AN INHALATION DEVICE

The present invention relates to an inhalation device, in particular, an inhalation device for administering a powdered medicament by inhalation from a blister pack.

It is known in the treatment of respiratory conditions to make use of dry powder inhalers comprising a suction tube arranged so that it is able to cooperate with a blister pack containing a plurality of individual blisters each holding a dose of powdered medicament.

Reference should now be made to WO 97/40876 which discloses an inhalation device comprising a suction tube and a blister pack assembly. The blister pack assembly is in the form of a carrier which holds the blister pack. The carrier is configured such that the upper surface has a plurality of holes which sit above the blisters in the blister pack thereby enabling the distal end of the suction tube to penetrate the blisters as and when required.

The object of the present invention is to provide an improved inhalation device of this kind which has a superior construction and is more user-friendly . In particular, the construction should be light and compact whilst retaining sufficient rigidity and strength bearing in mind that the user may have to administer the powdered medicament at frequent intervals. Moreover, the construction should be such that the user cannot misuse the inhalation device since incorrect delivery of the powdered medicament could be potentially harmful to the user.

According to the present invention, there is provided an inhalation device for administering a powdered medicament by inhalation comprising a suction tube through which the medicament is drawn on inhalation by a user, a blister pack and a

housing which carries the blister pack, the suction tube being removably connected to the housing and having a distal end which can interact with the blister pack and a proximal end through which the user inhales, characterised in that the inhalation device further comprises biasing means which move the suction tube into a position where it is biased away from the housing surfaces to facilitate grasping by the user when the inhalation device is ready for use.

Preferably, the biasing means form a connection for the suction tube to the housing.

Preferably, the biasing means raise the suction tube away from the housing surfaces.

Preferably, the housing is a carrier for the blister pack.

Preferably, the distal end of the suction tube is removably hinged on the carrier.

Preferably, the biasing means is an elongate resilient member, one end of which is connected to the suction tube and the other end of which is connected to the carrier.

Preferably, the resilient member biases the suction tube on the hinge from a first position where the suction tube is able to lie adjacent to the carrier to a second position where the suction tube is raised away from the carrier.

Preferably, the resilient member is in the form of a strip constructed with a protruding spine running centrally along the length of the strip.

Preferably, the end of the resilient strip which is connected to the suction tube has a thickened portion.

Preferably, the resilient member is connected to the carrier by a hooked formation.

Preferably, the hooked formation connects the resilient member to the carrier in such a way as to allow a sideways and/or twisting movement during transfer of the suction tube between blisters.

Preferably, the biasing means is a sprung element which forms part of the hinge on the carrier.

Preferably, the sprung element biases the suction tube on the hinge from a first position where the suction tube is able to lie adjacent to the carrier to a second position where the suction tube is raised away from the carrier.

Preferably, the hinge comprises a holding element for cooperation with the distal end of the suction tube.

Preferably, the suction tube is connected to the holding element by a flexible elongate member.

Preferably, the inhalation device further comprises an outer case for holding the suction tube and carrier, wherein the outer case is hinged such that the user is able to close the outer case against the biasing action of the biasing means thereby making the suction tube lie adjacent to the carrier when not in use and the outer case is closed.

Preferably, the housing comprises an outer case and a carrier which carries the blister pack.

Preferably, the distal end of the suction tube is removably hinged on the outer case.

Preferably, the biasing means is an elongate resilient member, one end of which is connected to the suction tube and the other end of which is connected to the carrier.

Preferably, the resilient member moves the suction tube on the hinge from a first position where the suction tube is able to lie adjacent to the outer case to a second position where the suction tube projects away from the outer case.

Preferably, the resilient member is in the form of a strip with the resilient member is in the form of a strip with one or more preformed waves which can unfold under tension.

Preferably, the end of the resilient strip which is connected to the suction tube has a thickened portion.

Preferably, the resilient strip is connected to the carrier by a hooked formation.

Preferably, the hooked formation connects the resilient member to the carrier in such a way as to allow a sideways and/or twisting movement during transfer of the suction tube between blisters.

