prophylaxis of diabetes mellitus or complications associated with diabetes mellitus such as diabetic retinopathy,

wherein in a further embodiment the pharmaceutically active compound comprises at least one human insulin or a human insulin analogue or derivative, glucagon-like peptide (GLP-1) or an analogue or derivative thereof, or exedin-3 or exedin-4 or an analogue or derivative of exedin-3 or exedin-4.

Insulin analogues are for example Gly(A21), Arg(B31), Arg(B32) human insulin; Lys(B3), Glu(B29) human insulin; Lys(B28), Pro(B29) human insulin; Asp(B28) human insulin; human insulin, wherein proline in position B28 is replaced by Asp, Lys, Leu, Val or Ala and wherein in position B29 Lys may be replaced by Pro; Ala(B26) human insulin; Des(B28-B30) human insulin; Des(B27) human insulin and Des(B30) human insulin.

Insulin derivates are for example B29-N-myristoyl-des(B30) human insulin; B29-N-palmitoyl-des(B30) human insulin; B29-N-myristoyl human insulin; B29-N-palmitoyl human insulin; B28-N-myristoyl LysB28ProB29 human insulin; B28-N-palmitoyl-LysB28ProB29 human insulin; B30-N-myristoyl-ThrB29LysB30 human insulin; B30-N-palmitoyl- ThrB29LysB30 human insulin; B29-N-(N-palmitoyl-Y-glutamyl)-des(B30) human insulin; B29-N-(N-lithocholyl-Y-glutamyl)-des(B30) human insulin; B29-N-(ω-carboxyheptadecanoyl)-des(B30) human insulin and B29-N-(ω-carboxyheptadecanoyl) human insulin.

Exendin-4 for example means Exendin-4(1-39), a peptide of the sequence H-His-Gly-Glu-Gly-Thr-Phe-Thr-Ser-Asp-Leu-Ser-Lys-Gln-Met-Glu-Glu-Glu-Ala-Val-Arg-Leu-Phe-Ile-Glu-Trp-Leu-Lys-Asn-Gly-Gly-Pro-Ser-Ser-Gly-Ala-Pro-Pro-Pro-Ser-NH2.

Exendin-4 derivatives are for example selected from the following list of compounds:

H-(Lys)4-des Pro36, des Pro37 Exendin-4(1-39)-NH2,
H-(Lys)5-des Pro36, des Pro37 Exendin-4(1-39)-NH2,
des Pro36 [Asp28] Exendin-4(1-39),
des Pro36 [IsoAsp28] Exendin-4(1-39),
des Pro36 [Met(O)14, Asp28] Exendin-4(1-39),
des Pro36 [Met(O)14, IsoAsp28] Exendin-4(1-39),
des Pro36 [Trp(O2)25, Asp28] Exendin-4(1-39),
des Pro36 [Trp(O2)25, IsoAsp28] Exendin-4(1-39),
des Pro36 [Met(O)14 Trp(O2)25, Asp28] Exendin-4(1-39),
des Pro36 [Met(O)14 Trp(O2)25, IsoAsp28] Exendin-4(1-39); or

des Pro36 [Asp28] Exendin-4(1-39),
des Pro36 [IsoAsp28] Exendin-4(1-39),
des Pro36 [Met(O)14, Asp28] Exendin-4(1-39),
des Pro36 [Met(O)14, IsoAsp28] Exendin-4(1-39),
des Pro36 [Trp(O2)25, Asp28] Exendin-4(1-39),
des Pro36 [Trp(O2)25, IsoAsp28] Exendin-4(1-39),

des Pro36 [Met(O)14 Trp(O2)25, Asp28] Exendin-4(1-39),
des Pro36 [Met(O)14 Trp(O2)25, IsoAsp28] Exendin-4(1-39),
wherein the group -Lys6-NH2 may be bound to the C-terminus of the Exendin-4 derivative;

or an Exendin-4 derivative of the sequence
H-(Lys)6-des Pro36 [Asp28] Exendin-4(1-39)-Lys6-NH2,
des Asp28 Pro36, Pro37, Pro38Exendin-4(1-39)-NH2,
H-(Lys)6-des Pro36, Pro38 [Asp28] Exendin-4(1-39)-NH2,
H-Asn-(Glu)5des Pro36, Pro37, Pro38 [Asp28] Exendin-4(1-39)-NH2,
des Pro36, Pro37, Pro38 [Asp28] Exendin-4(1-39)-(Lys)6-NH2,
H-(Lys)6-des Pro36, Pro37, Pro38 [Asp28] Exendin-4(1-39)-(Lys)6-NH2,
H-Asn-(Glu)5-des Pro36, Pro37, Pro38 [Asp28] Exendin-4(1-39)-(Lys)6-NH2,
H-(Lys)6-des Pro36 [Trp(O2)25, Asp28] Exendin-4(1-39)-Lys6-NH2,
H-des Asp28 Pro36, Pro37, Pro38 [Trp(O2)25] Exendin-4(1-39)-NH2,
H-(Lys)6-des Pro36, Pro37, Pro38 [Trp(O2)25, Asp28] Exendin-4(1-39)-NH2,
H-Asn-(Glu)5-des Pro36, Pro37, Pro38 [Trp(O2)25, Asp28] Exendin-4(1-39)-NH2,
des Pro36, Pro37, Pro38 [Trp(O2)25, Asp28] Exendin-4(1-39)-(Lys)6-NH2,
H-(Lys)6-des Pro36, Pro37, Pro38 [Trp(O2)25, Asp28] Exendin-4(1-39)-(Lys)6-NH2,
H-Asn-(Glu)5-des Pro36, Pro37, Pro38 [Trp(O2)25, Asp28] Exendin-4(1-39)-(Lys)6-NH2,
H-(Lys)6-des Pro36 [Met(O)14, Asp28] Exendin-4(1-39)-Lys6-NH2,
des Met(O)14 Asp28 Pro36, Pro37, Pro38 Exendin-4(1-39)-NH2,
H-(Lys)6-desPro36, Pro37, Pro38 [Met(O)14, Asp28] Exendin-4(1-39)-NH2,
H-Asn-(Glu)5-des Pro36, Pro37, Pro38 [Met(O)14, Asp28] Exendin-4(1-39)-NH2,
des Pro36, Pro37, Pro38 [Met(O)14, Asp28] Exendin-4(1-39)-(Lys)6-NH2,
H-(Lys)6-des Pro36, Pro37, Pro38 [Met(O)14, Asp28] Exendin-4(1-39)-(Lys)6-NH2,
H-Asn-(Glu)5 des Pro36, Pro37, Pro38 [Met(O)14, Asp28] Exendin-4(1-39)-(Lys)6-NH2,
H-Lys6-des Pro36 [Met(O)14, Trp(O2)25, Asp28] Exendin-4(1-39)-Lys6-NH2,
H-des Asp28 Pro36, Pro37, Pro38 [Met(O)14, Trp(O2)25] Exendin-4(1-39)-NH2,
H-(Lys)6-des Pro36, Pro37, Pro38 [Met(O)14, Asp28] Exendin-4(1-39)-NH2,
H-Asn-(Glu)5-des Pro36, Pro37, Pro38 [Met(O)14, Trp(O2)25, Asp28] Exendin-4(1-39)-

