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(54) Title of the Invention: **A hair styling apparatus**
Abstract Title: **Hair styling apparatus with fluid flow channels in projections downstream of outlet**

(57) A hair styling apparatus 10 comprises a support surface 16 and a fluid outlet 20 arranged to discharge a fluid, such as air, across the surface. Spaced hair styling projections 15 project from the surface. Each tooth 15 has a channel (27, figure 3) extending therethrough for passage of fluid discharged from the outlet. The through holes 27 may be located proximate to a base of each projection, adjacent to the support surface. The support surface may be a surface of a support member 17, the member comprising a platform 23 from which the projections extend and in which apertures (30, figure 6) are formed. These holes are positioned at the bases of projections. The member includes a body on which the platform is supported. The body has protrusions (31, figure 6) extending into and plugging apertures to define lower boundaries of fluid flow channels.

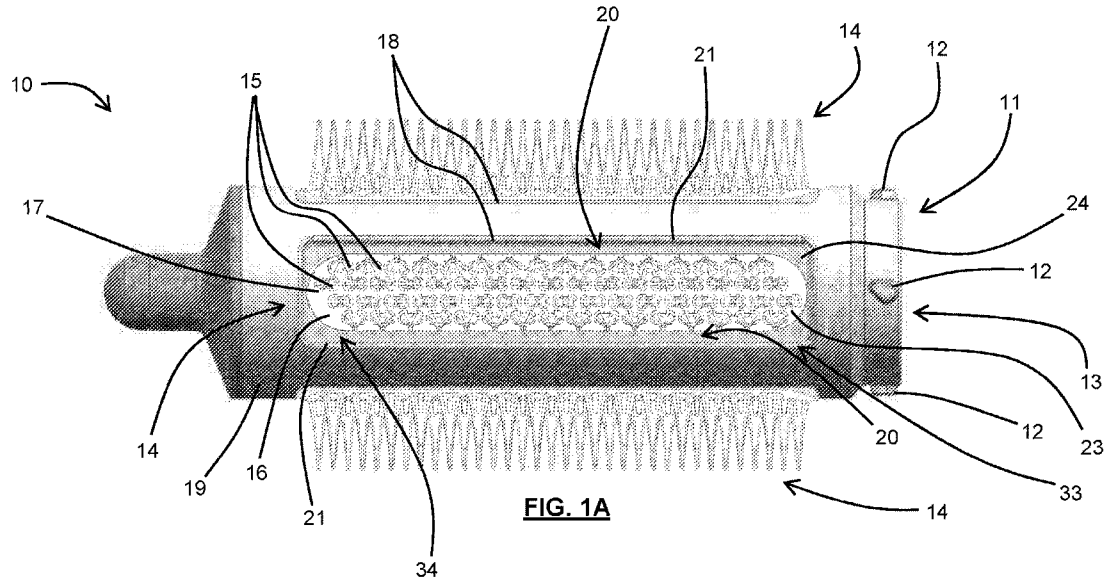

FIG. 1A

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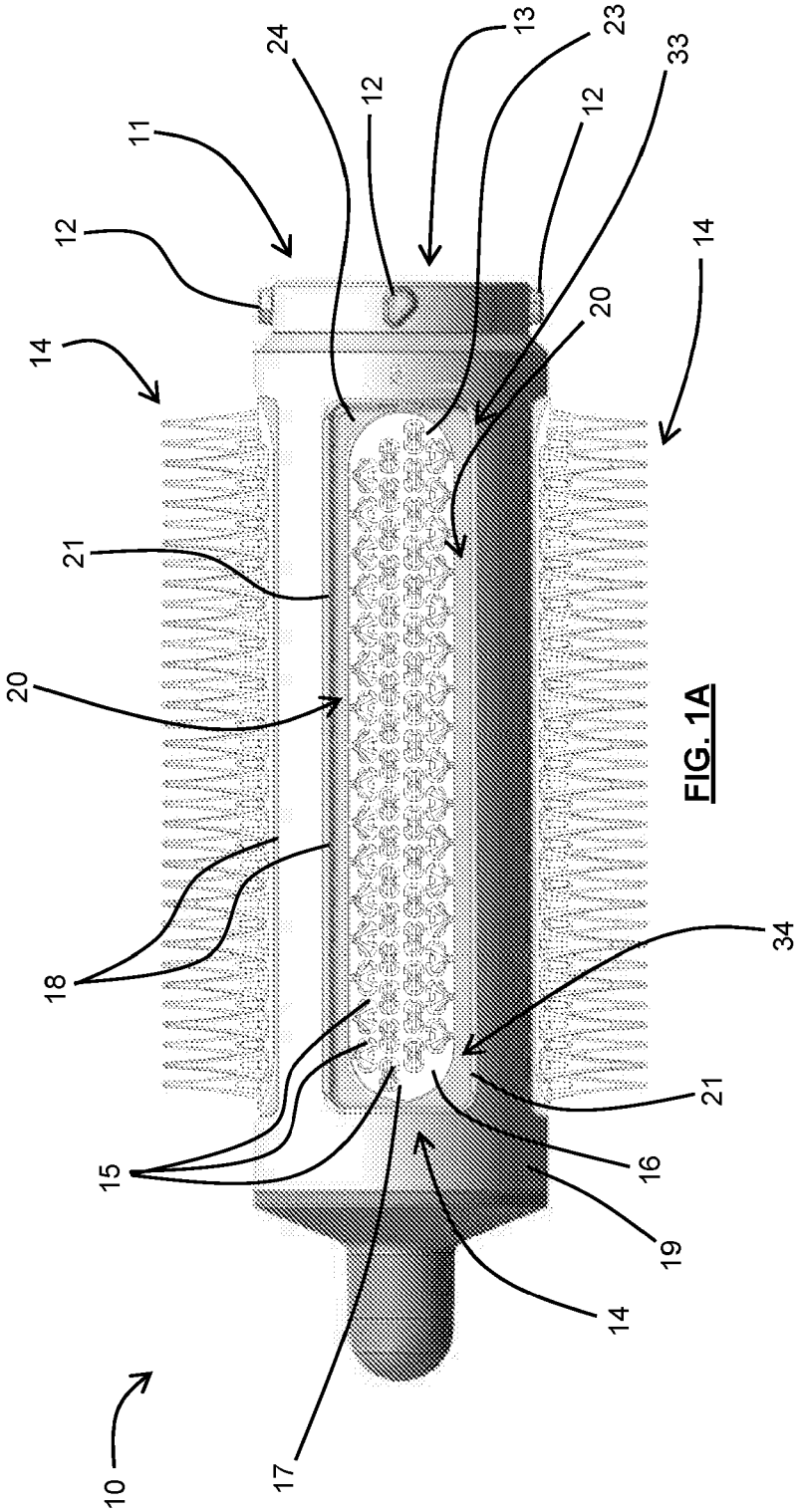

