Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).
Description

TECHNICAL FIELD

[0001] The present invention relates to a medicament dispenser and more particularly, the present invention relates to a structure for dispensing a medicament where the structure has a mechanical coupling member to substantially reduce jamming of the components normally attributable to such devices.

BACKGROUND OF THE INVENTION

[0002] Single use single dose medicament delivery devices are widely known and are generally used to dispense medicaments such as epinephrine in an urgent manner to a user, the so called "epi pen" is a typical example of such arrangements. One of the significant disadvantages inherent with these devices relates to jamming. The existing devices often employ spring configurations for movement of key parts such as the needle as well as the barrel which assists in delivery of the medicament to the needle. In the scenario where a jam has occurred, the result can be fatal if the user cannot repair the device to function properly. In some instances, repair is impossible given urgent time constraints and the user is forced to dismantle or destroy the structure in order to gain access to the medication.

[0003] The above is possible where the user is not a child or a user otherwise not capable of achieving access. To address the limitations in the art, a variety of solutions have been advanced in the art. An example is provided in United States Patent No. 6,808,507, issued October 26, 2004, to Roser. In the arrangement discussed in this patent, a telescopic member is provided and a spring surrounds the needle. The arrangement is useful, however there is still a possibility that the spring could be defective or otherwise fail, thus complicating delivery.

[0004] Botich et al, in United States Patent No. 6,039,713, issued March 21, 2000, teach a pre-filled retractable needle device. The device, as is common with most arrangements, includes reciprocating body members, springs, etc. In this instance the device has a number of movable parts which elevates the possibility for jamming or failure.

[0005] United States Patent No. 6,846,301, issued to Smith et al., June 25, 2005, teach a disposable safety syringe with a vacuum system to withdraw the needle into the body after use. There is no provision for a mechanical linkage for quick delivery of the medicament.

[0006] A further prior art automatic injection device is known from EP 1 932 558 A1.

[0007] The existing arrangements do not guard against accidental discharge of the medicament if accidentally triggered by contact with a firm surface.

[0008] Given the extent of development in the prior art, there exists a need for an improved medicament dispenser which is efficient and reliable while maintaining a lower profile than those devices currently available.

[0009] The present invention provides a significantly improved arrangement which is devoid of the structural limitations inherent with the prior art.

INDUSTRIAL APPLICABILITY

[0010] The technology set forth herein has utility in the medical arts inter alia.

DESCRIPTION OF THE INVENTION

[0011] One object of one embodiment of the present invention is to provide an improved medicament dispensing device. One object of another embodiment of the present invention is to provide an automatic injection device for dispensing a medicament, the device having a needle connected to a barrel adapted to retain medicament and a plunger within the barrel, characterized in that the device comprises:

- a first body member and a second body member coaxially mounted for reciprocal movement, and housing the needle, the barrel and the plunger;
- drive means connected between the first body member and the second body member for effecting the reciprocal movement; and
- coupling means on each of the first body member and the second body member coupled with the drive means, whereby upon reciprocal movement of the first body member and the second body member, the needle is exposed and the plunger is moved within the barrel for discharging the medicament.

[0012] In accordance with another not claimed example, there is provided a method for dispensing a medicament from a device having a needle, connected to a barrel adapted to retain medicament and a plunger within the barrel, the device having a first body member and a second body member mounted thereon for reciprocal movement comprising the steps of:

- providing a cover means for covering a tip of the needle;
- positioning the device in contact adjacent a user's skin;
- urging the device against the user to expose, in a first stage, the needle through the cover means; and
- urging, in a second stage, the device against the user to reciprocally move the cover means and the plunger where the needle penetrates a user's skin and the medicament is forced through the barrel and the needle to deliver the medicament to the user.
[0014] Having thus generally described the invention, reference will now be made to the accompanying drawings, illustrating preferred embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] Figure 1 is an exploded view of the arrangement according to one embodiment of the present invention;

Figure 2 is a cross section of Figure 1 with the arrangement shown in the ready to use state;

Figures 3 through 6 are cross sections of the device sequentially illustrating the component positions as the device is advance through a pre-use position through to use and withdrawal;

Figure 7 is a cross section of an alternate embodiment;

Figure 8 is a perspective view of yet another embodiment;

Figure 9 is a perspective view of a further alternate embodiment of the present invention;

Figure 10 is an exploded view of the device shown in Figure 9;

Figure 11 is a longitudinal cross section of the device before use;

Figure 12 is a longitudinal cross section of the device in a use position; and

Figure 13 is a longitudinal cross section of the device in a post use position.

