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Device for inhaling powdered substances

The invention relates to a device for inhaling powdered substances from the cavities of a blister pack, comprising a plate which engages over a blister-pack covering foil and has guide holes, and an insertable suction tube which can be moved by hand from guide hole to guide hole and which punctures the blister-pack covering hole with its leading end and a mouthpiece opening is formed at its other end.

An inhalation device of this type is disclosed in DE-OS 196 19 536. The cavities are each reliably located by the per se repluggable suction tube by means of the guide holes which virtually form a target grid. In this process, that section of the covering foil which otherwise seals the cup-shaped cavity is pierced. For the time when it is not in use, the suction tube is stored under a closed lid in a separate receiving chamber at the edge.

The object of the invention is to form an inhaling device of the generic kind with favourably fitted parts.

This object is achieved first of all and essentially in a device of the generic kind for inhaling powdered substances having the features of Claim 1, it being arranged that the suction tube is removably retained by means of an adapter along the one edge of the blister pack. The suction tube is thus held in a trapped manner. The adapter, which can be linked to the blister pack, imparts the retention of the suction tube in a manner beneficial for fitting. On the other hand, the deliberate release of the retention is required. The arrangement along the one side yields a spatially beneficial fitting. In addition, the parts joined together are able to stabilize one another mutually. That means that very thin walls can be employed. Furthermore, it is proposed that the adapter is held on the blister pack by a slide-in insertion joint. That can be effected in a constructionally simple manner and at the same time inexpensively since no additional parts are needed as attachment means. It is furthermore beneficial that the slide-in insertion joint is provided in the region of a central groove of the blister pack and comprises two tongues which receive the groove base between them. Such tongues can also be formed onto the adapter at the same time, just like the central groove on the blister pack. In general, a

slide-in insertion joint acting as a result of clamping is already sufficient. However, it is preferable that the slide-in insertion joint is latched. In this connection a reversible latching would have the advantage that the adapter can in each case be fitted again in a fresh blister pack. A constructionally simple retention lasting over the longest times of use is achieved in that the suction tube is clipped into a half-shell-like fitting of the adapter. The corresponding half-shell shape effects the necessary resilience or restoring force. A design of even original significance is yielded, in addition, in that the suction tube has a flexible arm which is directed radially with respect to it and which, when the blister-pack is pushed in under the plate, enters into a coupling position with respect to the plate. In this way, the suction tube is, so to speak, "put on the lead". The flexibility mentioned and the radial alignment with respect to the suction tube opens up an adequate freedom of movement within the framework of the retention limits. Furthermore, in this connection, the anchoring of the flexible arm is in detail such that the arm has a thickened end which is located in the blister-pack groove and threads under peripheral shoulders of a slot in the plate which extends congruently with the groove, the length of the arm corresponding at least to about half the width of the plate. The width region is thus completely covered for access and the length region of the plate is completely covered by the slot which provides an end-limited guide track for the thickened section. Furthermore, provision is made that the plate, including the adapter, is covered by a flap-lid of a housing, in which housing the plate forms an intermediate cover. In this way, the blister pack is protected and situationally positioned in the housing in an trapped manner. The appropriately free loading and unloading access is offered by an achievement which is such that, in the folded-open position, the flap-type lid exposes the entrance cross section of the compartment situated underneath the plate for the insertion of the blister pack. The corresponding hinge is expediently situated in the rear region of the housing. The adapter situated in front of the entrance cross section and the suction tube held by said adapter are kept accessible for gripping. In this connection, in the closed state of the housing, the situation is such that the flap-type lid embraces the adapter plus suction tube with a free space on the hinge side in a protective manner. In addition, a feature of the invention is that the flexible arm is seated on the suction tube by means of a swivel-joint ring. That increases the manoeuvrability. A constructionally beneficial achievement of the suction tube fitting then consists in that the suction tube is retained only with its mouth-piece end by a tongue of the fitting of the adapter and a second tongue of the fitting is fitted as impact protection at the