Preferably, the biasing means is a sprung element acting on the suction tube.

Preferred embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings, of which:

Figure 1 is a perspective view of the first embodiment of the inhalation device when enclosed in an outer case;

Figure 2 is a perspective view of the inhalation device in Figure 1 when the outer case has been opened;

Figure 3 is a perspective view of the inhalation device in Figure 2 showing how the suction tube and blister pack assembly are inserted into the outer case;

Figure 4 is a perspective view of the inhalation device when removed from the outer case;

Figure 5 is an exploded view of the elements of the inhalation device in Figure 4;

Figure 6 is an exploded view of the elements attached to the upper tray of the blister pack assembly;

Figure 7 is a plan view of the blister pack in Figure 5;

Figure 8 is a sectional view in direction X-X of the blister pack in Figure 7;

Figure 9 shows the detail of a single blister and slit in plan view;

Figure 10 is a sectional view through the blister and slit in Figure 9 (with a modified slit);

Figure 11 is a view of one side of the body of the suction tube;

Figure 12 is a sectional view in direction X-X in Figure 11;

Figure 13 is a view of the body of the suction tube in direction A in Figure 11;

Figure 14 is a sectional view in direction X-X in Figure 13;

Figure 15 is a view from above of the proximal end of the body of the suction tube in Figure 11;

Figure 16 is a view from below of the distal end of the body of the suction tube in Figure 11;

Figure 17 is a perspective view of the external sleeve of the suction tube and resilient strip;

Figure 18 is a view from one side of the external sleeve and resilient strip in Figure 17;

Figure 19 is a view in direction A in Figure 18;

Figure 20 shows detail of the guide arm of the suction tube in Figure 18;

Figure 21 is a sectional view in direction X-X in Figure 18;

Figure 22 shows detail of the connection of the resilient strip to the external sleeve of the suction tube;

Figure 23 is a sectional view in direction X-X in Figure 21;

Figure 24 is a plan view of the upper tray of the carrier;

Figure 25 is a sectional view in direction X-X in Figure 24;

Figure 26 is a view in direction A in Figure 24;

Figure 27 is a plan view of the lower tray of the carrier;

Figure 28 is a sectional view in direction X-X in Figure 27;

Figure 29 is a sectional view in direction Y-Y in Figure 27;

Figure 30 is a sectional view in direction Z-Z in Figure 27;

Figures 31 to 37 are various views of the inhalation device when the suction tube has been inserted into a blister in the blister pack assembly;

Figures 38 and 39 depict detail of the hook on the resilient strip;

Figure 40 is an enlarged view of the blister pack assembly;

Figure 41 is an enlarged view of an alternative blister pack assembly;

Figure 42 is a plan view of the blister pack in Figure 41;

Figures 43 and 44 depict a second preferred embodiment of the present invention;

Figure 45 depicts a perspective view of the third preferred embodiment of the present invention;

Figure 46 is a partially exploded view of the elements in Figure 45;

Figure 47 depicts the inhalation device in Figure 45 with the outer case closed and the lid partially cut away; and

Figure 48a and 48b depict detail of one of the guide arms of the suction tube in Fig. 46.

Reference should now be made to Figures 1, 2 and 3 which are various perspective views of a first preferred embodiment of the inhalation device 1 when enclosed in an outer case 2. The outer case 2 is hinged having a typical push-button locking mechanism 3. Figure 4 depicts the inhalation device 1 when removed from the outer case 2. The outer case 2 is constructed such that the inhalation device 1 can slide into the base 11. The sides of the blister pack assembly 5 cooperate with the internal surface of the sides of the base 11 to ensure that the inhalation device 1 is held securely in the outer case 2. In addition, the base 11 has two latching elements 50 which cooperate with holes 51 in the lower tray 16 (see Figure 27) which further secure the inhalation device 1 in the outer case 2.