NH2,
des Pro36, Pro37, Pro38 [Met(O)14, Trp(O2)25, Asp28] Exendin-4(1-39)-(Lys)6-NH2,
H-(Lys)6-des Pro36, Pro37, Pro38 [Met(O)14, Trp(O2)25, Asp28] Exendin-4(S1-39)-(Lys)6-NH2,
H-Asn-(Glu)5-des Pro36, Pro37, Pro38 [Met(O)14, Trp(O2)25, Asp28] Exendin-4(1-39)-(Lys)6-NH2;

or a pharmaceutically acceptable salt or solvate of any one of the afore-mentioned Exedin-4 derivative.

Hormones are for example hypophysis hormones or hypothalamus hormones or regulatory active peptides and their antagonists as listed in Rote Liste, ed. 2008, Chapter 50, such as Gonadotropine (Follitropin, Lutropin, Choriongonadotropin, Menotropin), Somatropine (Somatropin), Desmopressin, Terlipressin, Gonadorelin, Triptorelin, Leuprorelin, Buserelin, Nafarelin, Goserelin.

A polysaccharide is for example a glucosaminoglycane, a hyaluronic acid, a heparin, a low molecular weight heparin or an ultra low molecular weight heparin or a derivative thereof, or a sulphated, e.g. a poly-sulphated form of the above-mentioned polysaccharides, and/or a pharmaceutically acceptable salt thereof. An example of a pharmaceutically acceptable salt of a poly-sulphated low molecular weight heparin is enoxaparin sodium.

Pharmaceutically acceptable salts are for example acid addition salts and basic salts. Acid addition salts are e.g. HCl or HBr salts. Basic salts are e.g. salts having a cation selected from alkali or alkaline, e.g. Na+, or K+, or Ca2+, or an ammonium ion N+(R1)(R2)(R3)(R4), wherein R1 to R4 independently of each other mean: hydrogen, an optionally substituted C1-C6-alkyl group, an optionally substituted C2-C6-alkenyl group, an optionally substituted C6-C10-aryl group, or an optionally substituted C6-C10-heteroaryl group. Further examples of pharmaceutically acceptable salts are described in "Remington's Pharmaceutical Sciences" 17. ed. Alfonso R. Gennaro (Ed.), Mark

Publishing Company, Easton, Pa., U.S.A., 1985 and in Encyclopedia of Pharmaceutical Technology.

Pharmaceutically acceptable solvates are for example hydrates.

It will be further apparent to those skilled in the pertinent art that various modifications and variations can be made to the present invention without departing from the spirit and scope of the invention. Further, it is to be noted, that any reference signs used in the appended claims are not to be construed as limiting the scope of the present invention.

Brief Description of the Drawings

In the following, preferred embodiments of the invention will be described by making reference to the drawings, in which:

Figure 1 schematically illustrates a drug delivery device according to the prior art in an exploded view,

Figure 2 separately illustrates a cartridge holder shown in Figure 1, and

Figure 3 schematically depicts a cross section through the body component according to Figure 1,

Figure 4 is illustrative of the interconnection of body and cartridge holder according to a first embodiment of the invention,

Figure 5 schematically shows an alternative design for a latch element,

Figure 6 schematically depicts a latch element integrated in a longitudinal rib of the cartridge holder, and

Figure 7 schematically shows a positive interlock attainable by way of a latch element according to Figure 6.

Detailed Description

In Figure 4, a receptacle portion 51 of a body housing component 50 is illustrated, which is adapted to receive a correspondingly shaped insert portion 66 of a cartridge holder 60. In contrast to the embodiment as illustrated in Figures 1 to 3, the side wall sections 52, 65 of body 50 and cartridge holder 60 substantially comprise an entirely closed surface structure, which is free of radial through openings.

The latch mechanism 59 attainable by the embodiment as illustrated in Figure 4 is based on arrow-like latch elements 68 extending in longitudinal direction (z) from a proximal end of the insert portion 66. The body 50 comprises a tubular or cylindrically shaped side wall 52 having a bearing 54 extending in a lateral plane (x, y). The bearing 54, which also serves as a lateral web is integrally formed with the lateral side wall 52 of the body 50 and comprises at least one axial through opening 58 which is adapted to receive and to mate with the longitudinally extending latch elements 68 of the insert portion 66.

The latch elements 68 as illustrated in Figure 4 comprise two oppositely and circumferentially extending spreading pieces or barbs 70 that may squeeze or circumferentially deform when urged through the through openings 58 of the bearing 54. Resilient or elastic deformation of the barbs 70 can be supported by a longitudinal slit 72 extending between the circumferentially extending spreading pieces 70.

Position and circumferential distribution of the latch elements 68 corresponds with the circumferential size and position of the axial through openings 58 of the bearing 54. The bearing 54 as further illustrated in Figure 4 also comprises a central and

threaded through opening 56, that serves to axially guide a piston rod of a drive mechanism being not further illustrated here.

The latch elements 68 as shown in Fig. 4 extend in longitudinal direction (z) as well as in circumferential direction (w). They are particularly adapted to resiliently or elastically deform in circumferential direction (w) in order to establish a positive interlock with the bearing 54. This way, a mutual interconnection of body 50 and cartridge holder 60 can be attained on the basis of a positive snap-in solution without the necessity to provide through openings or other structurally weakened portions in the side wall sections 52, 65 of receptacle portion 51 and insert portion 66.

