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2,876,501

SWAB APPLICATOR

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FIG. 1.

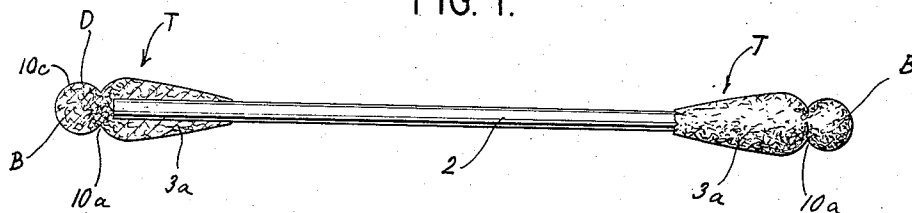


FIG. 3

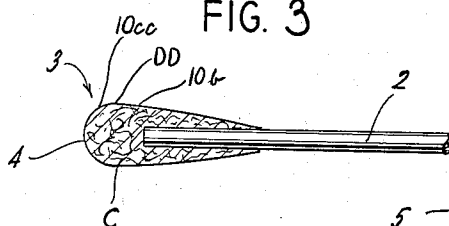


FIG. 2.

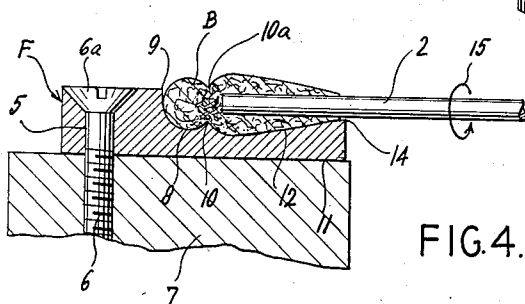
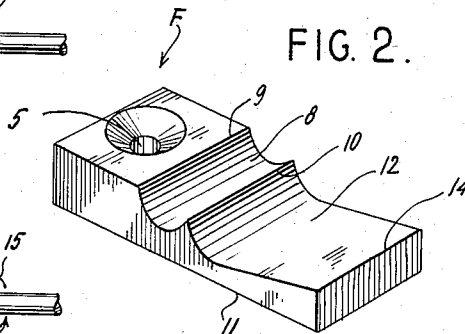


FIG. 4.

FIG. 5.

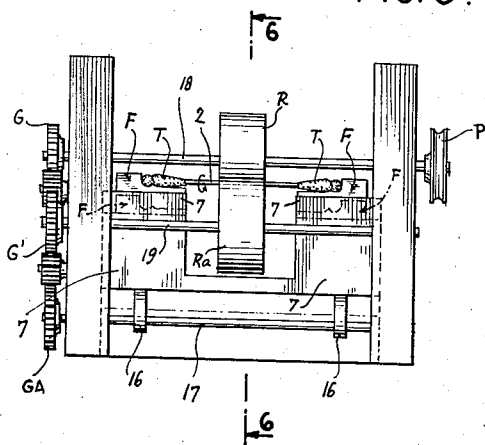
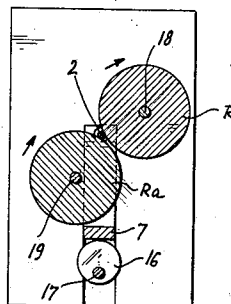


FIG. 6.



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2,876,501

SWAB APPLICATOR

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3 Claims. (Cl. 19—149)

My invention relates to a new and improved swab applicator, of the type which is made of absorbent cotton and which is ordinarily used to apply a medicament to living tissue such as the eyes or nostrils. The invention also includes a new and improved method for making said applicator, and new and improved mechanism for making the same. The invention includes the improved applicator, irrespective of the method and apparatus used for making the same.

It is well known to make a swab applicator which consists of a longitudinal stick or other mandrel, which has a wad or swab of soft and absorbent cotton or other material wrapped transversely and spirally around one or both ends of the stick or mandrel. Such applicator devices, and mechanism for making the same, are disclosed in U. S. Patents Nos. 1,652,108; 1,721,815; 1,921,604; 1,997,467; 2,006,539; 2,090,354; 2,430,648; 2,705,009.