The inhalation device 1 comprises a suction tube 4 and a blister pack assembly 5. The suction tube 4 is removably connected to the blister pack assembly 5 by an elongate resilient strip 6 which biases the suction tube 4 away from the blister pack assembly 5. The resilient strip 6 is constructed such that when the outer case 2 is closed the suction tube 4 can lie substantially flat against the blister pack assembly 5. On opening the outer case 2, the resilient strip 6 will raise the suction tube 4 such that it can be easily grasped by a user.

The suction tube 4 is hinged on the blister pack assembly 5. The internal surface of the lid 9 of the outer case 2 can optionally be provided with arms 10 which interlock in a snap-action with the proximal end 8 of the suction tube 4 when the outer case 2 is closed. On opening the outer case 2, the arms 10 will cooperate with

the resilient strip 6 to raise the suction tube 4. The arms 10 are constructed to slip over the proximal end 8 of the suction tube 4 as the lid 9 is rotated away from the blister pack assembly 5 and eventually release the proximal end 8, at which point the resilient strip 6 continues to maintain the suction tube 4 in the raised position.

In Figure 3, it is clear how the inhalation device 1 can slide into the base 11 of the outer case 2. The suction tube 4 and blister pack assembly 5 can be removed and replaced when the user has emptied all the blisters 13 in the blister pack 12 seen in the exploded view in Figure 5.

The blister pack assembly 5 comprises a carrier 14 and the blister pack 12. The carrier 14 has an upper tray 15 and a lower tray 16 which interlock and enclose the blister pack 12.

In Figure 6, the elements attached to the upper tray 15 have been exploded. Suction tube 4 comprises a body 4a and an external sleeve 4b. However, the suction tube 4 can be moulded as a single part rather than as two separate elements. The body 4a includes the proximal end 8 which forms the mouthpiece of the suction tube 4. The external sleeve 4b includes the distal end 7 and comprises guide arms 17 which hinge the suction tube 4 to the upper tray 15 and facilitate location of the suction tube 4 in the blister pack assembly 5.

Figure 7 is a plan view of the blister pack 12. The blister pack 12 has a plurality of blisters 13 arranged in four parallel rows. Each blister 13 holds a dose of powdered medicament (visible in Figures 8 and 10). The blister pack 12 comprises a lower base 18 containing a plurality of cavities 19 and an upper foil layer 20 which is sealed to the lower base 18. There is an optimum minimum sealing distance around a blister 13 in order to ensure that there will be no or very little ingress of moisture within a cavity 19 which could contaminate or degrade the powdered medicament.

The sealing distance "d" from the edge of a cavity 19 to the edge of an adjacent cavity 19 or a cut edge of the blister pack 12 must typically be at least 2mm. With this minimum sealing distance in mind, the aim is to reduce the overall size of the blister pack 12 for a given number of blisters 13. However, the blister pack 12 must also allow penetration of the guide arms 17 of the suction tube 4 on each side of a blister 13 and, therefore, the foil layer 20 and lower base 18 must be cut during manufacture of the blister pack 12. Although the blister pack 12 could be cut by removing appropriately shaped slots from the blister pack 12, there is the complication of removal of the cut portions of foil and base material. Any cut portions which are not removed could fall into a cavity, sit above a blister or affect the sealing of the foil to the base material. Furthermore, if a slot is cut away from the foil and base material the overall size of the blister pack 12 would have to increase bearing in mind the minimum sealing distance "d" of 2mm and any additional width of the slot.

Accordingly, the blister pack 12 is provided with slits 21 which are simply formed by scoring both the foil layer 20 and lower base 18. In this way, the minimum sealing distance "d" of 2mm can be achieved without adding to the overall size of the blister pack 12.

Although the guide arms 17 are constructed such that penetration of the slits 21 requires little force by the user, insertion can be facilitated by folding the opposed edges of the scored foil and base material downwardly to increase the width of the slit 21 without affecting the minimum sealing distance "d". The optional folding of the opposed edges of the slit 21 can be seen in Figure 10 and in Figure 41. Alternatively, the guide arms 17 can be constructed such that they have a narrower profile than the slit 21.