Typically, the longitudinal extension of the insert portion 66 substantially matches with the longitudinal extension of the receptacle portion 51. When a final assembly configuration of the drug delivery device is attained, cartridge holder 60 and body 50 not only abut in radial direction but also in longitudinal direction (z). It is intended, that a distal and lower end face of the body abuts 50 in longitudinal direction with a radially extending circumferential rim 64 of the cartridge holder 60. Correspondingly, also a proximally located end face of the insert portion 66 may but against the transverse or laterally extending bearing 54 in final assembly configuration. The circumferential rim 64 further separates a distal and substantially tubular shaped portion 62 of the cartridge holder 12 and the insert portion 66.

Figure 5 shows an alternative embodiment of a latch element 74 comprising a somewhat arrow-like shape and having two bevelled barbs 78 at the free end of an elongated socket portion 76. The barbs 78 are intended to mate and to abut with the proximally located surface of the bearing 54 as illustrated in Figure 4.

The embodiment according to Figures 6 and 7 is illustrative of another snap-in configuration. Here, the insert portion 66 of the cartridge holder 60 comprises substantially longitudinally extending ribs or tongues 80 with circumferentially

extending latch elements 82 comprising circumferentially extending barbs 84 that mate with correspondingly shaped recesses 88 of a longitudinal groove 86 provided in the inside facing side wall section 52 of the receptacle 51 of the body component 50.

Here, it is of further benefit, when the circumferentially protruding barbs or spreading pieces 84 comprise a sufficient elasticity that allows to urge the latch elements 82 through the groove 86 in longitudinal direction (z) until a final assembly configuration as illustrated in Figure 7 is reached. The recess 88 which is adapted to accommodate a relaxed latch element 82 comprises an undercutting 90 substantially extending in the lateral plane (z, w). However, also other embodiments are conceivable, wherein the undercutting 90 and the circumferentially protruding barbs comprise mutually corresponding abutment faces extending at an angle, substantially smaller than 90° with respect to the direction of assembly (z).

The embodiment according to Figures 6 and 7 can be arbitrarily combined with the embodiment according to Figure 4 and may therefore provide an additional fixation of cartridge holder 60 and body 50 of a drug delivery device, e.g. of pen-injector type.

List of Reference Numerals

10 drug delivery device
12 cartridge holder
14 body
16 threaded socket
18 needle assembly
20 needle holder socket
22 injection needle
24 inspection window
26 insert portion
28 through opening
30 rim
32 receptacle
34 prong
36 bevelled surface
38 end face
50 body
51 receptacle portion
52 side wall
54 bearing
56 through opening
58 through opening
59 interconnection
60 cartridge holder
62 distal portion
64 rim
65 side wall
66 insert portion
68 latch element
70 barb
72 slit

74 latch element
76 socket
78 barb
80 rip
82 latch element
84 barb
86 groove
88 receptacle
90 undercutting

Claims

1. A drug delivery device for administering a predefined dose of a medicament comprising a housing having:

- a body (14) to accommodate a drive mechanism,

- a cartridge holder (12) to accommodate a cartridge having a piston slidably disposed therein in an axial direction (z),

- an interconnection (59) between cartridge holder (12) and body (14), said interconnection having at least one displaceable or resiliently deformable latch element (68; 74; 82) to mate with a corresponding bearing (54; 90), wherein the latch element (68; 74; 82) is displaceable or deformable in a direction (z, w) extending substantially parallel to a circumferential side wall (52, 65) of the body (14) or cartridge holder (12).

2. The drug delivery device according to claim1, wherein cartridge holder (12) and body (14) comprise an insert portion (66) and a corresponding receptacle portion (51) for establishing an at least partially interleaved interconnection of cartridge holder (12) and body (14).

3. The drug delivery device according to claim 2, wherein the cartridge holder (12) comprises the insert portion (66) to be inserted into the receptacle portion (51) of the body (14), or vice versa.

4. The drug delivery device according to claims 2 or 3, wherein the insert portion (66) comprises the at least one latch element (68; 74; 82) extending in longitudinal direction (z) and having at least one resiliently deformable spreading piece (70; 78; 84) extending in circumferential direction (w).

5. The drug delivery device according to claim 2 to 4, wherein the receptacle portion (51) comprises the at least one bearing (54; 90) extending in a lateral plane (x, y)

with respect to a tubular shape of cartridge holder (12) and/or body (14).

6. The drug delivery device according to claim 5, wherein the bearing (54) comprises at least one axial through opening (58) to receive the latch element (68; 74; 82).

7. The drug delivery device according to claim 5 or 6, wherein the bearing (54) adjacently extends to an inside facing side wall section (52) of the receptacle portion (51) and comprises a central through opening (56) to axially guide a piston rod of the drive mechanism.

8. The drug delivery device according to any one of the preceding claims 2 to 7, wherein the latch element (82) and the corresponding bearing (90) are integrated in at least one longitudinally extending rib (80) or groove (86) of mutually engaging side wall sections (52, 65) of insert portion (66) and receptacle portion (51) of cartridge holder (12) and body (14), respectively.

9. The drug delivery device according to claim 8, wherein the tongue (80) and/or its latch element (82) radially outwardly protrudes from a lateral side wall section (65) of the insert portion (66).

10. The drug delivery device according to claim 8 or 9, wherein the bearing (90) comprises at least one undercutting (90) circumferentially extending in the groove (86) and being adapted to mate with a spreading piece (84) of the latch element (82) extending in circumferential direction (w).

11. The drug delivery device according to any one of the preceding claims 2 to 10, wherein side wall sections (52, 65) of the insert portion (66) and/or of the receptacle portion (51) comprise a closed surface structure, free of through openings.

12. The drug delivery device according to any one of the preceding claims, wherein the interconnection (59) is of non-releasable type.

13. The drug delivery device according to any one of the preceding claims, further comprising a cartridge filled with a medicament disposed in the cartridge holder (12).

Cartridge holder assembly for Drug Delivery Devices

Description

Field of the Invention

The present invention relates to the field of drug delivery devices and in particular to injection devices such like pen-type injectors for administering a predefined dose of a liquid medicament.

