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 may beis correctly and reliably engaged to the needle shield before the syringe and needle shield remover assembly is inserted into the housing.

In accordance with a first aspect of the present inventionone 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 twoone or more shield engagement mechanisms provided at a proximal end of the tubular member and configured for engagement with the needle shield, the two shield engagement mechanisms configured such that, wWhen the apparatus is pulled away from the syringe, the twoone or more

shield engagement mechanisms exert force against the needle shield to remove the needle shield from the syringe; two apertures disposed in a sidewall of the tubular member, wherein each of the two shield engagement mechanisms is provided in a respective one of the two apertures; and two cutout portions formed in the sidewall of the tubular member and circumferentially disposed in an alternating manner with the two apertures about the tubular member.

In accordance with another a second aspect of the present inventionexemplary ~~embodiment~~, an automatic injection device is provided. The automatic injection device includes a syringe, a needle shield coupled to a distal end of the syringe, and a distal cap for covering the needle shield. The automatic injection device also includes a needle shield remover disposed between the needle shield and the distal cap. The needle shield includes a tubular member for enclosing the needle shield coupled to the syringe, one or more cap engagement mechanisms provided at a distal end of the tubular member and engaged with the distal cap, and twoone or more shield engagement mechanisms provided at a proximal end of the tubular member and engaged with the needle shield, the two shield engagement mechanisms configured such that, ~~w~~When the needle shield remover is pulled away from the syringe, the twoone or more shield engagement mechanisms exert force against the needle shield to remove the needle shield from the syringe, two apertures disposed in a sidewall of the tubular member, wherein each of the two shield engagement mechanisms is provided in a respective one of the two apertures, and two cutout portions formed in the sidewall of the tubular member and circumferentially disposed in an alternating manner with the two apertures about the tubular member.

In accordance with a third aspect of the present invention, there is provided an apparatus for removing a needle shield from a syringe, comprising: a tubular member for enclosing the needle shield coupled to the syringe; 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; two shield engagement mechanisms provided at a proximal end of the tubular member and configured for engagement with the needle shield, the two shield engagement mechanisms configured such that, when the apparatus is pulled away from the syringe, the two shield engagement mechanisms exert force against the needle shield to remove the needle shield from the syringe; and two cutout portions formed in the sidewall of the tubular member and circumferentially disposed in an alternating manner with the two shield engagement mechanisms about the tubular member.

As disclosed~~In accordance with another exemplary embodiment~~, a method is provided for assembling an automatic injection device. The method includes coupling a needle shield to a distal end of a syringe. The method also includes engaging one or more shield engagement mechanisms of a needle shield remover to the needle shield. The method further includes inserting an assembly comprising the syringe, the needle shield and the needle shield remover into a housing of the automatic injection device.

Brief Description to the Drawings

The foregoing and other objects, aspects, features, and advantages of exemplary embodiments will become more apparent and may be better understood by referring to