The detailed construction of the suction tube 4 will now be described with reference to Figures 11 to 23. In Figure 11 the body 4a of the suction tube is

depicted. The body 4a comprises a mouthpiece 8 which forms the proximal end of the suction tube and a cutting mechanism 22 at the opposite end. A tapered channel 23 runs from the mouthpiece 8 to the cutting mechanism 22.

The cutting mechanism 22 is constructed to penetrate the foil layer 20 above a cavity 19 and allow the user to inhale the powdered medicament by breathing in through the mouthpiece 8. Figure 12 is a sectional view in direction X-X in Figure 11 and depicts by-pass holes 24 which will allow an additional air flow to the main air flow from within the cavity 19. Figures 13 and 14 are additional views of the suction tube body 4a. The cutting mechanism 22 includes a cutting blade 25 and plunger blades 26 on either side of the cutting blade 25. The cutting blade 25 will actually penetrate the foil layer 20, whilst the plunger blades 26 act to push the cut foil away to create a clear passage for the powdered medicament and ensure that all the powdered medicament can be inhaled from the cavity 19.

Details of the external sleeve 4b of the suction tube 4 and the resilient strip 6 can be seen in Figures 17 to 23.

The body 4a slots within the external sleeve 4b forming the suction tube 4 (see Figures 5 and 6). The resilient strip 6 has a fixed connection 27 at one end to the distal portion 7 of the suction tube 4 and is connectable by a hook 28 to the upper tray 15 at the opposite end to the hinging point of the suction tube 4 on the carrier (see Figures 3 and 24). The length of the resilient strip 6 is such that when the suction tube 4 sits on the hinge arms 29 and the hook 28 is located in the recess 30 in the upper tray 15, the resilient strip 6 will bend upwardly in an arc. This configuration of the resilient strip 6 results in the suction tube 4 being raised on the hinge arms 29. However, the resilient strip 6 is sufficiently flexible to allow the suction tube 4 to pivot on the hinge into the position where it will lie substantially flat against the upper tray 15 when the outer case 2 is closed.

In Figures 18 and 19 further details of the guide arms 17 and resilient strip 6 are visible. The resilient strip 6 has a protruding spine 31 which gives the resilient strip 6 a shallow "T" shaped cross-section. The protruding spine 31 is on the underside of the resilient strip 6 and serves to ensure that the resilient strip 6 will arc away from the surface of the upper tray 15. The arcing of the resilient strip 6 will result due to shrinkage effects after the moulding of the plastic material from which the strip is made. There is also a thickened portion 32 adjacent to the fixed connection 27 which serves to ensure that the resilient strip 6 does not easily twist or obstruct the slots and holes in the upper tray 15 during use.

Reference should now be made to Figures 20 to 23 which show details of the guide arms 17 on the external sleeve 4b of the suction tube 4.

In Figure 20 the external surface of a guide arm 17 is depicted. This surface pivots on a hinge arm 29 on the upper tray 15. In this configuration of the inhalation device, the hinge arms 29 are provided with a stub 33 and the guide arms 17 are each provided with a cooperating hole 34. In order to facilitate location of the guide arms 17 on the hinge arms 29, each guide arm 17 has a shallow tapering channel 35 leading from the outer edge of the guide arm 17 to the hole 34. The channels 35 help to re-locate the suction tube 4 on the hinge arms 29 after each use of the inhalation device. Preferably, the stubs 33 are a snap-fit in the holes 34.

Each guide arm 17 is also provided with two buttons 36 which are constructed to be a snap-fit in the slots in the upper tray 15 and lower tray 16 (described in detail with reference to Figures 31 to 37).

Figure 21 is a sectional view in direction X-X in Figure 18 of the external sleeve 4b. In this view, by-pass holes 37 can be seen which align with the by-pass

holes 24 in the suction tube body 4a. Figure 23 is a sectional view in direction X-X in Figure 21 and depicts the internal surface of a guide arm 17. An enlarged view of the fixed connection 27 of the resilient strip 6 to the external sleeve 4b appears in Figure 22.

Figures 24 to 26 depict the upper tray 15 of the carrier 14. In plan view the rows of holes 38 and slots 39 are visible which are configured to align with corresponding blisters 13 and slits 21 in the blister pack 12 (see Figure 7).