Background and Prior Art

Drug delivery devices allowing for multiple dosing of a required dosage of a liquid medicament, such as liquid drugs, and further providing administration of the medicament to a patient, are as such well-known in the art. Generally, such devices have substantially the same purpose as that of an ordinary syringe.

Drug delivery devices of this kind have to meet a number of user specific requirements. For instance in case of those with diabetes, many users will be physically infirm and may also have impaired vision. Therefore, these devices need to be robust in construction, yet easy to use, both in terms of the manipulation of the parts and understanding by a user of its operation. Further, the dose setting must be easy and unambiguous and where the device is to be disposable rather than reusable, the device should be inexpensive to manufacture and easy to dispose. In order to meet these requirements, the number of parts and steps required to assemble the device and an overall number of material types the device is made from have to be kept to a minimum.

Typically, the medicament to be administered is provided in a cartridge that has a moveable piston or bung mechanically interacting with a piston rod of a drive mechanism of the drug delivery device. By applying thrust to the piston in a distal direction, a predefined amount of the medicinal fluid is expelled from the cartridge.

In particular for elderly or physically infirm users, the overall handling of the device in a home medication environment should be simple and highly reliable. As for instance illustrated in Figures 1 to 3, drug delivery devices and in particular pen-type injectors typically comprise a multi-component housing 10. Here, a distal end section typically serves as a cartridge holder 12. The cartridge holder 12 comprises a threaded socket 16 at its distal end to receive a needle assembly 18 having a correspondingly threaded needle hub 20 and a double tipped injection needle 22.

The cartridge holder 12 further comprises an insert portion 26 at its proximal end section, by way of which the cartridge holder 12 can be at least partially inserted into a correspondingly shaped distal receptacle of a proximal housing component 14 of the drug delivery device, typically denoted as body 14. The body 14 serves to accommodate a drive mechanism having a piston rod to become operably engaged with a piston of a cartridge to be disposed and fixed in the cartridge holder 12. By way of the inspection window 24, the fluid or filling level of the cartridge can be visually inspected.

The known device 10 as illustrated in Figures 1 to 3 is of disposable type. Cartridge holder 12 and body 14 are adapted to be interconnected in a non-releasable way. For this purpose, the insert portion 26 of the cartridge holder 12 comprises several circumferentially distributed through openings 28 of substantially rectangular shape. Correspondingly and as illustrated in Figure 3, the receiving side wall portion 32 of the body 14 comprises radially inwardly protruding pegs or prongs 34 adapted to mate with the through openings 28 of the cartridge holder as soon as the cartridge holder 12 is appropriately inserted into the body 14 with its insert portion 26.

Radially inwardly protruding prongs 34 further comprise a bevelled surface 36 towards their distal end in order to facilitate mutual engagement of prongs 34 and through openings 28. Furthermore, the insert portion 26 of the cartridge holder 12 is delimited in distal direction by a circumferential and radially outwardly extending

rim 30, which in a final assembly configuration abuts against a distally located end face 38 of the body 14.

The housing components 12, 14 are typically manufactured as injection moulded plastic components, which, by virtue of appropriately selected thermoplastic materials feature a sufficient elasticity in order to support the snapping in and a resulting positive interconnection of cartridge holder 12 and body 14.

However, since such drug delivery devices 10 are predominately intended for home medication, the device has to fulfil highest possible standards in terms of failure safety and robustness, especially in view of mechanical impact.

If for instance the device 10 drops down from a considerably height, a mechanical load-distribution may rise above a critical level in the interconnection of cartridge holder 12 and body 14. Point stresses or point loading acting on the through opening 28 and/or on the prongs 34 may exceed a critical level and the interconnection of cartridge holder 12 and body 14 may break down, the housing components 12, 14 may release and the device 1 would be no longer of use.

Document WO 2008/003560 A1 describes a coupling for injection devices having a first housing part and a second housing part. There, an inside facing protrusion of the first part is clicked into an outwardly facing well of the second part. When first and second parts are further rotated relative to each other, a longitudinal elevation of the first part is forced up a ramp until it falls down a steep locking edge forming a locking well thereby establishing a rotational interlock between first and second parts.

Document WO 2009/137486 A1 discloses an arrangement for fixing an adaptor to a tubular body. There, resilient spring fingers are provided to nest in pockets. Said spring fingers extend and bend in circumferential direction and the pockets are provided in an inside facing side wall portion of the body

Objects of the Invention

It is therefore an object of the present invention to provide a drug delivery device comprising a robust, reliable and mechanically resistant interconnection of cartridge holder and body. The interconnection should be easily integrable in existing housing designs of drug delivery devices. It should also be easily implementable, both, in terms of production costs and assembly work. Moreover, the interconnection of body and cartridge holder should be intuitive and easy to establish.

Summary of the Invention

The present invention relates to a drug delivery device for administering a predefined dose of a medicament. The drug delivery device, typically designed as pen-type injector comprises a housing having at least two components, a proximally located body to accommodate a drive mechanism and a distally located cartridge holder to accommodate a cartridge having a piston slidably disposed therein in an axial direction. The drive mechanism to be arranged in the body typically has a displaceable piston rod, which is adapted to operably engage with the piston of the cartridge. This way, the piston rod can exert distally directed thrust to the piston for expelling a predefined amount of the medicament from the cartridge via a distally located seal, which is typically to be penetrated by an injection needle.

Cartridge holder and body are to be directly interconnected by way of an interconnection. The interconnection is preferably of positive-engaging type and has at least one displaceable or resiliently deformable latch element which is adapted to mate and to engage with a corresponding bearing. The latch element is displaceable or deformable in a direction (z, w) extending substantially parallel to a circumferential side wall of body or cartridge holder. Typically, body and cartridge holder are of substantially cylindrical or tubular shape. The at least one latch element is therefore adapted to establish a positive interlock between cartridge holder and body by way of which a snap-in- or engaging motion can exclusively

take place in the plane defined by the circumferential side walls of body or cartridge holder.

Such circumferentially directed displacement or deformation of the at least one latch element is beneficial in that mutually corresponding insert portions or receptacle portions of body and cartridge holder do no longer have to provide a through opening in a circumferential side wall portion that is to engage with radially inwardly or outwardly extending prongs or the like. Hence, the circumferential displacement or deformation of the at least one latch element supports a modified and more robust design of side wall portions of cartridge holder and body. Consequently, side wall sections of said housing components that form the interconnection of cartridge holder and body can be designed free of through openings and/or latch elements.