In making a conventional swab of absorbent cotton or other material, it is well known to bond one end of a thin wad or strip of absorbent cotton to a stick, as by means of an aqueous adhesive. The wad is then wound spirally around the stick, in two or more abutting layers. The end of the spirally wound wad extends beyond the end of the stick. A finishing adhesive, such as an aqueous adhesive, is then applied to the surface of the spirally wound wad. This surface, finishing adhesive penetrates all the spirally wound layers and binds them to each other. This finishing, binding adhesive is then dried or set. The resultant conventional dried tip has its original wrapped shape. Such conventional dried tip is of uniform slight density, and it is soft and easily compressed and deformed. It has little or no cushioning effect when the stick is applied under pressure.

When the applicator is applied under normal pressure, the conventional tip easily bends and flattens, so that the tissue is subjected to the longitudinal or lateral pressure of the stick.

According to this invention, I can make an initial tip in the usual manner. This initial tip is easily shaped and molded and compressed when the finishing adhesive is wet. While said finishing adhesive is wet, I revolve the initial tip in unison with the stick around the axis of the stick.

I apply shaping pressure upon said initial revolving tip, by means of a pressure-applying surface which is urged radially inwardly toward the axis of the stick, so that the tip revolves relative to said pressure-applying surface.

I thus reshape the initial tip, while said finishing adhesive is wet. Preferably, the initial tip is thus reshaped, immediately after the finishing adhesive has been applied and penetrated the layers of the initial tip.

I thus provide a new tip, a part of which projects beyond the end of the stick. This projecting part of the new tip has a head at its outer end, and a neck which joins said head to the tip-body which remains bonded to the stick. This neck is densified by the shaping pressure, so that, as one example, the density of the neck is twice the density of the corresponding zone of the original

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tip. The outer head is also densified. The adhesive of the new tip is then dried, thus setting the new tip in its new densified shape.

The projecting part of the new tip may be co-axial with the stick.

Due to the increase in density of the new set tip, its projecting part remains firm when said new set tip is dry or when it is wetted. Under normal applicator pressure, the new set tip, either wet or dry, does not bend or flatten, thus providing an effective cushion. The head of the new set tip is absorbent, so that the applicator can be used in the usual manner.

The shape of the new head may be a ball-shape, a knob-shape or a cylindrical shape. The diameter of the new head is preferably at least equal to the diameter of the stick.

It is highly preferred to provide a ball-head of unequal density, with minimum density at the tip of the new ball-head.

This new set tip can be conveniently used for applying liquid coloring matter and for many other uses. The new tip may be impregnated with a water-soluble dye and the dry tip can be immersed in water, in order to apply the dissolved dye in said tip. Since the new tip does not substantially bend or flatten under normal pressure, a fine line can be drawn.

It is highly preferred to shape the projecting end-part of the original tip by intermittent pressure of said pressure-applying surface.

Without limitation thereto, I prefer to make a ball-head, and to provide the outer end of the tip-body with a convex shape, so that the neck is groove-shaped.

The new tip preferably has a circular cross-section in each transverse plane which is perpendicular to the axis of the stick.

For this purpose, the initial tip has a conical shape, with its widest end at the outer end of said initial tip.

The invention is further disclosed in the annexed drawings and in the following description.

Fig. 1 is an elevation, partially in vertical section, which shows the improved tip at each end of a cylindrical stick.

Fig. 2 is a perspective view of a rigid former or shaper, which is used to apply the reshaping or shaping force to the original tip, while said original tip is in wet, moldable and compressible condition.

Fig. 3 is an elevation, partially in vertical section, which shows a completely formed initial or preliminary tip, whose longitudinal projection beyond the end of the longitudinal stick is subsequently reshaped to provide the improved shape of Fig. 1.