The hook 28 on the resilient strip 6 is intended to be a push-fit into the recess 30 when the inhalation device is assembled. The arrow-shape prevents removal of the hook 28 once pushed into the recess 30 thereby ensuring that the suction tube 4 remains connected to the blister pack assembly 5. For detail of the hook 28, reference should be made to Figures 38 and 39 described later. However, the recess 30 will allow a twisting and sideways movement of the hook 28 which is necessary to ensure that the suction tube 4 can penetrate all the blisters 13 without restriction of movement, in particular, when reaching the blisters which lie at the end of the blister pack 12 where the hook 28 is held. The twisting movement of hook 28 occurs due to the provision of a rib 48 (see Figures 38 and 39) against which the hook 28 bears, twisting about the point of contact. On each side of the recess 30 is a locking slot 40 which cooperates with the push-button locking mechanism 3 on the outer case 2. Figure 25 is a sectional view in direction X-X in Figure 24 whereas Figure 26 is a view in direction A in Figure 24.

The slots 39 are spaced such that the guide arms 17 on the suction tube 4 can penetrate easily. However, the buttons 36 on the guide arms 17 are a snap-fit in the slots 39 to ensure that the suction tube 4 will remain correctly located once a blister 13 has been penetrated by the cutting blade 25 and plunger blades 26 (see Figures 31 to 37).

Reference should now be made to Figures 27 to 30 which depict the lower tray 16. The lower tray 16 is constructed such that it can lock into position with the upper tray 15 when the blister pack 12 has been inserted. A plurality of guide pins 41 spaced around the perimeter of the upper tray 15 are a snap-fit in corresponding sleeves 42 in the lower tray 16.

The lower tray 16 is provided with slots 43 which correspond with the slots 39 in the upper tray 15 and slits 21 in the blister pack 12. The guide arms 17 will enter slots 43 after penetrating the foil layer 20 and lower base 18 of the blister pack 12. In Figure 28 it is clear that the slots 43 have a depth provided by a wall 44 around the slot extending from the surface 45 of the lower tray 16. The wall 44 ensures that a guide arm 17 will enter a slot 39 in the upper tray 15 correctly and that the suction tube 4 remains upright in the carrier 14 during inhalation of the powdered medicament by the user. By provision of the slots 43 in the lower tray 16, the depth of the lower tray 16 can be less than if the lower tray was solid, in which case, the depth would have to increase by the thickness of the base material of the lower tray 16. Clearly, any constructional feature which reduces the size of the inhalation device or the weight makes the device more advantageous and user-friendly.

In Figure 29, which is a sectional view in direction Y-Y in Figure 27, the upright ridges 46 which help to locate the blister pack 12 correctly can be seen. However, the ridges 46 also provide support for the blister pack 12 when the suction tube 4 penetrates a blister 13. Each blister 13 will sit between two ridges 46 thereby ensuring that the blister pack 12 does not slip within the carrier 14 during assembly. The connection of the upper tray 15 to the lower tray 16 is achieved by the interlocking pins 41 (visible in Figures 24 and 25) and sleeves 42 (visible in Figure 27). In this respect, reference should be made to the blister pack 12 in Figure 5 which is provided with "U" shaped recesses 47 which sit around the interlocking pins

41 and sleeves 42 when the blister pack 12 is assembled between the upper tray 15 and lower tray 16. The lower tray 16 is also provided with guide pins 49 which ensure accurate location of the blister pack 12 within the lower tray 16. During assembly, the blister pack 12 will typically be placed in the lower tray 16 first so that it is important to locate the blister pack 12 correctly thereby making the next step of assembling the upper tray 15 on the lower tray 16 relatively trouble-free.

In a preferred embodiment, the guide pins 49 could have a hooked configuration to hold the blister pack 12 as well as provide a means for its accurate location.

Figure 30 is a sectional view in direction Z-Z in Figure 27, showing details of the slots 43 and ridges 46.

Figures 31 to 37 depict the inhalation device in use when the suction tube 4 has penetrated a blister 13.