Also, respective side wall portions of cartridge holder and body can be designed as substantially closed surfaces inherently providing increased mechanical strength, reliability and failure safety in the event of considerable mechanical impact.

Typically, the interconnection is established by a plurality of mutually corresponding and mutually mating latch elements and bearings, that are may be integrated or integrally formed with said housing components, cartridge holder and body.

Moreover, cartridge holder and/or body, in particular the interconnection between cartridge holder and body comprise an insert portion and a corresponding receptacle portion for establishing an at least partially interleaved interconnection of cartridge holder and body. This way, a cartridge holder portion for instance acting as insert portion can be inserted into a receptacle portion of the body. Respective insert and receptacle portions then at least partially overlap in radial direction when a final assembly configuration is attained.

The receptacle portion comprises the at least one bearing, which extends in a lateral plane (x, y) with respect to a tubular shape of cartridge holder and/or body. Typically, the bearing extends substantially perpendicular to the longitudinal extent of body, cartridge holder and/or insert portion and respective latch elements. The at least one bearing extends radially inwardly from an inside facing side wall section of the receptacle.

The bearing may be integrally formed with the receptacle portion of the body and may further delimit the receptacle portion in proximal direction. The at least one bearing, typically extending radially inwardly from an inside facing side wall section of the receptacle may be integrally formed with the body. By way of the bearing extending in the lateral plane, any longitudinally or axially directed force effect transferred via the longitudinally extending latch element can be transferred to the bearing and may further conducted and transferred to the closed shape side wall structure of the body.

Moreover, the bearing comprises at least one axial through opening to receive the at least one latch element of the insert portion. Typically, the latch element may resiliently deform in order to pass through the bearing's through opening. Thereafter, circumferentially extending spreading pieces of the latch element may appropriately spread, thus preventing to retract the latch element. The latch element may also comprise an arrow-like design, wherein respective bevelled shaped spreading barbs substantially inhibit a release of the interconnection of latch element and bearing. In a relaxed configuration, the through opening of the bearing is therefore smaller than the circumferential extent of the latch element. The latch element, in particular its spreading pieces or barbs have to be resiliently squeezed in order to pass through the bearing's through opening or receptacle.

The through opening of the bearing can be arranged adjacent a circumferential side wall of the receptacle portion. It may also be arranged at a radial distance from the side wall portion.

According to another embodiment, the cartridge holder comprises the insert portion to be inserted into the receptacle portion of the body, or vice versa. Typically, the cartridge holder comprises the insert portion at a proximal end section and the body comprises the receptacle portion at a distal end section. This way, the cartridge holder can be at least partially inserted into the body in order to establish a positive interconnection of said housing components. However, the design of the drug delivery device is not limited to such configurations. It is generally conceivable, that the cartridge holder comprises a receptacle portion adapted to receive an insert portion of the body.

According to a further embodiment, the insert portion comprises the at least one latch element extending in longitudinal direction (z) and having at least one resiliently deformable spreading piece extending in circumferential direction (w). It may be of further benefit, when the latch element longitudinally extends from a distal end of the insert portion. Typically, a plurality of latch elements is provided at the distal end face of the insert portion in order to intercept or to distribute mechanical impact across the circumference of the insert portion.

According to another embodiment, the bearing adjacently extends to an inside facing side wall section of the receptacle portion and further comprises a central through opening to axially guide a piston rod of the drive mechanism. The central through opening may be threaded in order to cooperate with an outer thread of the piston rod. Alternatively, the central through opening of the bearing or web may also comprise a radially extending groove or protrusion to mate with a radially extending rotation inhibiting protrusion or groove of the piston rod.

According to another embodiment, the latch element and the corresponding bearing are integrated in at least one longitudinally extending rib and groove of mutually engaging side wall sections of insert portion and receptacle portion of cartridge holder and body, respectively. When side wall sections of insert portion and receptacle portion are provided with mutually corresponding ribs and grooves, a torsion-resistant interconnection of body and cartridge holder can be attained.

Moreover, by way of mutually corresponding tongues and grooves in or on side wall sections of body and cartridge holder, a mutual interconnection of said housing components requires a respective rotative alignment of body and cartridge holder prior to an insertion of insert portion into the receptacle portion. Additional or adjacent to the above-described latching element, also the groove and the corresponding rib can be equipped with mutually corresponding latch elements and bearings. For instance, the longitudinal groove may comprise a circumferentially extending bearing or a respective recess adapted to mate and to engage with circumferentially extending latch elements of the rib.

Preferably, the rib and/or the groove extend in radial direction with respect to mutually corresponding side wall sections of insert portion and receptacle portion. In particular, the rib or a correspondingly shaped tongue may radially outwardly protrude from a lateral side wall section of the insert portion. Accordingly or alternatively, the rib may also extend radially inwardly from an inward facing side wall section of the receptacle portion. A corresponding and cooperating groove adapted to receive said rib is provided in the corresponding inner or outer side wall section of the receptacle or the insert portion.

In a further preferred aspect, the bearing adapted to mate with the at least one latch element comprises at least one undercutting circumferentially extending in the groove. The undercutting is designed and configured to cooperate with a spreading piece or barb of the latch element extending in circumferential direction.

It is of further benefit, when according to another embodiment side wall sections of the insert portion and/or of the receptacle portion comprise a substantially closed surface structure, which is substantially free of through openings or comparative structurally weakened areas. This way, side wall sections of insert portion and receptacle portion of body and cartridge holder can be structurally strengthened, such that they become less prone to fracture in response to mechanical impact or shock.

In a further aspect, the interconnection to be established between cartridge holder and body is of non-releasable type. Hence, once an interconnection has been established, a non-destructive release of said housing component is neither intended nor possible. Upon consumption of the medicament provided in a cartridge, the drug delivery device is intended to be discarded in its entirety.

According to another preferred aspect, the drug delivery device is equipped with a pre-filled cartridge arranged in the cartridge holder. The cartridge is at least partially filled with an injectable medicament. Also, the drug delivery device is further equipped with a drive mechanism arranged in the body, ready to exert distally directed thrust to the cartridge's piston for the purpose of precisely expelling a predefined dose or amount of the medicament.

