Summary

Exemplary embodiments provide a needle shield remover that reliably engages with a distal cap of an automatic injection device and with one or more needle shields coupled to a syringe of the device. An exemplary needle shield remover includes one or more inwardly-projecting shield engagement mechanisms that reliably engage with the needle shields, and one or more cap engagement mechanisms that reliably engage with the distal cap. When a user removes the distal cap, the needle shield remover reliably removes the needle shields (e.g., a soft needle shield and a rigid needle shield) from the syringe, thereby exposing the injection needle for performing an injection. In an exemplary assembly method, an exemplary needle shield remover is engaged to a needle shield coupled to a syringe, prior to insertion of the syringe and needle shield remover assembly into a housing of the automatic injection device. This exemplary assembly method allows visual inspection, outside the housing of the device, to ensure that the needle shield remover is correctly and reliably engaged to the needle shield before the syringe and needle shield remover assembly is inserted into the housing.

According to a first aspect of the present invention, there is provided a needle shield remover for removing a needle shield from a syringe, comprising: a cap having an open end and a closed end with a centrally located aperture, a tubular needle shield remover disposed within the cap for removing a needle shield from the syringe, the tubular needle shield remover having a proximal tubular portion having a first outer diameter and a distal tubular portion having a second outer diameter less than the first outer diameter, a platform structure projecting longitudinally from the distal tubular portion of the tubular needle shield remover along a longitudinal axis toward the aperture, and a cap engagement mechanism projecting radially outwardly from the platform structure to cooperatively engage the tubular needle shield remover with the

cap via the aperture; characterized in that the platform structure allows the cap and the tubular shield remover to move in an axial direction relative to each other.

In accordance with one exemplary embodiment, an apparatus is provided for removing a needle shield from a syringe. The apparatus includes a tubular member for enclosing the needle shield coupled to the syringe. The apparatus also includes one or more cap engagement mechanisms provided at a distal end of the tubular member and configured for engagement with a distal cap provided for covering a distal end of the syringe. The apparatus also includes one or more shield engagement mechanisms provided at a proximal end of the tubular member and configured for engagement with the needle shield. When the apparatus is pulled away from the syringe, the one or more

CLAIMS

1. A needle shield remover for removing a needle shield from a syringe, comprising:

a cap having an open end and a closed end with a centrally located aperture, a tubular needle shield remover disposed within the cap for removing a needle shield from the syringe, the tubular needle shield remover having a proximal tubular portion having a first outer diameter and a distal tubular portion having a second outer diameter less than the first outer diameter,

a platform structure projecting longitudinally from the distal tubular portion of the tubular needle shield remover along a longitudinal axis toward the aperture, and

a cap engagement mechanism projecting radially outwardly from the platform structure to cooperatively engage the tubular needle shield remover with the cap via the aperture; characterized in that the platform structure allows the cap and the tubular shield remover to move in an axial direction relative to each other.

2. The needle shield remover of claim 1, wherein the cap includes an inwardly-projecting stop portion provided in the aperture.

3. The needle shield remover of claim 1, wherein the platform structure defines a gap extending longitudinally between the cap engagement mechanism and the distal tubular portion of the tubular needle shield remover, wherein an inwardly-projecting stop portion of the cap is accommodated in the gap to define one of an upper or lower limit of axial movement between the cap and the tubular needle shield remover.

4. The needle shield remover of claim 1, wherein the cap and the tubular needle shield remover form a single assembly that is pre-assembled before the tubular needle shield remover is engaged with the needle shield.

5. The needle shield remover of claim 1, wherein the cap and the tubular needle shield remover slide in an axial direction relative to each other during attachment to the needle shield.

6. The needle shield remover of claim 1, wherein the cap and the tubular needle shield remover form a single assembly, and the single assembly is engaged to the needle shield after the syringe is loaded into an automatic injection device.

7. The needle shield remover of claim 1, wherein the platform structure includes a first longitudinally projecting portion, a second longitudinally projecting portion and a transverse portion at a distal end of the platform structure extending between the first longitudinally projecting portion and the second longitudinally projecting portion, and wherein the cap engagement mechanism is cooperatively engaged with the transverse portion.

8. The needle shield remover of claim 1, wherein the proximal tubular portion of the tubular needle shield remover includes two needle shield engagement mechanisms engageable with the needle shield of the syringe.

9. The needle shield remover of claim 8, wherein the two needle shield engagement mechanisms project inwardly from a side wall of the proximal tubular portion.

10. The needle shield remover of claim 9, wherein each of the needle shield engagement mechanisms include a first inclined wall that extends from the side wall.

11. The needle shield remover of claim 10, wherein each of the two shield engagement mechanisms comprises a second inclined wall coupled to the first inclined wall and extending inwardly into a cavity of the tubular needle shield remover.

12. The needle shield remover of claim 11, further comprising two apertures disposed in a side wall of the proximal tubular portion of the tubular needle shield remover, and wherein each of the two shield engagement mechanisms is provided in a respective one of the two apertures.

13. The needle shield remover of any of claims 1 to 12, further comprising two cutout portions formed in the side wall of the proximal tubular portion of the tubular needle shield remover and circumferentially disposed in an alternating manner with the two apertures about the tubular needle shield remover.

14. An automatic injection device comprising:

a housing,

a syringe slidably disposed in the housing;

a needle shield covering a needle of the syringe; and

a needle shield remover according to claim 1 removably coupled to the housing and the needle shield.