Figure 31 is a perspective view of the inhalation device when the suction tube 4 has been inserted in the first blister 13 in the second row from the right of the blister pack 12. The resilient strip 6 now serves the function of ensuring that the suction tube 4 remains connected to the blister pack assembly 5. Figure 32 is a partial plan view of the upper tray 15 with the suction tube 4 inserted in one of the holes 38 and adjacent slots 39. In the enlarged view in Figure 33, further details are visible of the mouthpiece of the suction tube 4 and through the suction tube 4 down to the cutting blade 25.

Figures 34, 35 and 36 are different sectional views in directions A-A, B-B and C-C respectively in Figures 32 and 33. The sectional views show clearly how the suction tube 4 penetrates the upper tray 15, the blister pack 12 and the lower tray

16. Figure 37 depicts the air flow into the inhalation device when a user inhales to empty the contents of the cavity 19 and corresponds to Figure 36.

In Figures 34 and 35, it is clear how the buttons 36 on the guide arms 17 snap into the upper tray 15 and the lower tray 16 to ensure that the suction tube 4 remains correctly located during inhalation through the mouthpiece by a user. After inhalation the suction tube 4 can be removed simply by overcoming the slight resistance of the buttons 36 when locked in the slots 43.

It is also important to note that the suction tube 4 is constructed such that when a blister 13 is penetrated, there is an air gap between the suction tube 4 and the surface of the upper tray 15 which allows an air flow A (see Figure 37). The distal end 7 of the suction tube 4 which comprises the cutting mechanism 22 is also constructed such that during penetration of a blister 13, there will be an air gap between the cutting mechanism 22 and the perimeter of the hole 38 in the upper tray 15. Furthermore, the blister pack assembly 5 is constructed such that there is an air gap between the lower surface of the upper tray 15 and the blister pack 12 which allows an air flow B (see Figure 37). The air flow A and air flow B into the cavity 19 facilitate inhalation of the contents by a user.

Figures 38 and 39 show enlarged detail of the arrow-shaped hook 28 on the resilient strip 6 when located in the blister pack assembly 5. Figure 38 is a sectional view which depicts how the hook 28 is held in the recess 30.

In Figure 39, which is a view in direction E in Figure 38, the hook 28 is seen to be held just below the upper tray 15. However, as mentioned earlier the hook 28 is able to move within the recess 30 from side to side and twist as the suction tube 4 moves from blister to blister. The twisting movement is achieved by a rib 48 against which the hook 28 bears, rotating about the point of contact.

Figure 40 is an enlarged sectional view through the blister pack assembly 5 which shows how the blister pack 12 sits between the upper tray 15 and lower tray 16. The slit 21 has been formed by scoring the foil layer 20 and lower base 18.

In Figure 41, an alternative blister pack 12 is depicted where the slits 21 have been folded or pushed downwards making the slit wider without affecting the minimum optimum sealing distance described earlier. With the folded slits 21, penetration of the blister pack 12 by the guide arms 17 is made easier. Figure 42 is a perspective view of just the blister pack 12 in Figure 41 depicting the folded slits 21.

Reference should now be made to Figures 43 and 44 which depict the second preferred embodiment of the present invention. In this respect, it should be noted that the blister pack assembly 105 is substantially different to that in the first preferred embodiment. However, Figures 43 and 44 depict an alternative biasing means for raising the suction tube 104 away from the blister pack assembly 105 in order that the user can easily grasp the suction tube 104. The inhalation device 101 comprises similar elements to the first preferred embodiment, i.e. an outer case 102, an upper tray 115, a blister pack 112 and a lower tray 116. It should be noted that the upper tray 115 is fixed to the outer case 102 in this embodiment. The lower tray 116 and blister pack 112 can slide out of the outer case 102 when the blister pack 112 needs replacing. However, the present invention is concerned only with the suction tube raising means which comprises a sprung holding element 106 pivotable on a hinge 129 on the blister pack assembly 105. The holding element 106 is biased upwardly by a spring 106a connected to the pivot point of the holding element 106 on the lower tray 116. Figure 44 is an exploded view of only the suction tube 104, the blister pack 112, the lower tray 116 and the sprung holding element 106. The inhalation device 101 operates in a similar manner to the first preferred embodiment in that as soon as the outer case 102 is opened the suction tube 104 will be raised