opposite, cutting-edge end. Said tongue extends like a sight in front of the sensitive cutting-edge end. Under these circumstances, this also means that no damage occurs during manipulation. In addition, the preferably symmetrically designed tongue structure promotes manipulation for left-handed individuals since the suction tube is easily replugged. To retain the arm, the procedure is furthermore such that the groove of the blister pack is fitted with a limit stop which prevents the thickened end of the flexible arm from escaping from the threaded-under position. This is the closed position. The latter is loaded by a stop on the housing side. For the threading underneath mentioned, it proves advantageous that the one tongue of the adapter has a groove for inserting the flexible arm. Thickened section and cross section of the arm are thus kept out of the way. An advantageous variant consists in that the adapter is retained at the one rim edge of the blister pack by means of a pushbutton-type joint. This expediently involves a formation of corresponding pushbutton parts in pairs. In an advantageous manner, the procedure is such in this connection that one pushbutton half is moulded out of the side-wall material of the blister pack. This is the male part. The associated female part is formed in a congruently aligned manner on the adapter. The avoidance of a perforation in the blister pack is desirable insofar as the further design is such that the blister pack has moisture-absorbing insertion inserts in the region between the cavities. In this respect, the procedure is furthermore such that the groove is moulded into the wall forming the cavities and the groove base is situated at approximately the central height of the plane of the blister pack thickness, and from which longitudinal webs moulded from the wall material proceed which extend right down to a blister-pack rear wall which is provided on the side situated opposite the blister-pack covering foil. This and the further measure that the blister-pack rear wall terminates the receptacle for the insertion inserts results in closed spaces in which the insertion inserts are received. Finally, a measure is furthermore proposed which is such that there are fitted to the leading end of the suction tube latching fingers which, being resilient in the radial direction, enter fitting niches in the guide holes of the plate and engage in latching niches provided in the guide holes. In this way, a safe fitting of the suction tube for use is achieved. The latching is perceptible so that the user can be sure of having reached the correct standby position for sucking. The suction tube can be deliberately pulled off. The latching niches ensure that the latching heads of the latching fingers are also pulled into the fitting function. Constructionally, the appropriate structure can easily be formed in that the latching niches are formed by webs which extend parallel to the guide hole rim and are less

thick than the height of the guide hole. Finally, it also proves advantageous that the upper side of the webs is countersunk with respect to the upper side of the plate.

The subject matter of the invention is explained in greater detail below by reference to an exemplary embodiment illustrated in a drawing. In the drawing:

Figure 1 shows a perspective view of the device according to the invention for inhaling, specifically in a ready-to-use position and with plate accordingly exposed, that is with the housing open,

Figure 2 shows the front view of the closed housing,

Figure 3 shows a side view thereof,

Figure 4 shows a plan view of the housing,

Figure 5 shows a bottom view of the housing,

Figure 6 shows a front view of the device with flap-type lid opened,

Figure 7 shows a side view thereof,

Figure 8 shows a view, corresponding to Figure 6, with a blister pack equipped with an adapter fitted,

Figure 9 shows a side view thereof,

Figure 10 shows the suction tube in side view,

Figure 11 shows the same in front view,

Figure 12 shows the arm in side view,

Figure 13 shows the same in front view,

Figure 14 shows the adapter in plan view,

Figure 15 shows a side view thereof,

Figure 16 shows the blister pack in plan view,

Figure 17 shows a side view thereof,

Figure 18 shows a perspective separate view of the adapter on an enlarged scale,

Figure 19 shows the associated coupling end of the blister pack,

Figure 20 shows a cross section through the joint between adapter and blister pack,

Figure 21 shows a longitudinal section through said joint,

Figure 22 shows a staggered longitudinal section through the inhaling device, with a section through the inserted suction tube,

Figure 23 shows a staggered cross section through the inhaling device, with a section through the inserted suction tube,

Figure 24 shows the plan view of a region of a cavity of the blister pack on a considerably enlarged scale and with the hole pattern shown in the covering foil,

Figure 25 shows the front view of the suction tube with the cutting edge disposed at the leading end on a more enlarged scale than Figure 22,

Figure 26 shows the plan view thereof,

Figure 27 shows the bottom view of the suction tube, specifically viewed in the direction of the cutting edge,

Figure 28 shows a side view of Figure 25,

Figure 29 shows a longitudinal section through Figure 28,

Figure 30 shows a longitudinal section through Figure 25,

Figure 31 shows a perspective view of the cutting-edge end of the suction tube,

Figure 32 shows a cross section through a modified design of a blister pack in an exploded view,

Figure 33 shows a plan view thereof illustrating fitted moisture-absorbing insertion inserts and shown only in an enlarged detail,

Figure 34 shows said blister pack in assembled form, specifically viewed towards the one end,

Figure 35 shows a plan view of said blister pack in its entirety,

Figure 36 shows a side view thereof,

Figure 37 shows the other end of said blister pack,

Figure 38 shows the associated adapter, uncoupled, and

Figure 39 shows the same coupled.

The device V shown for inhaling powdered substances comprises an essentially flat plate 1. The latter is pierced in sieve fashion. This involves guide holes 2, disposed in a row for the selective application or plugging-in of a suction tube 3.

The suction tube 3 has, at its leading, insertable end, a cutting edge 4 in the form of a centrally situated blade-type flank. The latter pierces in a cutting fashion an unsupportedly stretched section 5' of a covering foil 5 covering a cavity 6.

The cavity 6 is a cup-shaped recess 7 of a blister pack 8. The cup depth is approximately 4 mm and cup diameter in the entrance region approximately 7.5 mm.