FIG. 1A

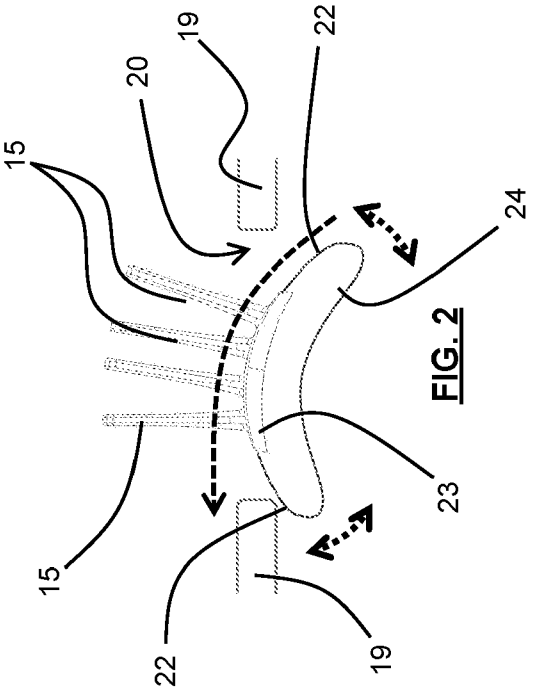

FIG. 2

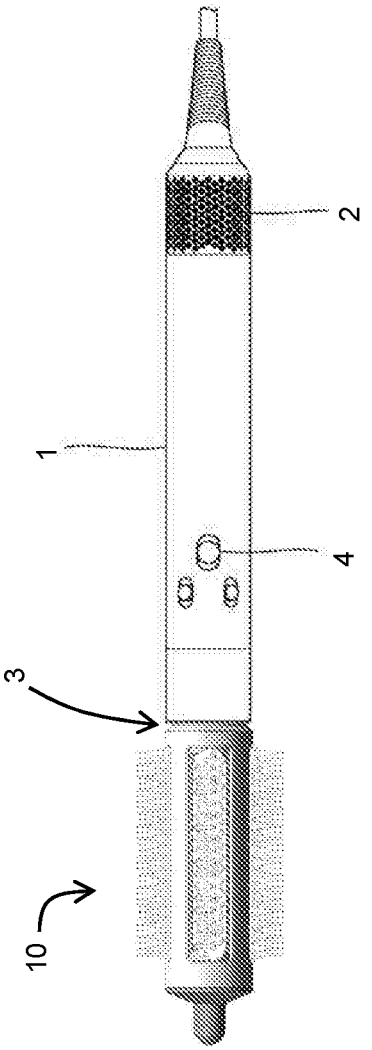

FIG. 1B

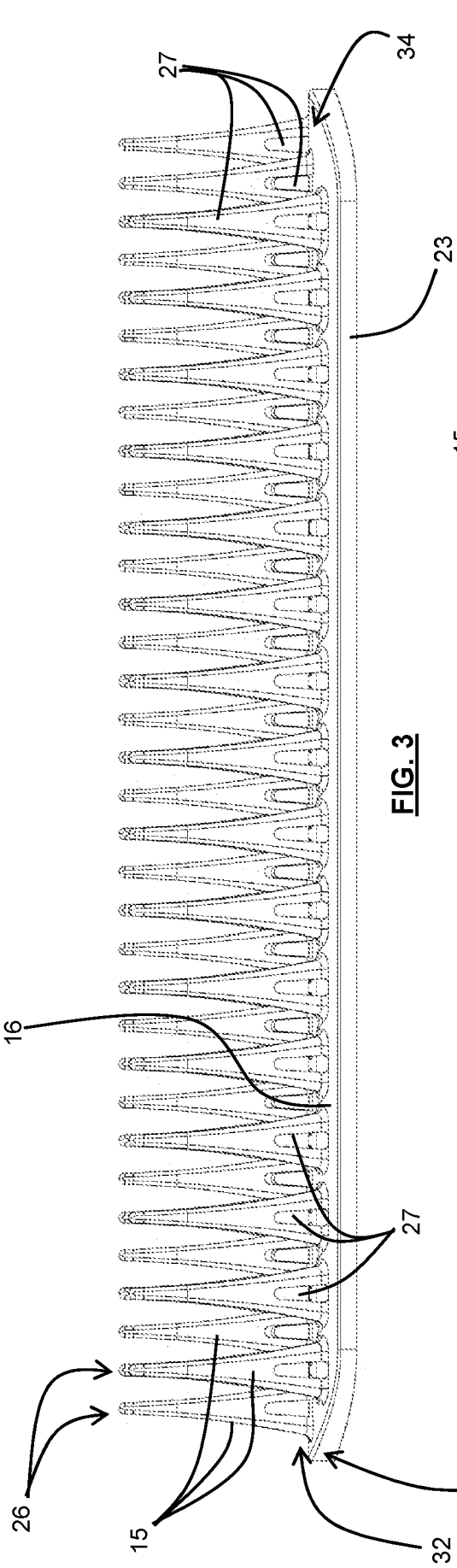

FIG. 3

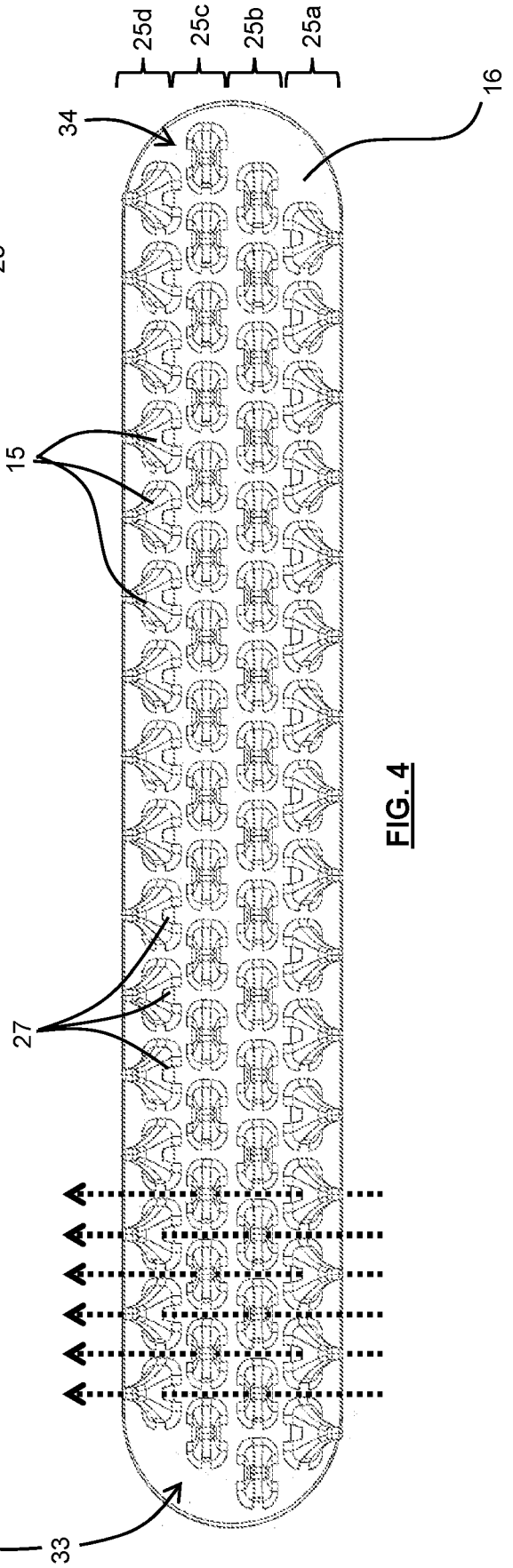

FIG. 4

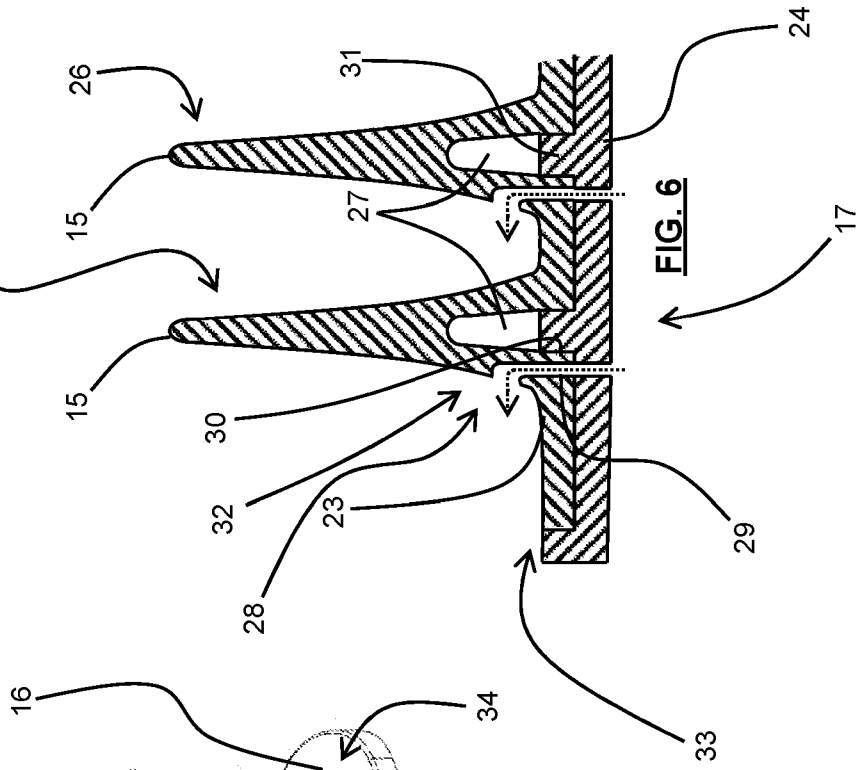

FIG. 6

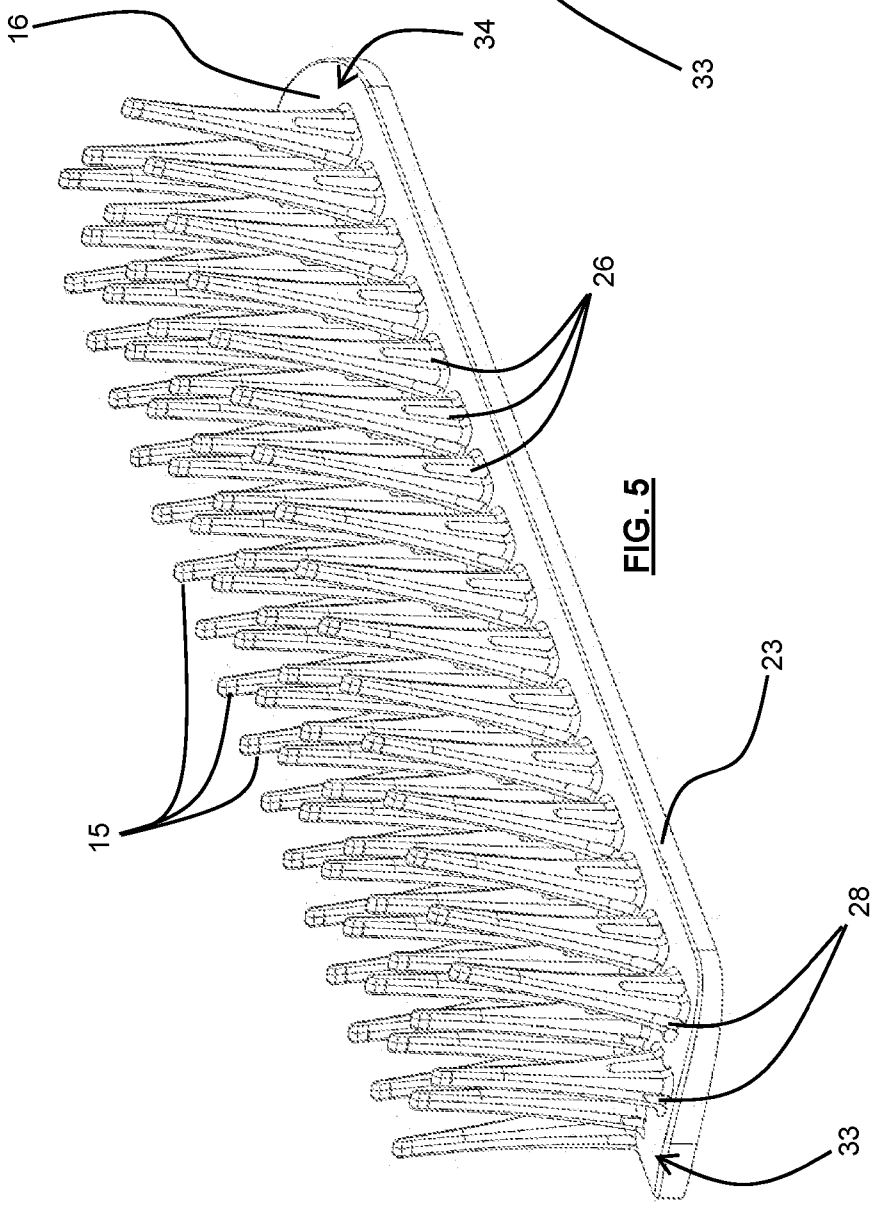

FIG. 5

A HAIR STYLING APPARATUS

Technical Field

The present disclosure relates to a hair styling apparatus of a type that makes use of a fluid flow to facilitate hair styling.

Background

Hair styling apparatuses in the form of hair styling devices or attachments (for attachment to such devices) can be used to form hair into a desired shape or style. In some cases, such apparatuses may use a fluid flow to aid in styling a user's hair. Fluid (such as air or steam) may be directed onto a user's hair to apply heat to the hair, breaking chemical bonds in the hair and allowing it to be reshaped. Additionally, or alternatively, fluid flow can be used to control e.g. the shape and position of a user's hair as it is being styled. For example, some apparatuses are known that are configured to discharge fluid flow in a manner that urges hair towards a surface and retains the hair on that surface (for example, using the Coanda effect). The ability to control hair in this manner can provide more efficient styling.

To achieve some styles, it can be desirable to provide projections, such as comb teeth or bristles. Projections of various shapes and sizes (e.g. widths) can be used to achieve different effects. Likewise, altering the spacing between projections can affect how a hair styling apparatus performs. For example, smaller spacing can increase the tension that is applied to a user's hair as the projections are moved through the hair.