[0016] Similar numerals used in the drawings denote similar elements.

BEST MODE FOR CARRYING OUT THE INVENTION

[0017] Referring now to the drawings, Figure 1, illustrates one embodiment of the present invention. The overall arrangement is denoted by numeral 10. The arrangement provides an exterior body, shown in the example in two sections 12 and 14. Section 12 provides an opening 16 to allow a user visibility of the interior to determine that the device has been discharged. This will be discussed in greater detail herein after.

[0018] Turning to the major components of the device, a second body member 18 is configured for reception and slideable movement with the exterior body supra. Member 18 has a mounting 20 with, as shown in the example, projections 22 configured for fixed location in seating 24 in body members 12 and 14. A drive member 26 is rotatably connected to mounting 20 and at one end thereof has a pivotally connected use indicator member 28 at pivot point 30 for indicating when the unit is used. The opposite end of member 26 pivotally connects coupling member 32 at pivot point 34. Member 32, at the opposite end thereof, has a pivot connection 36. The connection at 36 is with a barrel plunger 38 received within barrel 40. Barrel 40 terminates in needle hilt 42 which, in turn, receives needle 44. As is illustrated, the barrel 40 retains a predetermined amount of medicament forwardly of plunger 38.

[0019] In order to provide protection and sterility to the device 10, the same includes a cover 46. The same is configured to always extend outwardly sufficiently to completely cover the tip of the needle. In this manner, springs 48 or other resilient means urge cover member 50 outwardly of a terminal end 52 of body 18. The cover member 50 also provides a foam cap 54 or other resilient material which protects the tip of the needle 44. This also assists in preventing spillage from the tip. As a further precaution and for adding durability and aesthetic appeal, a secondary cap 56 is frictionally retained by body members 12 and 14 at perimeter lip 58.

[0020] In order to bias the needle 44 in the position shown in Figure 2, the storage or standby position, springs 60 are provided extending between mount 20 and spring retainers 62. Figure 1 illustrates the springs in a compressed state.

[0021] With reference to Figures 3 through 6, shown are the various dispositions of the elements from a pre-injection position (Figure 1) to a post injection position (Figure 6).

[0022] Figure 3 depicts the position of the elements in a relaxed, pre-injection state where the cover 50 is spaced from the user, U. In Figure 4, first stage contact is made with the user, U. The cover 50 is forced backwardly toward terminal end 52, the springs 48 are compressed and the needle tip penetrates the foam cap 54 through to the skin of the user, U. In order to administer the medicament, the body formed by members 12 and 14 is urged forward to the position shown in Figure 5. This movement results in the pivotal movement of coupling 32 by the motion of drive member 26. The coupling member 32 movement, in turn, by the pivotal connection urges plunger 38 forward to discharge the medicament contained within barrel 40.

[0023] As will be realized from a review of Figures 4 and 5, once injection has been completed, indicator 28 extends rearwardly within the body to be visible within opening 16. This is indicative that the unit is used.

[0024] Figure 6 illustrates the disposition of the components subsequent to an injection.

[0025] Turning now to Figure 7, shown is a longitudinal cross section of an alternate embodiment of the device. In this embodiment, the drive member is a toothed pinion 60, rotatably mounted to mount 20. Cooperating with pinion 60 is a pair of opposed toothed racks 62 and 64. Pinion
60 is received by racks 62 and 64 in the same manner as a rack and pinion system used in an abundance of mechanical systems. In the embodiment shown, rack 62 is integral with body member 18, while rack 64 is integral with plunger 38. Relative movement between the first body member and the second is the same as that discussed supra with respect to the first embodiment. As is evinced in the Figure, rack 62 is disposed in advance of rack 64. This staggered relationship allows for free movement of the outer body (members 12 and 14) to advance plunger 38.

[0026] Figure 8 illustrates an embodiment of the device where an aperture 66 within the body is adapted to receive an elongate length 68, such as a lanyard, a hook 70, a clasp 72 a ring 74, etc. to allow for easier portability.

[0027] Referring now to Figure 9, shown is a further embodiment of the present invention in an assembled state. The embodiment shown is generally similar to the embodiment that has been previously discussed, with this arrangement further including a top grip member 74 which, in the example, comprises a rubber material with a plurality of raised sections 76, which raised section 76 are in spaced relation to provide, for example, a thumb rest for actuating the device. The material of which the top grip 74 may be made can include any material suitable for this purpose and may simply comprise the material of which the body members 12 and 14 are composed. In order to complement the use of the article, body 14 includes concavities 78, which concavities are useful to assist a user (not shown) in holding the device 10.