Fig. 4 is a vertical section, partially in elevation, which shows the former in active reshaping or shaping position.

Fig. 5 is an end elevation which diagrammatically illustrates the mechanism for twirling or revolving the stick, and the mechanism for vertically reciprocating the formers from a lower idle position below the spirally wound pieces or wads of absorbent cotton, and to an upper active shaping position in which the formers contact with the spirally wound pieces or wads of absorbent cotton and shape them to the form of Fig. 4.

Fig. 6 is a section on the line 6—6 of Fig. 5.

Fig. 1 is to scale. In one illustrative commercial device, the length of the stick 2 is substantially 2.875 inches; and its diameter is substantially one-twelfth of an inch. In said illustrative commercial device, the thickest part of swab-body 3a of the new tip T has a diameter of substantially three-sixteenths of an inch. At the narrowest part of the groove 10a of tip T of said illustrative commercial device, the diameter of tip T is one-eighth of an inch to five thirty-seconds of an inch. In said illustrative commercial device, the axial length

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of tip T beyond the adjacent tip of stick 2 is substantially 0.2 inch to 0.3 inch.

The scale of Fig. 1 is close to twice the scale of said illustrative commercial device.

Fig. 3 is to the same scale as Fig. 1.

Fig. 3 shows the initial spirally wound tip 3, which is made as above described. This initial tip 3 is of conical shape, with a convex end 4.

The initial or original tip 3 is shaped to form the improved tip T, while the binder of said original tip 3 is still wet and unset. Preferably, the initial or original tip 3 is thus reshaped, immediately after said original tip 3 has been formed. The reshaped tip T is then dried, or its adhesive is otherwise set, thus retaining the set tip T in its densified shape of Fig. 1.

The improved tip T has a circular cross-section in each transverse plane which is perpendicular to the axis of stick 2.

The initial tip 3 and the improved tip T are of the same length, as can be readily seen by comparing Fig. 1 and Fig. 3.

The improved, set tip T is inwardly densified.

The densification of tip T relative to the slight density of the initial tip 3, can be ascertained by comparing the transverse or vertical dimensions of tip T in Fig. 1, with corresponding transverse dimensions in the same respective transverse zone of the initial tip 3 in Fig. 3.

Thus, the reference numerals 10a and 10b define the same vertical zones in tip T and tip 3. The density of tip T at the transverse or vertical zone of 10a is substantially twice its density in zone 10b.

The point D defines the maximum diameter of ball-head B.

This point D corresponds to point DD of Fig. 3.

The density of ball-head B in the vertical zone of point D is about 130% of its density at point DD.

The points 10c and 10cc define corresponding vertical zones. It is clear that ball-head B is only slightly densified in the vertical zone of point 10c.

Hence the densification at the tip of ball-head B is slight. Said densification increases towards the maximum vertical diameter of ball-head B, and further increases towards the groove-neck 10a.

Since absorbent cotton cannot be shaped with absolute precision in forming tip T, the shape shown in Fig. 1 is approximate.

However, by providing a neck or groove 10a of maximum density, close to the respective end of stick 2, the dry or wet head B remains substantially axially aligned with the stick 2 and acts as an effective cushion in the dry and wet condition of tip T, under normal applicator pressure.

As shown in Fig. 1, the diameter of ball-head B is greater than the diameter of the cylindrical stick 2, and the longitudinal distance between the groove-junction 10a and the respective end of stick 2 is less than the diameter of ball-head B. Due to this short distance between ball-head B and the respective end of stick 2, any bending movement of head B is limited. Also the rounded convex end of tip-body 3a limits any binding movement of head B relative to stick 2.

Fig. 2 shows a rigid former F, which has a planar bottom or outer face 11. For convenience, it is assumed that this bottom, outer face 11 is in the horizontal position, and that the longitudinal axis of stick 2 is also horizontal when the former F is applied. When said former F is used, the plane of said bottom, outer face 11 is horizontal and parallel to the longitudinal, horizontal axis of stick 2.