away from the blister pack assembly 105. The suction tube 104 is preferably attached to the holding element 106 by a flexible cord 106b. In this way, the user will not be able to lose the suction tube 104. The suction tube 104 has a proximal end 108 which forms the mouthpiece and a distal end 107 which carries the cutting elements which penetrate the blisters in the blister pack 112.

Reference should now be made to Figures 45 to 48 which depict the third preferred embodiment of the present invention. In this respect, it should be noted that the blister pack assembly 205 is similar to that in the first preferred embodiment. The main distinction is that the suction tube 204 is removably hinged on the outer case 202.

The inhalation device 201 comprises similar elements to the first embodiment i.e. an outer case 202, a blister pack assembly 205 (comprising a carrier with a blister pack in the form depicted in Figure 5) and a suction tube 204. Since the main distinction is the hinge mechanism, no specific reference will be made to other features which function in a similar manner to the first embodiment.

Reference to Figures 45 and 46 reveals that the guide arms 217 of the suction tube 204 are now able to pivot on hinge arms 229 lying on each side of a moulded recess in the lid 209 of the outer case 202. Each hinge arm 229 is provided with a stub 233 which is configured to sit in a hole 234 on a guide arm 217 of the suction tube 204 (see Figures 48a and 48b). In order to facilitate location of the suction tube 204 on the hinge arms 229, each guide arm has a shallow tapering channel 235 leading to the hole 234. The stubs 233 should be a snap-fit in holes 234.

Each guide arm 217 is also provided with a flexible leg 236a on which is located a button 236b. The flexible leg 236a and button 236b are an alternative

arrangement to the two buttons 36 in the first embodiment (see Figure 20). It has been found that with certain materials, after repeated insertion and withdrawal of the suction tube 4 in the blister pack assembly 5, the buttons 36 began to wear which resulted in a reduced snap-fit action and, therefore, less stability when the suction tube 4 sits in the blister pack assembly 5. The flexible leg 236a in the third embodiment attempts to overcome this potential problem by allowing the resilient force to be adjusted. This increase in flexibility also means that a larger button 236b can be used which also improves the snap-action when inserting the suction tube 204 in the blister pack assembly 205. It follows that if the material from which the guide arms 217 are made is the same as the material from which the hinge arms 229 are made, the stubs 233 and holes 234 can also be increased in size to improve the snap-action of the suction tube 204 in the lid 209.

A further difference in the third embodiment can be seen in Figure 47. In this figure, the outer case 202 is closed and the suction tube 204 lies adjacent to the blister pack assembly 205 and lid 209. The resilient strip 206 has several waves 200 which are preformed when the strip is manufactured. The waves 200 are constructed such that only when there is a pulling tension on the resilient strip 206 (see Figure 45) the waves will unfold completely. The provision of the preformed waves 200 ensures that when the suction tube 204 penetrates the blisters in the area close to where the hook 228 is received in recess 230 in the blister pack assembly 205, there will be a reduced risk of the resilient strip 206 becoming tangled and interfering with the smooth operation of the inhalation device by the user (comparison should be made with Figure 31 of the first embodiment where the resilient strip 6 simply arcs away from the blister pack assembly 5).

In use, when the outer case 202 is opened the resilient strip 206 is of such a length that when the lid 209 is fully opened the suction tube 204 will be pulled away from the lid 209 in order to facilitate grasping by the user. The user then removes the

suction tube 204 from the hinge arms 229 and inserts the guide arms 217 into the blister pack assembly 205 as shown in Figure 31, for example.

Although only three preferred embodiments of the present invention have been described in detail, various modifications of the raising means for the suction tube can be envisaged which would also provide the advantages disclosed herein.