[0028] Turning to Figure 10, shown is an exploded view of the device shown generally in Figure 9. Reference will be made to Figures 10 through 13 for the following description. In this embodiment, each of the body members 12 and 14 includes a threaded section 80 and 82, respectively. This is for purposes of engaging cap 56 which, in this embodiment is threaded (not shown) for purposes of engaging the threads 80 and 82. The cap 56 is of the variety that it is removable for a single use only. Such caps are known in the art. As a further security feature, the cap may include a breakaway seal 84 which typically takes the form of a ring attached to the body of the cap 56 by disengageable or breakaway connectors as is well known in the art.

[0029] As has been indicated previously, body members 12 and 14 are referred to collectively as a first body member, whereas the second body member 18, in this embodiment, includes a needle cover 88, which needle cover 88 substantially surrounds the entire needle and tip. At the terminal end of the needle 44 there is provided a foam cap 54 which accommodates the tip of the needle 44 which also cooperates with a cover member 88 to effectively surround and close the needle 44. This is obviously contributory to the hygiene and sterility of the device. Disposed coaxially about needle 44 and within the internal volume of cover there is disposed a spring 90 which is positioned between the needle cover 88 of member 86 and seating 92 within second body member 18 as shown. This retains the spring 90 until the device 10 is tended for use.

[0030] As is evident from Figures 10 through 13, the first body member formed by sub members 12 and 14 and the second body member 18 house the major components of the device and specifically, the plunger 38, barrel 40, needle hilt 42 and needle 44. As with the previous embodiments, second body member 18 includes the toothed rack coupling means 63, whereas the plunger 38 and more particularly, the arm of the plunger includes the second toothed rack coupling means 64. As with the previous embodiments, pinion 61 acts as a drive member which connects both of the racks 63 and 64. In this embodiment, observation window 94 is provided in the structure and visible through connected body members 12 and 14 to allow the user to determine whether barrel 40 contains any medicament and whether the medicament has been compromised.

[0031] This has been noted with respect to the previously described embodiments, in the embodiment shown in Figures 9 through 13, body members 12, 14 and second body member 18 are coaxially mounted and designed for reciprocal movement. As a particularly and beneficial advantage, in the embodiment shown in Figures 9 through 13 second body member 18, in opposition to the front cap 88 includes a terminal wall 100. As best seen in Figure 11, terminal wall 100 is spaced from wall 102, which is formed by the connection of body members 12 and 14. This space permits movement of the body member 18 relative to assembled members 12 and 14 sufficiently to allow the needle 44 to penetrate cover 88 and pierce foam cap 54 and the user’s skin before injection. This avoids spillage and allows accurate injection of the medicament without wastage and allows for intra-muscular injections.

[0032] As a further attendant advantage, the embodiment under discussion also provides for a locking mechanism 104, shown in the example as a leaf spring and best shown in Figures 10 and 13. Spring 104, when the device is in a ready to use position is compressed by disposition of body members 12, 14 and 18 as illustrated in Figure 11.

[0033] Turning to Figure 12, the device 10 is shown in an injection position where the needle 44 has penetrated the foam cap 54 and end cap 88 and where second body member 18 is retracted within the first body member composed of members 12 and 14. As is evident, the spring 90 is compressed, with the plunger 38 moved forwardly within the barrel 40 and with the rack 64 moved forwardly relative to the position showing Figure 11. In a similar manner, rack 62 is moved rearwardly as shown in Figure 12. The locking member 104, is now compressed inside the gear rack 62 as shown in Figure 12.

[0034] Turning now to Figure 13, shown is a longitudinal cross-section of the device 10 subsequent to injection of the medicament. As is obvious from the illustration, once body member 18 is returned to the extended position with spring 90 relaxed, lock member 104 has nothing
further to maintain a compressed state and therefore springs upwardly in a diagonal pattern as shown in Figure 13, with the terminal end of 106 of spring 104 engaging the under surface of body member 14. This arrangement effectively locks retractable movement of body member 18 into the first body member 12, 14 whereby the device 10 cannot be reused. This is simply prevented by the lock arrangement 104. Further, as illustrated in Figure 13, the second body member 18 fully extends to provide the cap 54 and end cap 88 to completely encapsulate and extend over the tip of needle 44 so that there is no possibility of inadvertent contact of the used needle with a user. As further benefit, as noted above with respect to the previous embodiments the opening 16 in body member 12 allows the user to determine whether the device has been discharged. A similar structure to that noted herein previously is provided for this benefit.