The inner face of former F has a recess 8, whose smooth wall is of part-cylindrical shape in this embodiment. Said part-cylindrical recess 8 has parallel and lateral edges 9 and 10. These edges are sufficiently blunt to prevent tearing or cutting the absorbent cotton C. When said former F is applied to the wet, initial unset

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tip 3, said lateral edges 9 and 10 are perpendicular to the longitudinal axis of stick 2. The inner face of former F also has an end-recess 12. This has a smooth face whose blunt lateral edge 14 is parallel to said lateral edges 9 and 10. The representation of the former F in Fig. 4 is to scale. As shown in Fig. 4, the blunt lateral edge 10 is below or transversely further away from the longitudinal axis of stick 2 than the lateral blunt edge 9. Also, the smooth face-wall of recess 12 has a part-cylindrical shape adjacent lateral edge 10, and the other outer part of said smooth face-wall of recess 12 has a planar shape, which is inclined towards the longitudinal axis of stick 2. When the former F is in active position in contact with the unset tip 3, said former F may contact with said initial wet and moldable tip 3 along the entire face-wall of recess 12, or only adjacent the part-cylindrical portion of said face-wall of recess 12. The plane of wall 11 is parallel to the longitudinal axis of stick 2 in Fig. 4.

For purposes of illustration, it is assumed that a single, preliminary, completely formed, wet and unset tip 3 has been made at each end of stick 2, and that each longitudinally projecting part of said initial unset tip 3 is to be reshaped to form the improved tip or swab T.

The preferred method of doing this is illustrated in Figs. 4 and 5.

The usual twirling friction rolls R and Ra are fixed to respective horizontal and parallel shafts 18 and 19, to which drive gears G and G' are respectively fixed. These gears G and G' mesh with an intermediate gear, so that the shafts 18 and 19 and the rolls R and Ra are revolved in unison at the same direction, as illustrated by the clockwise arrows in Fig. 6. These rolls R and Ra are revolved at the same angular velocity, as at 120 revolutions per minute.

The horizontal stick 2 is located in the usual manner between the friction rolls R and Ra, which frictionally revolve the stick 2 about the horizontal axis in the counterclockwise direction, as illustrated by arrow 15 in Fig. 4.

The two identical formers F are fixed to a common base 7 by screws 6, whose heads 6a fit in the enlarged frustoconical ends of bores 5 of former F.

The base 7 is guided for vertical sliding movement in the frame of the machine.

Cam-shaft 17 is horizontal and parallel to shafts 18 and 19.

Said shaft 17 has a gear GA, which can mesh directly with gear G', or with an intermediate connecting gear. The direction of revolution of cam-shaft 17 is not important. Cams or eccentrics 16 are fixed to cam-shaft 17. If cams are used, they may have any shape, with one or more high parts. The vertically slidable base 7 is downwardly biased by gravity or a spring to always contact with the cams or eccentrics 16. In this illustration, the members 16 are eccentrics, but they may be cams of any shape.

The shafts 18, 19, 17 and the friction rolls R and Ra may be turned in unison at the same angular speed, as at 120 revolutions per minute, thus revolving the stick 2 and its preliminary swabs 3 in unison with rolls R and Ra and the cams or eccentrics 16 at the said rate of 120 revolutions per minute.

The shaft 17 and its cams or eccentrics 16 may be turned at greater or less angular velocity than shafts 18 and 19. A clutch may be provided to connect cam-shaft 17 at any selected time to the drive mechanism, which is conventionally illustrated.

When base 17 is in its inactive bottom position, the two formers F are below and out of contact with the masses of cotton on stick 2.

Fig. 4 illustrates the top active position of base 7, to which it is vertically shifted by the cams or eccentrics 16. In said top position and below said top position, the formers F contact with and exert shaping pressure on the masses of cotton on stick 2.