Claims:

1. An inhalation device for administering a powdered medicament by inhalation comprising a suction tube through which the medicament is drawn on inhalation by a user, a blister pack and a housing which carries the blister pack, the suction tube being removably connected to the housing and having a distal end which can interact with the blister pack and a proximal end through which the user inhales, characterised in that the inhalation device further comprises biasing means which move the suction tube into a position where it is biased away from the housing surfaces to facilitate grasping by the user when the inhalation device is ready for use.

2. An inhalation device as claimed in Claim 1, wherein the biasing means form a connection for the suction tube to the housing.

3. An inhalation device as claimed in Claim 1 or Claim 2, wherein the biasing means raise the suction tube away from the housing surfaces.

4. An inhalation device as claimed in Claim 3, wherein the housing is a carrier for the blister pack.

5. An inhalation device as claimed in Claim 4, wherein the distal end of the suction tube is removably hinged on the carrier.

6. An inhalation device as claimed in Claim 5, wherein the biasing means is an elongate resilient member, one end of which is connected to the suction tube and the other end of which is connected to the carrier.

7. An inhalation device as claimed in Claim 6, wherein the resilient member biases the suction tube on the hinge from a first position where the suction

tube is able to lie adjacent to the carrier to a second position where the suction tube is raised away from the carrier.

8. An inhalation device as claimed in Claim 7, wherein the resilient member is in the form of a strip constructed with a protruding spine running centrally along the length of the strip.

9. An inhalation device as claimed in Claim 7 or Claim 8, wherein the end of the resilient strip which is connected to the suction tube has a thickened portion.

10. An inhalation device as claimed in any of Claims 6 to 9, wherein the resilient member is connected to the carrier by a hooked formation.

11. An inhalation device as claims in Claim 10, wherein the hooked formation connects the resilient member to the carrier in such a way as to allow a sideways and/or twisting movement during transfer of the suction tube between blisters.

12. An inhalation device as claimed in Claim 5, wherein the biasing means is a sprung element which forms part of the hinge on the carrier.

13. An inhalation device as claimed in Claim 12, wherein the sprung element biases the suction tube on the hinge from a first position where the suction tube is able to lie adjacent to the carrier to a second position where the suction tube is raised away from the carrier.

14. An inhalation device as claimed in Claim 13, wherein the hinge comprises a holding element for cooperation with the distal end of the suction tube.

15. An inhalation device as claimed in Claim 14, wherein the suction tube is connected to the holding element by a flexible elongate member.

16. An inhalation device as claimed in any of Claims 3 to 15, further comprising an outer case for holding the suction tube and carrier, wherein the outer case is hinged such that the user is able to close the outer case against the biasing action of the biasing means thereby making the suction tube lie adjacent to the carrier when not in use and the outer case is closed.

17. An inhalation device as claimed in Claim 1 or Claim 2, wherein the housing comprises an outer case and a carrier which carries the blister pack.

18. An inhalation device as claimed in Claim 17, wherein the distal end of the suction tube is removably hinged on the outer case.

19. An inhalation device as claimed in Claim 18, wherein the biasing means is an elongate resilient member, one end of which is connected to the suction tube and the other end of which is connected to the carrier.

20. An inhalation device as claimed in Claim 19, wherein the resilient member moves the suction tube on the hinge from a first position where the suction tube is able to lie adjacent to the outer case to a second position where the suction tube projects away from the outer case.

21. An inhalation device as claimed in Claim 20, wherein the resilient member is in the form of a strip with one or more preformed waves which can unfold under tension.

22. An inhalation device as claimed in Claim 21, wherein the end of the resilient strip which is connected to the suction tube has a thickened portion.

23. An inhalation device as claimed in any of Claims 21 or 22, wherein the resilient strip is connected to the carrier by a hooked formation.

24. An inhalation device as claimed in Claim 23, wherein the hooked formation connects the resilient member to the carrier in such a way as to allow a sideways and/or twisting movement during transfer of the suction tube between blisters.

25. An inhalation device as claimed in claim 18 wherein the biasing means is a sprung element acting on the suction tube.

26. An inhalation device substantially as herein described with reference to the accompanying drawings.