The term „medicament", as used herein, means a pharmaceutical formulation containing at least one pharmaceutically active compound,

wherein in one embodiment the pharmaceutically active compound has a molecular weight up to 1500 Da and/or is a peptide, a proteine, a polysaccharide, a vaccine, a DNA, a RNA, a antibody, an enzyme, an antibody, a hormone or an oligonucleotide, or a mixture of the above-mentioned pharmaceutically active compound,

wherein in a further embodiment the pharmaceutically active compound is useful for the treatment and/or prophylaxis of diabetes mellitus or complications associated with diabetes mellitus such as diabetic retinopathy, thromboembolism disorders such as deep vein or pulmonary thromboembolism, acute coronary syndrome (ACS), angina, myocardial infarction, cancer, macular degeneration, inflammation, hay fever, atherosclerosis and/or rheumatoid arthritis,

wherein in a further embodiment the pharmaceutically active compound comprises at least one peptide for the treatment and/or prophylaxis of diabetes mellitus or complications associated with diabetes mellitus such as diabetic retinopathy,

wherein in a further embodiment the pharmaceutically active compound comprises at least one human insulin or a human insulin analogue or derivative, glucagon-like peptide (GLP-1) or an analogue or derivative thereof, or exedin-3 or exedin-4 or an analogue or derivative of exedin-3 or exedin-4.

Insulin analogues are for example Gly(A21), Arg(B31), Arg(B32) human insulin; Lys(B3), Glu(B29) human insulin; Lys(B28), Pro(B29) human insulin; Asp(B28) human insulin; human insulin, wherein proline in position B28 is replaced by Asp, Lys, Leu, Val or Ala and wherein in position B29 Lys may be replaced by Pro; Ala(B26) human insulin; Des(B28-B30) human insulin; Des(B27) human insulin and Des(B30) human insulin.

Insulin derivates are for example B29-N-myristoyl-des(B30) human insulin; B29-N-palmitoyl-des(B30) human insulin; B29-N-myristoyl human insulin; B29-N-palmitoyl human insulin; B28-N-myristoyl LysB28ProB29 human insulin; B28-N-palmitoyl-LysB28ProB29 human insulin; B30-N-myristoyl-ThrB29LysB30 human insulin; B30-N-palmitoyl- ThrB29LysB30 human insulin; B29-N-(N-palmitoyl-Y-glutamyl)-des(B30) human insulin; B29-N-(N-lithocholyl-Y-glutamyl)-des(B30) human insulin; B29-N-(ω-carboxyheptadecanoyl)-des(B30) human insulin and B29-N-(ω-carboxyheptadecanoyl) human insulin.

Exendin-4 for example means Exendin-4(1-39), a peptide of the sequence H-His-Gly-Glu-Gly-Thr-Phe-Thr-Ser-Asp-Leu-Ser-Lys-Gln-Met-Glu-Glu-Glu-Ala-Val-Arg-Leu-Phe-Ile-Glu-Trp-Leu-Lys-Asn-Gly-Gly-Pro-Ser-Ser-Gly-Ala-Pro-Pro-Pro-Ser-NH2.

Exendin-4 derivatives are for example selected from the following list of compounds:

H-(Lys)4-des Pro36, des Pro37 Exendin-4(1-39)-NH2,
H-(Lys)5-des Pro36, des Pro37 Exendin-4(1-39)-NH2,
des Pro36 [Asp28] Exendin-4(1-39),
des Pro36 [IsoAsp28] Exendin-4(1-39),

des Pro36 [Met(O)14, Asp28] Exendin-4(1-39),
des Pro36 [Met(O)14, IsoAsp28] Exendin-4(1-39),
des Pro36 [Trp(O2)25, Asp28] Exendin-4(1-39),
des Pro36 [Trp(O2)25, IsoAsp28] Exendin-4(1-39),
des Pro36 [Met(O)14 Trp(O2)25, Asp28] Exendin-4(1-39),
des Pro36 [Met(O)14 Trp(O2)25, IsoAsp28] Exendin-4(1-39); or

des Pro36 [Asp28] Exendin-4(1-39),
des Pro36 [IsoAsp28] Exendin-4(1-39),
des Pro36 [Met(O)14, Asp28] Exendin-4(1-39),
des Pro36 [Met(O)14, IsoAsp28] Exendin-4(1-39),
des Pro36 [Trp(O2)25, Asp28] Exendin-4(1-39),
des Pro36 [Trp(O2)25, IsoAsp28] Exendin-4(1-39),
des Pro36 [Met(O)14 Trp(O2)25, Asp28] Exendin-4(1-39),
des Pro36 [Met(O)14 Trp(O2)25, IsoAsp28] Exendin-4(1-39),
wherein the group -Lys6-NH2 may be bound to the C-terminus of the Exendin-4 derivative;

or an Exendin-4 derivative of the sequence
H-(Lys)6-des Pro36 [Asp28] Exendin-4(1-39)-Lys6-NH2,
des Asp28 Pro36, Pro37, Pro38Exendin-4(1-39)-NH2,
H-(Lys)6-des Pro36, Pro38 [Asp28] Exendin-4(1-39)-NH2,
H-Asn-(Glu)5des Pro36, Pro37, Pro38 [Asp28] Exendin-4(1-39)-NH2,
des Pro36, Pro37, Pro38 [Asp28] Exendin-4(1-39)-(Lys)6-NH2,
H-(Lys)6-des Pro36, Pro37, Pro38 [Asp28] Exendin-4(1-39)-(Lys)6-NH2,
H-Asn-(Glu)5-des Pro36, Pro37, Pro38 [Asp28] Exendin-4(1-39)-(Lys)6-NH2,
H-(Lys)6-des Pro36 [Trp(O2)25, Asp28] Exendin-4(1-39)-Lys6-NH2,
H-des Asp28 Pro36, Pro37, Pro38 [Trp(O2)25] Exendin-4(1-39)-NH2,
H-(Lys)6-des Pro36, Pro37, Pro38 [Trp(O2)25, Asp28] Exendin-4(1-39)-NH2,
H-Asn-(Glu)5-des Pro36, Pro37, Pro38 [Trp(O2)25, Asp28] Exendin-4(1-39)-NH2,
des Pro36, Pro37, Pro38 [Trp(O2)25, Asp28] Exendin-4(1-39)-(Lys)6-NH2,
H-(Lys)6-des Pro36, Pro37, Pro38 [Trp(O2)25, Asp28] Exendin-4(1-39)-(Lys)6-NH2,