The latter (8) contains powdered substance in a multiplicity of such cavities 6. These compartmented amounts of powder substance are, for example, medication powder 6. That is indicated in the drawings by a dot pattern.

The covering foil 5 is composed of an aluminium foil. It is attached to the otherwise planar upper side of the blister pack 8, for example, by sealing it on.

The rims 6' of the cavities 6, which are in this case circular, are situated, when the blister pack 8 is fitted, in a manner suitable for utilization, to the plate 1, which functions, as it were as a mask congruently with respect to the guide holes 2 of the said plate 1.

Thus, the medication powder 9 can be gradually administered in precisely metered doses by introducing and removing and advancing the suction tube 3 to the next guide hole 2. The corresponding feeding to the target point takes place by sucking the suction tube 3. For this purpose, the suction tube 3 has a mouth-piece opening 10 at its other end.

The mouth-piece opening 10 is connected for flow purposes via a suction channel 11 to the surroundings of the cutting edge 4 which are open to the tube. In this way, the cavity 6 is emptied without residue.

The suction channel 11 is connected for flow purposes to the transverse ventilation holes 12. The latter emerge at the outer surface of the suction tube 3 and provide an additional flow to the central powder-laden main stream which empties the cavity 6. However, they debouch in an outer wall plane which stands back from the actual gripping zone of the suction tube 3, and specifically, also have strips projecting beyond them laterally so that the fingers of the holding hand cannot keep the transverse ventilation holes 12 closed. In addition, that region of the outside-surface wall provided for gripping is roughened to increase gripping capability, in particular coarsely grooved annularly.

The suction tube 3 is fitted to the blister pack 8 in a trapped manner. An adapter 13 is inserted as a suitable connecting web. The latter extends at the one edge 14 of the blister pack 8 and is mounted there. The edge is a narrow edge or transverse edge of the blister pack 8 which is rectangular in outline. The other narrow edge has the reference symbol 15.

The removable suction tube 3 retained in this way by means of the adapter 13 is inserted in a half-shell-like mounting 16 of the adapter 13. This is a clip connection. The latter results from tongues 16', 16" which are curved in an arc shape and are of identical profile. Said tongues are separated spatially, preferably in the corner zones of the one edge 14 and are open towards the plane of the plate 1.

Despite the provision of two tongues 16', 16", the suction tube 3 is retained otherwise in a freely projecting manner suitable for gripping only by means of its end on the mouth-piece side by the tongue 16' of the fitting 16 of the adapter 13 at that point, on the left-hand side in the drawing. Embraced by the tongue 16" is a recessed, essentially cylindrical outside-wall section, circumscribing the mouth-piece opening 10, of the other end of the suction tube 3, which end is reserved for applying the mouth. This allows the use or fitting habits of both right-handed and left-handed individuals to be covered.

Optionally, the cutting-edge-type end, that is to say the cutting-edge 4, extends, retained by clipping on the right-hand side or left-hand side, in both cases in proximity to the respective internal flank of the lashes 16', 16" which is so close that one can always function as impact protection. The centrally situated point 4' of the cutting edge 4 extends even only slightly into

the interior of the respective tongue. The mouth-piece recess is used as an axial stop limitation for the clipped-in suction tube 3. The internal flank of the respective tongue 16' or 16" reciprocates.

The adapter 13 is mounted on the blister pack 8 by means of a sliding insertion connection. The relevant means emerge particularly clearly from Figures 18 to 21. The contribution on the blister-pack side to the sliding insertion connection is a central groove 17. The latter is open towards the edge 14. The groove-forming wall material in the region of the central groove 17 assumes, when viewed in cross section, a U-shaped form, proceeding from a flat cover 18 which essentially forms the blister pack 8 and on which the recesses 7 are deep-drawn or moulded to project in the same direction.

The U-shaped wall form is matched in mould fashion by two tongues 19, 20. Projecting freely, the latter proceed from the back 21 of a transverse strip 22 of the adapter 13. They (19, 20) overlap in the assigned position the coupling-side end region of the blister pack 8 on the upper and lower side. In this connection, a groove base 23 and even sections of lateral groove flanks 24 of the central groove 17 are situated in a U-shaped insertion slot 25 formed by the two tongues 19, 20. The U-shape has a direction-ensuring action. Swivelling is prevented.

The front end, adjacent to the edge 14, of the lower tongue 20 converges towards the insertion slot 25. That has a centring action on the corresponding front end of the U-profile wall of the central groove 17. The chamfering including both the U-shaped web and the U-shaped limb of the tongue 20 which is U-shaped in cross section is at a good 45°. The rectangular cross section of the upper tongue 19 partially plunges into the U-space of the tongue 20 leaving a slit for the purpose of forming the insertion slot 25.

Relative to the plane of the blister pack 8, the unsupported front end of the finger-shaped upper tongue 19 is convexly rounded in said plane. Mounted in front of the matching rounding 26 is a matchingly concave terminating contour 27 on the internal end of the central groove 17.