Other features of the device include:

- the drive means may comprise an indirect drive;
- the drive member is rotatably mounted to a support fixedly secured within the second body member;
- the coupling means is connected to the drive member for pivotal motion relative thereto;
- the coupling means is connected to the barrel for pivotal motion relative thereto;
- rotatable drive member includes stop means for limiting the movement between the first body member and the second body member;
- device is a single use and single dose device;
- the device includes indicator means for indicating when the device is discharged of the medicament;
- the barrel and the first body member are mounted for coaxial movement in the same direction;
- coupling means for coupling the rotatable drive member with the plunger and the second body member;
- a one time removable cap on the cover;
- a break away security seal on the cap;
- cover means for covering a tip portion of the needle;
- a cap for releasable positioning over the cover means;
- a retraction means for retracting the needle into the second body member subsequent to use;
- springs mounted on the first body member as the retraction means;
- springs for the cover means for urging the cover means back after use to cover the tip portion of the needle;
- a section to allow for visibility of the indicator means;
- and the first body member includes an aperture for receiving a member selected from the group consisting of an elongate length, a hook, a clasp and a ring.

Claims

1. An automatic injection device (10) for dispensing a medicament, said device having a needle (44) connected to a barrel (40) adapted to retain medicament and a plunger (38) within said barrel, a first body member (12, 14) and a second body member (18) coaxially mounted for reciprocal movement, and housing said needle (44), said barrel (40) and said plunger (38); characterized in that said device comprises:

- drive means (26) connected between said first body member (12, 14) and said second body member (18) for effecting said reciprocal movement between said first body member and said second body member; and coupling means (32) on each of said first body member (12, 14) and said second body member (18) coupled with said drive means (26), whereby upon reciprocal movement of said first body member (12, 14) and said second body member (18), said needle (44) is exposed and said plunger (38) is moved within said barrel (40) for discharging said medicament.

2. The automatic injection device as set forth in claim 1, wherein said drive means (26) is a direct drive means or an indirect drive means.

3. The automatic injection device as set forth in claim 1, wherein said coupling means (32) comprises a toothed rack (62, 64).

4. The automatic injection device as set forth in claim 1, wherein said drive means comprises a pinion (60).

5. The automatic injection device as set forth in any preceding claim, wherein said second body member (18) includes a needle cover (88) for surrounding and covering said needle (44).

6. The automatic injection device as set forth in any
preceding claim, wherein said needle (44) is retractable in an opposed direction of movement relative to a direction of movement of said plunger (38).

7. The automatic injection device as set forth in any preceding claim, wherein said barrel (40), said plunger (38) and said needle (44) are removable from said device for replacement.

8. The automatic injection device as set forth in any preceding claim, wherein said device includes lock means (104) for preventing reuse of a used injection device.

Patentansprüche

1. Eine automatische Injektions-Vorrichtung (10) zur Verabreichung eines Medikamentes, wobei die Vorrichtung eine Nadel (44), die mit einem Zylinder (40) verbunden ist, der zur Aufnahme eines Medikamentes ausgebildet ist, und einen Kolben (38) in dem Zylinder aufweist, mit einem ersten Hauptteil (12, 14) und einem zweiten Hauptteil (18), die koaxial für eine gegenseitige Bewegung befestigt sind und ein Gehäuse für die Nadel (44), den Zylinder (40) und den Kolben (38) bilden; dadurch gekennzeichnet, dass die Vorrichtung weiterhin eine Antriebseinrichtung (26), die zwischen dem ersten Hauptteil (12, 14) und dem zweiten Hauptteil (18) angeordnet ist, um die gegenseitige Bewegung zwischen dem ersten Hauptteil und dem zweiten Hauptteil zu bewirken; und eine Kupplungseinrichtung (32) auf jedem von dem ersten Hauptteil (12, 14) und dem zweiten Hauptteil (18) umfasst, die mit den Antriebseinrichtungen (26) verbunden ist, wodurch bei einer gegenseitigen Bewegung des ersten Hauptteils (12, 14) und des zweiten Hauptteils (18) die Nadel (44) freigesetzt und der Kolben (38) in dem Zylinder (40) zur Abgabe des Medikamentes bewegt wird.