H-Asn-(Glu)5-des Pro36, Pro37, Pro38 [Trp(O2)25, Asp28] Exendin-4(1-39)-(Lys)6-NH2,
H-(Lys)6-des Pro36 [Met(O)14, Asp28] Exendin-4(1-39)-Lys6-NH2,
des Met(O)14 Asp28 Pro36, Pro37, Pro38 Exendin-4(1-39)-NH2,
H-(Lys)6-desPro36, Pro37, Pro38 [Met(O)14, Asp28] Exendin-4(1-39)-NH2,
H-Asn-(Glu)5-des Pro36, Pro37, Pro38 [Met(O)14, Asp28] Exendin-4(1-39)-NH2,
des Pro36, Pro37, Pro38 [Met(O)14, Asp28] Exendin-4(1-39)-(Lys)6-NH2,
H-(Lys)6-des Pro36, Pro37, Pro38 [Met(O)14, Asp28] Exendin-4(1-39)-(Lys)6-NH2,
H-Asn-(Glu)5 des Pro36, Pro37, Pro38 [Met(O)14, Asp28] Exendin-4(1-39)-(Lys)6-NH2,
H-Lys6-des Pro36 [Met(O)14, Trp(O2)25, Asp28] Exendin-4(1-39)-Lys6-NH2,
H-des Asp28 Pro36, Pro37, Pro38 [Met(O)14, Trp(O2)25] Exendin-4(1-39)-NH2,
H-(Lys)6-des Pro36, Pro37, Pro38 [Met(O)14, Asp28] Exendin-4(1-39)-NH2,
H-Asn-(Glu)5-des Pro36, Pro37, Pro38 [Met(O)14, Trp(O2)25, Asp28] Exendin-4(1-39)-NH2,
des Pro36, Pro37, Pro38 [Met(O)14, Trp(O2)25, Asp28] Exendin-4(1-39)-(Lys)6-NH2,
H-(Lys)6-des Pro36, Pro37, Pro38 [Met(O)14, Trp(O2)25, Asp28] Exendin-4(S1-39)-(Lys)6-NH2,
H-Asn-(Glu)5-des Pro36, Pro37, Pro38 [Met(O)14, Trp(O2)25, Asp28] Exendin-4(1-39)-(Lys)6-NH2;

or a pharmaceutically acceptable salt or solvate of any one of the afore-mentioned Exedin-4 derivative.

Hormones are for example hypophysis hormones or hypothalamus hormones or regulatory active peptides and their antagonists as listed in Rote Liste, ed. 2008, Chapter 50, such as Gonadotropine (Follitropin, Lutropin, Choriongonadotropin, Menotropin), Somatropine (Somatropin), Desmopressin, Terlipressin, Gonadorelin, Triptorelin, Leuprorelin, Buserelin, Nafarelin, Goserelin.

A polysaccharide is for example a glucosaminoglycane, a hyaluronic acid, a heparin, a low molecular weight heparin or an ultra low molecular weight heparin or a derivative thereof, or a sulphated, e.g. a poly-sulphated form of the above-mentioned

polysaccharides, and/or a pharmaceutically acceptable salt thereof. An example of a pharmaceutically acceptable salt of a poly-sulphated low molecular weight heparin is enoxaparin sodium.

Pharmaceutically acceptable salts are for example acid addition salts and basic salts. Acid addition salts are e.g. HCl or HBr salts. Basic salts are e.g. salts having a cation selected from alkali or alkaline, e.g. Na+, or K+, or Ca2+, or an ammonium ion N+(R1)(R2)(R3)(R4), wherein R1 to R4 independently of each other mean: hydrogen, an optionally substituted C1-C6-alkyl group, an optionally substituted C2-C6-alkenyl group, an optionally substituted C6-C10-aryl group, or an optionally substituted C6-C10-heteroaryl group. Further examples of pharmaceutically acceptable salts are described in "Remington's Pharmaceutical Sciences" 17. ed. Alfonso R. Gennaro (Ed.), Mark Publishing Company, Easton, Pa., U.S.A., 1985 and in Encyclopedia of Pharmaceutical Technology.

Pharmaceutically acceptable solvates are for example hydrates.

It will be further apparent to those skilled in the pertinent art that various modifications and variations can be made to the present invention without departing from the spirit and scope of the invention. Further, it is to be noted, that any reference signs used in the appended claims are not to be construed as limiting the scope of the present invention.

Brief Description of the Drawings

In the following, preferred embodiments of the invention will be described by making reference to the drawings, in which:

Figure 1 schematically illustrates a drug delivery device according to the prior art in an exploded view,

Figure 2 separately illustrates a cartridge holder shown in Figure 1, and

Figure 3 schematically depicts a cross section through the body component according to Figure 1,

Figure 4 is illustrative of the interconnection of body and cartridge holder according to a first embodiment of the invention,

Figure 5 schematically shows an alternative design for a latch element,

Figure 6 schematically depicts a latch element integrated in a longitudinal rib of the cartridge holder, and

Figure 7 schematically shows a positive interlock attainable by way of a latch element according to Figure 6.

Detailed Description

In Figure 4, a receptacle portion 51 of a body housing component 50 is illustrated, which is adapted to receive a correspondingly shaped insert portion 66 of a cartridge holder 60. In contrast to the embodiment as illustrated in Figures 1 to 3, the side wall sections 52, 65 of body 50 and cartridge holder 60 substantially comprise an entirely closed surface structure, which is free of radial through openings.

The latch mechanism 59 attainable by the embodiment as illustrated in Figure 4 is based on arrow-like latch elements 68 extending in longitudinal direction (z) from a proximal end of the insert portion 66. The body 50 comprises a tubular or cylindrically shaped side wall 52 having a bearing 54 extending in a lateral plane (x, y). The bearing 54, which also serves as a lateral web is integrally formed with the lateral side wall 52 of the body 50 and comprises at least one axial through opening 58 which is adapted to receive and to mate with the longitudinally extending latch elements 68 of the insert portion 66.