The U-limbs of the lower tongue 20 terminate at a distance from the upper side of the transverse strip 22, which is equal at least to the total thickness of the cover 18 plus covering foil 5 of the blister pack 8 so that the edge 14 can be supported on the back 21 of the adapter 13 also as a result of this so as to be free of transverse tipping for the blister pack 8 and not to damage the slide-in insertion joint.

The upper edge of the upper tongue 19, on the other hand, terminates at the same level as the upper side of said transverse strip 22. The tongues 16' and 16" forming the fitting 16 explained above proceed from the breast of the transverse strip 22.

If fixing proceeding beyond a clamping action should be desired in regard to the slide-in insertion joint to avoid an unintentional separation of the components 8 and 13, then it consists in a latching which is shown particularly clearly in Figures 19 to 21. Specifically, this involves a latching projection 28 in the groove base 23. The latching recess 29 is assigned to the latching projection 28. Said recess is situated in the U-web of the lower tongue 20. The latching recess 28 is formed as a continuous hole. This forms the basis for a further function, explained below, for the purpose of latching. The convergence emphasized above is useful for the function of a facilitated traversal of the mouth of the insertion slot 25 during the assembly. The wart-like embossing (shown somewhat exaggeratedly) of the latching projection is forced back and latches forcefully into the latching recess 29 in the event of congruent alignment with the latter. The joint can be released again by applying a suitable pulling force.

The insertion length of the slide-in insertion joint is greater than the width of the insertion slot 25. The ratio is about 2:1. The insertion length of the tongues 19, 20 is equal to about one fifth of the total length of the blister pack 8.

The suction tube 3 is retained via adapter 13 by means of a flexible arm 30. The latter holds the suction tube 3 "like a dog on the lead". The suction tube is thus trapped and has a movement freedom in the necessary "radius" of action. The arm 30 proceeds radially from the elongated-pipe-type suction tube 3. An open ring 31 serves as retention means for the arm 30 on the suction-tube side. As a consequence of its radial opening 32, the arm 30 can be clipped

onto a waist 33 of the suction tube 3. The waist circumference is circular, just like the interior of the ring 31. A rotation capability is therefore left between the ring, denoted below as swivel-joint ring 31 and the waist 33 formed as an annular groove.

Attached diametrically with respect to the opening 32 of the swivel-joint ring 31 is a cord-type arm 30. At the other end, the latter merges into a thickened end 34. This is a sphere formed on immediately at that point. The arm 30 acts in a centre-orienting manner (compare Figures 12 and 13).

The thickened end 34 holds the arm 30 on the blister pack 8 or plate 1. The appropriate coupling position is brought about when the blister pack 8 is pushed under the plate 1 as envisaged here (compare Figures 8, 9). For this purpose, the latter forms a compartment 35 which takes into account the corresponding cross-sectional profile of the blister pack 8 (compare Figure 22). Serving as guiding section, in the narrower sense, of the compartment 35 are parallel longitudinal edges 8' of the longitudinal-groove-type sections which guide the blister pack, but which continue on the lower side of the plate 1 into a receiving space 36 which is dimensioned so that the latter is capable of receiving the cavities 6 formed by recesses 7 (compare Figures 22 and 23).

The lower side of the receiving space 36 terminates with a rear wall 37. The latter extends parallel to the plate 1. Longitudinal walls joining plate 1 and rear wall 37 together integrally are denoted by 38. The latter merge in the region of the one edge 14 and the other edge 15 of the blister pack 8 inserted in card-type fashion into transverse walls 39. This results in a housing 40 of very shallow design about the size of a cigarette packet.

Plate 1, including the adapter 13 of the housing 40, is covered by a flap-type lid 41. To this extent, the plate 1 functions as an intermediate cover of the housing 40 of the device V.

The flap-type lid 41 is hinged in the coupling region of the adapter 13. The corresponding hinge axis is 42. It is formed in the end region at that point of the rear wall 37 and extends in a spatially parallel manner with respect to the longitudinal central axis x-x of the suction tube 3 held in the fitting 16. In the open position, the lid cross section is situated outside the

housing cross section. Since the hinge axis 42 is somewhat set back from the hinge-side transverse wall of the flap-type lid 41, a lid-side overhang 41' remains. The latter functions as an opening-limiting stop. The counterstop is provided by the back of the rear wall 37 at that point.

The suction tube 3 is attached when the blister pack 8 is inserted. For this purpose, the arm 30 is placed like an arrow in the groove of a crossbow. For this purpose, in the figurative sense, the upper tongue 19 forms a groove 43 on its upper side, which groove also crosses the strip 22. The cross section of said groove is dimensioned so that the arm 30 when actually stretched out linearly does not exceed the rectangular base cross section of the tongue 19 towards the outside. The groove 43 is, in addition, open towards both ends. The length of the arm 30 in the loading position is dimensioned so that the thickened end 34 comes below the central groove 17 on the other side of the terminating contour 27.

