DRIP CHAMBER WITH INTEGRATED OPTICS

TECHNICAL FIELD

[0001] The present disclosure relates to a rectangular drip chamber for an infusion tube with integrated optics, in particular, lenses integrated onto one or more walls of the drip chamber. The present disclosure relates to an optical imaging system including the rectangular drip chamber for the infusion tube with integrated optics.

BACKGROUND

[0002] It is known to use lenses, separate from a cylindrical drip chamber, as part of an optical imaging system for an infusion tube. Source light and imaging light must pass through the cylindrical wall of the drip chamber when entering and exiting the drip chamber, respectively, greatly complicating the optical design of both the illumination and imaging sub-systems (lenses, image sensors etc.).

SUMMARY

[0003] According to a first aspect, there is provided a drip chamber for an infusion tube, comprising a first end arranged to receive a drip tube; a second end including an exit port; at least one wall connecting the first and second ends; a space enclosed by the first and second ends and the at least one wall; and first and second lenses each directly fixed to said at least one wall.

[0003a] According to a second aspect, there is provided an optical imaging system for use with an infusion device, comprising at least one light source for emitting first light; a drip chamber including at least one wall connecting first and second ends of the drip chamber, a space at least partially enclosed by the at least one wall and the first and second ends, and first and second lenses each fixed to the at least one wall, said first and second lenses each arranged to transmit the first light to the space or receive the first light transmitted through the space; an optics system including at least one image sensor for receiving the first light from said first and second lenses and transmitting data characterizing the first light received from said first and second lenses; and at least one specially programmed processor configured to generate at least one image of the space using the data.

[0003b] According to a third aspect, there is provided a drip chamber for an infusion tube, comprising a first end including a drip tube; a second end including an exit

port; first, second, third, and fourth walls connecting the first and second ends, wherein, in a cross-section orthogonal to a longitudinal axis of the drip tube, the first, second, third, and fourth walls form a rectangle enclosing a space, wherein one of said first, second, third and fourth walls includes a code integral to said one of said first, second, third and fourth walls, the code including information regarding the drip chamber; and first and second lenses each directly fixed to one of said first, second, third and fourth walls.

[0003c] According to a fourth aspect, there is provided a method of forming a drip chamber for an infusion tube, the method comprising forming a first end arranged to receive a drip tube; forming a second end including an exit port; connecting the first and second ends with at least one wall and enclosing a space with the first and second ends and the at least one wall; integrally attaching a code to the at least one wall, the code including information regarding the drip chamber; and directly fixing first and second lenses to the at least one wall.

[0003d] Herein disclosed is a drip chamber for an infusion tube, including: a first end arranged to receive a drip tube; a second end including an exit port; at least one wall connecting the first and second ends; a space enclosed by the first and second ends and the at least one wall; and at least one lens integral to the at least one wall or directly fixed to the at least one wall.

[0004] Also disclosed is an optical imaging system for use with an infusion device, including: at least one light source for emitting first light; a drip chamber including at least one wall connecting first and second ends of the drip chamber and a space at least partially enclosed by the at least one wall and the first and second ends; and at least one lens integral to the at least one wall or directly fixed to the at least one wall, the at least one lens arranged to: transmit the first light to the space or receive the first light transmitted through the space. The imaging system includes an optics system including at least one image sensor for receiving the first light from the at least one lens and transmitting data characterizing the first light received from the at least one lens; and at least one specially programmed processor configured to generate, using the data, at least one image of the space.

[0005] Also disclosed is a drip chamber for an infusion tube, including: a first end arranged to receive a drip tube; a second end

including an exit port; and first, second, third, and fourth walls connecting the first and second ends. In a cross-section orthogonal to a longitudinal axis for the drip tube, the first, second, third, and fourth walls form a rectangle enclosing a space.

[0006] Also disclosed is a method of forming a drip chamber for an infusion tube, including: forming a first end arranged to receive a drip tube; forming a second end including an exit port; connecting the first and second ends with at least one wall; enclosing a space with the first and second ends and the at least one wall; and integrating at least one lens into the at least one wall; or directly fixing at least one lens to the at least one wall.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] Various embodiments are disclosed, by way of example only, with reference to the accompanying schematic drawings in which corresponding reference symbols indicate corresponding parts, in which:

Figure 1 is a schematic side view of an optical imaging system with a rectangular drip chamber;

Figure 2 is a schematic top view of an optical imaging system with a square drip chamber;

Figure 3 is a schematic side view of an optical imaging system with a drip chamber including at least one integrated or directly fixed lens;

Figure 4 is a schematic top view of an optical imaging system with a drip chamber including at least one integrated or directly fixed lens;

Figure 5 is a schematic side view of an optical imaging system with a drip chamber including at least one integrated or directly fixed lens; and

Figure 6 is a schematic top view of an optical imaging system including at least one integrated or directly fixed lens.

DETAILED DESCRIPTION

[0008] At the outset, it should be appreciated that like drawing numbers on different drawing views identify identical, or functionally similar, structural elements of the disclosure. It is to be understood that the disclosure as claimed is not limited to the disclosed aspects.

[0009] Furthermore, it is understood that this disclosure is not limited to the particular methodology, materials and modifications described and as such may, of