2. Die automatische Injektions-Vorrichtung nach Anspruch 1, bei der die Antriebseinrichtung (26) eine direkte Antriebseinrichtung oder eine indirekte Antriebseinrichtung ist.

3. Die automatische Injektions-Vorrichtung nach Anspruch 1, bei der die Kupplungseinrichtung (32) eine Zahnstange (62, 64) umfasst.

4. Die automatische Injektions-Vorrichtung nach Anspruch 1, bei der die Antriebseinrichtung ein Ritzel (60) umfasst.

5. Die automatische Injektions-Vorrichtung nach ei- nem der vorhergehenden Ansprüche, bei der der zweite Hauptteil (18) eine Nadel-Abdeckung (88) zum Umgeben und Abdecken der Nadel (44) einschließt.

6. Die automatische Injektions-Vorrichtung nach einem der vorhergehenden Ansprüche, bei der die Nadel (44) in einer entgegengesetzten Bewegungsrichtung gegenüber der Bewegungsrichtung des Kolbens (38) zurückziehbar ist.

7. Die automatische Injektions-Vorrichtung nach einem der vorhergehenden Ansprüche, bei der der Zylinder (40), der Kolben (38) und die Nadel (44) aus der Vorrichtung für einen Austausch entfernbar sind.

8. Die automatische Injektions-Vorrichtung nach einem der vorhergehenden Ansprüche, bei der die Vorrichtung eine Verriegelungseinrichtung (104) zum Verhindern einer Wiederbenutzung eines benutzten Injektions-Vorrichtung einschließt.

Revendications

1. Dispositif d’injection automatique (10) pour distribuer un médicament, ledit dispositif ayant une aiguille (44) raccordée à un corps cylindrique (40) adapté pour retenir le médicament et un piston plongeur (38) à l’intérieur dudit corps cylindrique, un premier élément de corps (12, 14) et un second élément de corps (18) montés de manière coaxiale pour le mouvement réciproque, et logeant ladite aiguille (44), ledit corps cylindrique (40) et ledit piston plongeur (38) ; caractérisé en ce que ledit dispositif comprend :

   des moyens d’entraînement (26) raccordés entre ledit premier élément de corps (12, 14) et ledit second élément de corps (18) pour effectuer ledit mouvement réciproque entre ledit premier élément de corps et ledit second élément de corps ; et des moyens de couplage (32) sur chacun parmi ledit premier élément de corps (12, 14) et ledit second élément de corps (18) couplé avec lesdits moyens d’entraînement (26), moyennant quoi suite au mouvement réciproque dudit premier élément de corps (12, 14) et dudit second élément de corps (18), ladite aiguille (44) est exposée et ledit piston plongeur (38) est déplacé à l’intérieur dudit corps cylindrique (40) pour décharger ledit médicament.

2. Dispositif d’injection automatique selon la revendication 1, dans lequel lesdits moyens d’entraînement (26) sont des moyens d’entraînement direct ou des moyens d’entraînement indirect.
3. Dispositif d’injection automatique selon la revendication 1, dans lequel lesdits moyens de couplage (32) comprennent une crémaillère (62, 64).

4. Dispositif d’injection automatique selon la revendication 1, dans lequel lesdits moyens d’entraînement comprennent un pignon (60).

5. Dispositif d’injection automatique selon l’une quelconque des revendications précédentes, dans lequel ledit second élément de corps (18) comprend un couvercle d’aiguille (88) pour entourer et recouvrir ladite aiguille (44).

6. Dispositif d’injection automatique selon l’une quelconque des revendications précédentes, dans lequel ladite aiguille (44) est rétractable dans une direction de mouvement opposée par rapport à une direction de mouvement dudit piston plongeur (38).

7. Dispositif d’injection automatique selon l’une quelconque des revendications précédentes, dans lequel ledit corps cylindrique (40), ledit piston plongeur (38) et ladite aiguille (44) sont amovibles dudit dispositif pour le remplacement.

8. Dispositif d’injection automatique selon l’une quelconque des revendications précédentes, dans lequel ledit dispositif comprend des moyens de verrouillage (104) pour empêcher la réutilisation d’un dispositif d’injection usagé.
REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader’s convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 6039713 A, Botich [0004]
- US 6846301 B, Smith [0005]
- EP 1932558 A1 [0006]