Said terminating contour is extended as a transverse wall up to the level of the upper side of the blister pack 8. This barrier is, however, interrupted by a slit 44 which is open upwards. The latter permits the passage of the arm 30, whose thickened end has, on the other side of the terminating contour 27 forming the transverse wall mentioned, a limit stop 45 which prevents the thickened end 34 of the flexible arm 30 from leaving its threaded-under position (compare Figures 6 and 7). That part of the central groove 17 which continues on the other side of the terminating contour 27 interrupted only by the gap or the slit 44 is denoted by 17' and is dealt with further under the concept of a groove. The depth of the groove 17' is less than that of the adapter-connecting central groove 17. Its (17') profile is hemispherical and dimensioned so that at least half of the thickened end 34 constructed as a sphere comes below it. The groove 17' forms a longitudinally oriented running path indicated by double arrow y for the thickened end 34. That end of the groove 17 situated nearer the other edge 15 of the blister pack 8 likewise has a limiting stop 46.

A continuation or addition to the said running path arrow y on the upper side into that region of the housing 40 overlapping the blister pack 8 or its compartment 35 is formed by rim shoulders 47 on the lower side of the plate 1. The rim shoulders 47, which in cross section each circumscribe just under a quarter circle and supplement the remaining hemispherical

profile of the running path are, as clearly emerges from Figure 23, disposed in pairs and merge into a slot 48 which, although it allows the arm 30 through, retains the thickened end 34. When the arm 30 is in the threaded-under state, the "lead" can obviously no longer be released from the housing 40 unless the limit stop 45 is free.

The slot 48 which extends in the longitudinal central plane of the housing 40 provides a movable retention point on the housing side for the arm 30, which retention point is fully adequate for access. Thus, in the longitudinal direction, the radius of action for introducing the suction tube 3 into the guide holes 2 is covered, as is also the space requirement in the lateral direction, for which purpose the length of the arm 30 is equal at least to about half the width of the plate 1.

The outlet of the slot 48 on the upper side is chamfered. That applies also in regard to the end 48' situated nearer the edge 15, of the slot, which is open in the opposite direction, that is to say towards the adapter 13. The inclined flanks of the slot 48 which are achieved by the chamfering and diverge outwards are denoted by 49. Such a contour promotes the joint mobility of the end 34, that is to say the sphere, held in a guided and floating manner. In addition, it is increased owing to a slight overwidth of the slot 48 compared with the cross section of the arm 30.

Even in the state where the suction tube 3 is held in the adapter 13, it is substantially protected against mechanical stresses. The central groove 17 and its linear continuation in the form of the groove denoted by 17' are moulded deeply enough into the wall forming cavities 6. The groove base 23 is situated at about the central height of the plane of the blister-pack thickness. The longitudinal central axis of the suction tube 3 clipped into the fitting 16 also extends essentially in the plane. The radially applied arm 30 can thus be inserted in the appropriately extending channel 43 without transverse stress.

Stresses do not occur via the flap-type lid 41 since the flap-type lid 41 is provided with a free space 50 on the hinge side. This free space 50 accommodates the free-standing section of the adapter 13, that is to say essentially the fitting 16 and the suction tube 3, in a load-free manner. The folded-open position of the flap-type lid 41 provides a free gripping access to

the adapter 13 so that the blister pack can be fitted or an empty one removed and a fresh blister pack 8 can readily be fitted. In the swung-open position, the entrance cross section 35' is completely free, this also being the case in the region of the compartment 35 on the upper side and lower side.

Although the rim-carrying support explained for the blister pack 8 in the slot 35 plus receiving space 36 is already adequate, in accordance with a development of a variant, shown from Figure 32 onwards, of the blister pack 8, a measure has been taken which consists in that longitudinal webs 51 are provided which are moulded from the wall material of the blister pack 8. In addition, the wall material is in this case peripherally angled. The narrow peripheral rim wall thus achieved is denoted by 52. This gives said blister pack 8 a, so to speak, shell-type shape instead of a card-type shape. The narrow edge of the longitudinal web 51 and the rim wall 52 terminate in the same plane.

The longitudinal webs 51 proceed from the outside of the central groove 17 or the groove 17'. This blister structure produced as an injection-moulded part takes into account in the same way the cavities 6 described above. The reference numerals are applied analogously.

The shell-type blister structure is provided with a rear wall 53 on the side remote from the plate 1. This provides a sealed termination from the outside. Here, again, the cavities 6 containing the medication powder 9 are sealed by the covering foil 5 explained above. The finished blister pack 8 is revealed by Figure 34 as well as 35 and 36.