The latch elements 68 as illustrated in Figure 4 comprise two oppositely and circumferentially extending spreading pieces or barbs 70 that may squeeze or circumferentially deform when urged through the through openings 58 of the bearing 54. Resilient or elastic deformation of the barbs 70 can be supported by a longitudinal slit 72 extending between the circumferentially extending spreading pieces 70.

Position and circumferential distribution of the latch elements 68 corresponds with the circumferential size and position of the axial through openings 58 of the bearing 54. The bearing 54 as further illustrated in Figure 4 also comprises a central and threaded through opening 56, that serves to axially guide a piston rod of a drive mechanism being not further illustrated here.

The latch elements 68 as shown in Fig. 4 extend in longitudinal direction (z) as well as in circumferential direction (w). They are particularly adapted to resiliently or elastically deform in circumferential direction (w) in order to establish a positive interlock with the bearing 54. This way, a mutual interconnection of body 50 and cartridge holder 60 can be attained on the basis of a positive snap-in solution without the necessity to provide through openings or other structurally weakened portions in the side wall sections 52, 65 of receptacle portion 51 and insert portion 66.

Typically, the longitudinal extension of the insert portion 66 substantially matches with the longitudinal extension of the receptacle portion 51. When a final assembly configuration of the drug delivery device is attained, cartridge holder 60 and body 50 not only abut in radial direction but also in longitudinal direction (z). It is intended, that a distal and lower end face of the body abuts 50 in longitudinal direction with a radially extending circumferential rim 64 of the cartridge holder 60. Correspondingly, also a proximally located end face of the insert portion 66 may but against the transverse or laterally extending bearing 54 in final assembly configuration. The circumferential rim 64 further separates a distal and

substantially tubular shaped portion 62 of the cartridge holder 12 and the insert portion 66.

Figure 5 shows an alternative embodiment of a latch element 74 comprising a somewhat arrow-like shape and having two bevelled barbs 78 at the free end of an elongated socket portion 76. The barbs 78 are intended to mate and to abut with the proximally located surface of the bearing 54 as illustrated in Figure 4.

The embodiment according to Figures 6 and 7 is illustrative of another snap-in configuration. Here, the insert portion 66 of the cartridge holder 60 comprises substantially longitudinally extending ribs or tongues 80 with circumferentially extending latch elements 82 comprising circumferentially extending barbs 84 that mate with correspondingly shaped recesses 88 of a longitudinal groove 86 provided in the inside facing side wall section 52 of the receptacle 51 of the body component 50.

Here, it is of further benefit, when the circumferentially protruding barbs or spreading pieces 84 comprise a sufficient elasticity that allows to urge the latch elements 82 through the groove 86 in longitudinal direction (z) until a final assembly configuration as illustrated in Figure 7 is reached. The recess 88 which is adapted to accommodate a relaxed latch element 82 comprises an undercutting 90 substantially extending in the lateral plane (z, w). However, also other embodiments are conceivable, wherein the undercutting 90 and the circumferentially protruding barbs comprise mutually corresponding abutment faces extending at an angle, substantially smaller than 90° with respect to the direction of assembly (z).

The embodiment according to Figures 6 and 7 can be arbitrarily combined with the embodiment according to Figure 4 and may therefore provide an additional fixation of cartridge holder 60 and body 50 of a drug delivery device, e.g. of pen-injector type.

List of Reference Numerals

10	drug delivery device
12	cartridge holder
14	body
16	threaded socket
18	needle assembly
20	needle holder socket
22	injection needle
24	inspection window
26	insert portion
28	through opening
30	rim
32	receptacle
34	prong
36	bevelled surface
38	end face
50	body
51	receptacle portion
52	side wall
54	bearing
56	through opening
58	through opening
59	interconnection
60	cartridge holder
62	distal portion
64	rim
65	side wall
66	insert portion
68	latch element
70	barb
72	slit

74 latch element
76 socket
78 barb
80 rip
82 latch element
84 barb
86 groove
88 receptacle
90 undercutting

Claims

1. A drug delivery device for administering a predefined dose of a medicament comprising a housing having:

- a body (14) to accommodate a drive mechanism,

- a cartridge holder (12) to accommodate a cartridge having a piston slidably disposed therein in an axial direction (z),

- an interconnection (59) between cartridge holder (12) and body (14), said interconnection having at least one displaceable or resiliently deformable latch element (68; 74; 82) to mate with a corresponding bearing (54), wherein the latch element (68; 74; 82) is displaceable or deformable in a direction (z, w) extending substantially parallel to a circumferential side wall (52, 65) of the body (14) or cartridge holder (12), wherein cartridge holder (12) and body (14) comprise an insert portion (66) and a corresponding receptacle portion (51) for establishing an at least partially interleaved interconnection of cartridge holder (12) and body (14), characterized in that

- the receptacle portion (51) comprises the at least one bearing (54) extending in a lateral plane (x, y) with respect to a tubular shape of cartridge holder (12) and/or body (14), and wherein

- the bearing (54) comprises at least one axial through opening (58) to receive the latch element (68; 74; 82).

2. The drug delivery device according to claim 1, wherein the cartridge holder (12) comprises the insert portion (66) to be inserted into the receptacle portion (51) of the body (14), or vice versa.

3. The drug delivery device according to claims 1 or 2, wherein the insert portion (66) comprises the at least one latch element (68; 74; 82) extending in

longitudinal direction (z) and having at least one resiliently deformable spreading piece (70; 78; 84) extending in circumferential direction (w).

4. The drug delivery device according to any one of the preceding claims , wherein the bearing (54) adjacently extends to an inside facing side wall section (52) of the receptacle portion (51) and comprises a central through opening (56) to axially guide a piston rod of the drive mechanism.

5. The drug delivery device according to any one of the preceding claims, wherein side wall sections (52, 65) of the insert portion (66) and/or of the receptacle portion (51) comprise a closed surface structure, free of through openings.

6. The drug delivery device according to any one of the preceding claims, wherein the interconnection (59) is of non-releasable type.

7. The drug delivery device according to any one of the preceding claims, further comprising a cartridge filled with a medicament disposed in the cartridge holder (12).