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Preferably, the shaft 17 is provided with eccentrics 16, and said eccentrics 16 are revolved in unison with rolls R and R_a at the same angular velocity, and the eccentrics 16 are shaped so that the formers F contact with the initial, wet, unset tips 3 during about five-sixths of each revolution of said tips T.

The rigid formers F may be made of metal, and their recesses 8 and 12 may have very smooth and polished faces, so that there is minimum friction between said faces and the unset tip 3. Hence, although the tips 3 revolve relative to the faces of recesses 8 and 12, there is low tangential friction against said smooth faces. Also, the adhesive of initial tip 3 may be allowed to dry or set partially prior to applying the formers F, so that the desired shaping action is secured without objectionably distorting tip 3.

When the formers F are moved upwardly to contact with the revolving tips 3, the initial contact is at the smooth and blunt edge 10, which densifies the swab 3 by a spinning action, during which the tip 3 revolves freely relative to said smooth, straight blunt edge 10.

As the upward movement of the formers F is continued, the same spinning and densifying action is produced by the smooth surfaces of recesses 8 and 12, while the tips 3 continue to revolve in unison with stick 2.

The edges 9 and 14 need not contact with the revolving tips 3.

Since the projecting part of each tip 3 is short, actual commercial operation has shown that the projecting parts of tips 3 remain axially aligned with stick 2 during the operation of the formers F.

Hence it is not necessary to apply any downward pressure on the projections of tips 3 during the operation of formers F. The use of said downward pressure is optional.

Fig. 4 shows the top position of formers F, in which edge 9 is spaced outwardly from the tip of ball-head B and edge 14 is spaced inwardly from the cotton tip, and edge 14 is below the revolving stick 2, whose direction of revolution is indicated by arrow 15.

The stick 2 can be replaced by any type of support. It may be a wire. Hence, when I refer to a stick 2 in a claim, I refer to any other support.

For convenience in defining the invention in the claims, it is assumed that the stick 2 is twirled around a horizontal axis. The invention applies if the stick or other support has one or two tips. Hence, when I refer to a single tip, I include an applicator which has two tips.

I have described a preferred embodiment of my invention, but numerous changes, omissions, additions and substitutions can be made without departing from its scope.

I claim:

1. A method of shaping an unset tip of absorbent

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cotton, said unset tip consisting of spirally wound layers of absorbent cotton which are connected by adhesive, said unset cotton tip having an inner end which is fixed to an end of a stick which has a longitudinal axis, said unset tip having a projection which extends outwardly beyond said end of said stick, which consists in revolving said mass in unison with said stick around said longitudinal axis, and intermittently applying shaping pressure to said revolving mass in a zone which is intermediate said end of said stick and the outer end of said projection to reduce the diameter of said projection.

2. A method according to claim 1, in which the outer end of said projection is shaped by said shaping pressure to form a ball-head.

3. Mechanism for shaping a swab-mass whose inner end is connected to a stick at one end of said stick and which has an outer projection which extends longitudinally outwardly beyond said end of said stick, said stick having a horizontal longitudinal axis; said mechanism including twirling means adapted to twirl said stick in unison with said swab-mass around said horizontal longitudinal axis, said twirling mechanism having an active part which is operative at a part of said stick which is spaced from said swab-mass, a former, said former being movable upwardly to an upper active position in which said former contacts with said swab mass, said former being movable downwardly to a lower position in which it is below said swab-mass, actuating means for moving said former in successive strokes between said upper active position and said lower position to contact said former intermittently with said swab-mass, said former having a lateral edge between its outer end and its inner end, said lateral edge being perpendicular to said axis, said former having another lateral inner edge which is located outwardly relative to said first-mentioned lateral edge, the second-mentioned lateral edge being higher than the first-mentioned lateral edge, the upper face of said former having a part-cylindrical shape between said lateral edges, said first-mentioned lateral edge being intermediate the outer end of said projection and the end of said stick.

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