Accommodated in the region between the cavities 6 or the cup-forming recesses 7 on the ready-to-use blister pack 8 are moisture-absorbing inserts 54. The latter have a tablet shape and are accommodated in a situation-positioned manner in a gap 55 left by four equally spaced cavities 6 (compare Figure 33).

The blister-pack rear wall 53 closes off the two receptacles 56 situated on both sides of the groove 17/17' extending in the longitudinal central plane. The moisture-absorbing action is thus distributed over two independent chambers. The inserts 54 have a height which is equal

to that of the receptacles 56. A support is thus very well provided by the rear wall 53, which is composed, for example, of aluminium foil.

The rear wall 53 and the longitudinal webs 51 are supported on the inside or upper side of the rear wall 37 of the housing 40. It goes without saying that the lower side of the cup-forming recess 7 could also extend up to said upper side or to the upper side of the blister pack rear wall 53.

The adapter 13 is coupled to a blister pack 8 from Figure 32 onwards in a butt application, i.e. the adapter does not overlap the outline shape of the blister pack 8. On the contrary, the adapter 13 is in this case effected through a push-button-type joint to the one rim edge 14, specifically in this case with the utilization of the peripheral, angled rim wall 52 described. Reference may be made to Figure 37.

The one pushbutton half 57, which forms a male part, is moulded out of the side-wall material of said blister pack 8. The associated female part is situated in the transverse strip 22 of the adapter 13. The pushbutton-type joint is designed in terms of force so that a detachment of the adapter 13 from the matching blister pack is deliberately possible. The pushbutton half 57 representing the male part involves mushroom-head-type, transversely slotted or cross-slotted projections having a constricted shank. The mushroom-head widened section which is accordingly present catches behind a neck shoulder 58 of the other pushbutton half 59 forming the female part. As far as is necessary for comprehension, the reference numerals are otherwise analogously applied; here again leaving a possibility of choice open, namely aligning the cutting edge 4 either on the right-hand side or on the left-hand side of the fitting 16 of the adapter 13.

The cutting edge 4 has a bracket-shaped or frame-shaped cutting-edge blade. Relative to the circular extension of the cavity 6 guided so as to be locatable, said cutting-edge blade extends along the diametrical line D-D (compare Figure 24). The cut goes almost up to the internal rim 6' of the cavity 6. First, the centrally situated point 4' penetrates the cavity-sealing section 5' of the covering foil 5 centrally. The subsequent cut is brought about by the penetration of the cutting-edge flanks 4" of the cutting edge 4, which cutting-edge flanks fall away in roof-

slope manner, in the form of a central cut. The cutting-edge flanks 4", 4" enclose an angle α of approximately 120°. The roof slopes extend symmetrically with respect to the longitudinal central axis x-x of the suction tube 3 (compare Figure 29).

The frame hollow section of the cutting-edge blade is denoted by 60. It is situated in a flow connection, open towards the cutting-edge head, to the suction channel 11 and to the transverse ventilation holes 12. It forms the open partition of the suction channel.

Extending on both sides of the diametrically aligned cutting edge 4 and spaced apart from the latter are plunger blades 61 as adjacent flanks. Their free-standing impact flanks 61' are axially markedly re-entrant compared with the exposed contour of the cutting edge 4. Said plunger blades 61 extend laterally and in parallel at a distance from the broad sides of the cutting edge 4.

The plunger blades 61 function as displacement tools. They guide the cut-slit edges of the pierced, unsupportedly stretched section 5' of the covering foil 5 to the side, proceeding virtually to the internal rim 6' of the cavity 6. This ruptures a large hole cross section. Accordingly, the cavity 6 is discharged with regard to the powder 9 with an advantageous flow.

An always identically reproducible rupture pattern results, as emerges from Figure 24. The plunger blades 61 rupture the pre-cut slit further proceeding on both sides of the cutting edge 4. Outwardly extending wedge pairs result whose wedge apex near the rim is denoted by 62. This results in tongue-shaped folded flaps 63 which are forced against the cavity rim by the plunger blades 61 and in triangular or angle-shaped intermediate flaps 64 which are due to the slit cut and are situated between a wedge apex 65 situated on the diametrical line D-D and the wedge apex 62 already described.

The plunger blades 61 may, as shown, also be sharpened, which does not in any case adversely affect their displacement function.

The clearance between the plunger blades 61 and the width, measured in the greater cutting-edge width, of the cutting-edge blade frame hollow section 60 are equal. From the root of the two elements 60, 61, the markedly narrower clear cross section of the suction tube 3 merges into a greater clear internal diameter, forming the suction channel 11. Situated in the region forming the larger cross section, are also the transverse ventilation holes 12.

Disposed symmetrically in the lower region of the transverse ventilation holes 12 are insertion limiting projections 66 for the head end of the suction tube 3, which head end can be inserted into the guide holes 2. The insertion limiting projections 66 corresponding to the lower sides and provided in quadruplicate and essentially distributed at equal angles locate the hole rim zones on the upper side of the guide holes 2 of the plate 1. In this position, the optimum insertion depth of the cutting edge 4 with respect to the cavity has been reached.

In order to make this clear to the user by simple means, the suction tube 3 has precautions for latching to the plate 1. For this purpose, latching fingers 67 are formed on the leading end of the suction tube 3. Said latching fingers extend in a free-standing manner and parallel to the cutting edge 4, and terminate in latching heads 68 which point outwards. The latching is noticeable.

When the suction tube 3 is fitted by insertion, the latching fingers 47 also travel into the guide holes 2 of the plate 1 which forms a mask.

The latching fingers 67 are outside the circular cross section of the guide holes 2 and do not therefore remove any flow path cross section. Fitting niches 69 provided in an equal number are the corresponding receptacles for the latching fingers 67, which latching fingers enter behind the hole rim of the guide holes 2. Said fitting niches are oriented in the longitudinal extension of the housing 40 with respect to the row of holes shown in Figure 1. They are situated in a common diametrical line of the guide holes 2. That can be used for the corresponding cutting-edge orientation of the suction tube 3. Said fitting niches 69 are thus already oriented in the insertion direction, but also merge at the lower side of the plate 1 into latching niches 70 (compare Figure 22). The latter are seized from below by a flank 68', situated transversely to the insertion direction, of the latching head 68. Said flank 68' is not

very steep so that the suction tube 3 can be deliberately withdrawn again from its insertion fitting. There is therefore a latching-type coupling in which the latching fingers 67 spring inwards in the radial direction for a short time. The flank 68' of the latching head 68 has a radial width which is equal to at least the deflection space 71 on the cutting-edge side between the cutting-edge head of the suction tube 3 and the back of the latching fingers 67.

As emerges particularly clearly from Figure 22, the latching niches 70 are formed by webs 72 which hold the plate 1 together over the rows of holes. They thus extend parallel to the guiding rim and have a thickness which is less than is the length or the height of the guiding hole 2. The latching niche 70 reduces the vertical height of the web 72. A withdrawal in this respect also results on the upper side. The upper side of the web 72 is obviously recessed with respect to the plate 1. In this way, there are flow webs 73 to the adjacent guide holes 2 if, for any reason, said guide holes 2 should be blocked for the inflow of air. In any case, provision is made for an adequate suction air inflow in the external surroundings of the cutting edge 4 and the plunger blades 61. The relevant inflow path based on the corresponding wall offsets is denoted in Figure 23 by 74. The retaining function of the plunger blades 61 with displacement action can also be seen in this figure with regard to the ruptured and folded-back areas of the section 5' of the covering foil 5.

Returning to the additional function indicated of the latching recess 29, it is to be explained that it also interacts with a further latching projection 75 on the housing side (compare Figure 21). The latter proceeds from the inside of the rear wall 37 of the housing 40 and engages by means of its wart-like structure in the bore at that point. In this way, the adapter 13 and the blister pack 8 suspended thereon can only be pulled deliberately out of the housing 40 of the device V.

The corresponding withdrawal movement of the blister pack 8 can furthermore be aided by pressing out the partially exposed edge 15 of the blister pack 8 from the end at that point of the housing 4. The appropriate access is achieved by a niche 76 in the plate 1, which niche crosses or intersects the compartment 35 next to the receiving space 36 in this end region in the plate 1. In addition, the niche 76 interacts with a projection 78 which can be appropriately inserted. The latter is situated at a suitable point on the inside of the flap-type lid 41.

Such a joint projection 78 has a protective action on the hinge axis 42. The joint projection 78 may, in addition, also be used to form a latch which keeps the flap-type lid 41 closed, its latch counterpart being situated at a corresponding point in the niche 76.

The version according to Figure 1 may also be such that the suction tube 3 is joined to the plate 1 by means of the flexible arm (for example a cord), be it proceeding from a central fixed point in the plate 1 (and the arm 30 being long enough to reach all the holes 2), or in that the sphere 34 remains trapped in the slot 49, independently of the blister pack (8). The slot 49 may then be closed at both ends and the tongues 16' and 16" may be seated preferably on the plate 1.

It is also possible that the sphere 34 or the like is displaceable and retained in a channel, preferably central groove 17 of the blister pack 8, in which case the adapter 13 may also be displaced with or replaced by another holding means for fixing the suction tube 3 to the blister pack when not in use.

All the feature disclosed are essential to the invention. Also incorporated in the disclosure of the application are herewith the disclosure contents of the associated/appended priority documents (copy of the prior application) in their full scope, also for the purpose of including features of these documents in the claims of the present application.

CLAIMS:

1. A blister pack device comprising a blister pack (8) with a lower base having a plurality of cavities (6) for a powdered medicament and an upper sealing foil layer (5) and a suction tube (3) for piercing the foil layer (5) and emptying the contents of a cavity (6), wherein the suction tube (3) is connected directly to the blister pack (8) so as to allow the suction tube to empty each cavity (6).

2. A device as claimed in Claim 1, wherein the suction tube (3) is detachably retained by means of an adapter (13) along one edge (14) of the blister pack (8).

3. A device according to Claim 2, characterised in that the adapter (13) is mounted on the blister pack (8) by means of a slide-in insertion joint.

4. A device according to Claim 3, characterised in that the slide-in insertion joint is provided in the region of a central groove (17) of the blister pack (8) and comprises two tongues (19,20) which receive the groove base (23) between them.

5. A device according to Claim 3 or Claim 4, characterised in that the slide-in insertion joint (28/29) is latched.

6. A device according to any of Claims 2 to 5, characterised in that the suction tube (3) is clipped into a half-shell-like fitting (16) of the adapter (13).

7. A device according to Claim 6, characterised in that the suction tube (3) is retained only with its mouthpiece side end by a tongue (16' or 16") of the fitting

(16) of the adapter (13) and in that a second tongue (16' or 16") of the fitting (16) is assigned to the oppositely situated cutting-edge end as an impact protection.

8. A device according to Claim 2, characterised in that the adapter (13) is retained at the one rim edge (14) of the blister pack (8) by means of a push button-type joint.

9. A device according to Claim 8, characterised in that the one push button half (57) is moulded out of the side-wall material of the blister pack (8).

10. A device as claimed in any of Claims 1 to 6, comprising a plate (1) which engages over and is spaced from the blister pack (8) having guide holes (2) which sit above the cavities (6) in the blister pack (8) to guide the suction tube (3) into successive cavities (6).

11. A device according to Claim 10, characterised in that the plate (1) including the adapter (13) is covered by the flap-type lid (41) of a housing (40), in which housing (40) the plate (1) forms an intermediate cover.

12. A device according to Claim 11, characterised in that, in the swung open position, the flap-type lid (41) exposes the entrance cross section (35') of a compartment (35) situated underneath the plate (1) for the insertion of the blister pack (8).

13. A device according to Claim 11 or Claim 12, characterised in that the flap-type lid (41) embraces the adapter (13) plus suction tube (3) by means of a hinge-side free space (50).

14. A device according to any of Claims 1 to 13, characterised in that the suction tube (3) is connected directly to the blister pack (8) by a flexible arm (30).

15. A device as claimed in Claim 14, characterised in that the flexible arm (30) has a thickened end (34) which is slidable in a groove (17') in the blister pack (8).

16. A device according to Claim 15, characterised in that the groove (17') of the blister pack (8) is assigned a limit stop (45) which limits the sliding movement of the thickened end (34) of the flexible arm (30).

17. A device according to any of Claims 14 to 16, when appendent on Claim 4, characterised in that the one tongue (19) of the adapter (13) has a groove (43) for inserting the flexible arm (30).

18. A device according to any preceding claim, characterised in that the blister pack (8) has moisture-absorbing inserts (54) in the region between the cavities (6).

19. A device according to Claim 15 or Claim 16, characterised in that the groove (17,17') is moulded into the wall which forms the cavities and the groove base (23) is situated approximately at the central height of the plane of the blister pack thickness and from which longitudinal webs (51) moulded from the wall material project which extend up to a blister pack rear wall (53) which is provided on the side situated opposite the blister pack covering foil (5).

20. A device according to Claim 19, characterised in that the blister pack rear wall (53) seals off a receptacle (56) for moisture-absorbing inserts (54) in the region between the cavities (6).

21. A device according to Claim 10, characterised in that latching fingers (67) are assigned to the leading end of the suction tube (3), which latching fingers, being resilient in the radial direction, enter into fitting niches (69) of the guide holes (2) of the plate (1) and engage in latching niches (70) assigned to the guide holes (2).

22. A device according to Claim 21, characterised in that the latching niches (70) are formed by webs (72) which extend in parallel with the guide hole rim and have a thickness which is less than the height of the guide hole (2).

23. A device according to Claim 22, characterised in that the upper side of the webs (72) is recessed with respect to the upper side of the plate (1).

24. A device according to any of Claims 14 to 17 as dependent on Claim 10, characterised in that the plate end of the arm (30) proceeds from a fixed point of the plate (1).

25. A device according to Claim 24, characterised in that the plate end of the arm (30) is displaceable in a longitudinal slot 48 of the plate (1).

26. A device according to Claim 25, characterised in that the sliding movement of the suction tube (3) is achieved by means of a slot guide (17',48) in which a sphere seated on the end of the arm (30) runs in a shape-locked manner.

27. A blister pack device substantially as herein described with reference to the accompanying drawings.