While it is desirable to provide projections (such as comb teeth and bristles) in apparatuses that make use of a fluid flow (as described above), the projections can disrupt the fluid flow and reduce their ability to control hair. This disruption is especially prevalent where there is limited space between comb teeth for fluid to flow.

The control of a user's hair can also be disrupted by bleed flows, which are sometimes present in hair styling apparatuses that utilise fluid flow. The purpose of a bleed flow is to ensure that fluid can still escape from the apparatus when one or more fluid outlets (through which fluid flows in normal use) are closed. Such bleed flows prevent an undesirable build of fluid pressure within the apparatus.

In apparatuses that include multiple fluid outlets it is known to selectively open and close the outlets to control the location and/or direction of fluid flow e.g. depending on the direction the apparatus is moved along a tress of hair. In these apparatuses, it is also known to configure the outlets so that when they are "closed" a path remains for a small volume of fluid flow from the

outlet. This path provides for bleed flow in these apparatuses. However, a problem with such arrangements, as briefly mentioned above, is that bleed fluid discharged through the "closed" outlets disrupt the hair being styled and/or the (primary) fluid flow being used to style and/or control the hair.

The present disclosure has been devised in light of the above considerations.

Summary

In a first aspect, there is provided a hair styling apparatus comprising:

a support surface;

a fluid outlet arranged to discharge fluid (e.g. air) across the support surface;

a plurality of spaced hair styling projections projecting from the support surface for styling a user's hair; and

a plurality of fluid flow channels, each channel extending through a respective projection of the plurality of projections for passage of fluid discharged from the fluid outlet.

The provision of a plurality of fluid flow channels through projections of the hair styling apparatus helps to ensure that the projections provide minimal disruption to the fluid that is discharged across the support surface. This provides for improved control of hair being styled by the hair styling apparatus. Likewise, such an arrangement also allows wider and/or more closely spaced projections to be provided (while still maintaining the ability of the airflow to control hair) for increased hair tension in use.

The apparatus of the first aspect may comprise a fluid passage. The fluid outlet may be an outlet of the fluid passage. The fluid outlet may be a closeable fluid outlet.

The apparatus of the first aspect may comprise at least one bleed outlet provided on a projection of the plurality of projections. The bleed outlet may be in fluid communication with the fluid passage and arranged to discharge fluid laterally from the projection so as to allow fluid to escape from the passage when the fluid outlet is closed.

In a second aspect, there is provided a hair styling apparatus comprising:

a plurality of spaced hair styling projections projecting from a support surface of the apparatus for styling a user's hair;

a fluid passage having a closeable fluid outlet arranged to discharge fluid (e.g. air) from the apparatus onto a user's hair in use; and

at least one bleed outlet provided on a projection of the plurality of projections, the bleed outlet in fluid communication with the fluid passage and arranged to discharge fluid laterally from the projection so as to allow fluid to escape from the passage when the fluid outlet is closed.

The provision of the at least one bleed outlet allows for escape of fluid from the fluid passage when the closeable fluid outlet is in a closed position. Providing the at least one bleed outlet on a projection, and arranging the bleed outlet to discharge fluid laterally, has been found to minimise disruption to hair being styled and/or to fluid being discharged from the closeable fluid outlet (when in an open position).

The fluid outlet of the second aspect may be arranged to discharge fluid across the support surface.

The hair styling apparatus of the second aspect may comprise a plurality of fluid flow channels. Each channel may extend through a respective projection of the plurality of projections for passage of fluid discharged from the fluid outlet.

Optional features of the first and second aspects will now be set out.

Each fluid flow channel may extend through its respective projection in a direction that is substantially parallel to the direction in which fluid is discharged from the fluid outlet.

The support surface may be elongate in a longitudinal direction. The fluid outlet may be arranged to discharge fluid in a transverse direction (e.g. substantially perpendicular to the longitudinal direction) across the support surface. Each channel may extend in the transverse direction.

The support surface may be configured to promote the Coanda effect (i.e. for fluid discharged from the fluid outlet). The support surface may be convex. Such a surface may promote the Coanda effect such that fluid discharged from the fluid outlet attaches (and remains attached) to the support surface. The support surface may have a smooth convex profile.

The support surface may be convex in the transverse direction (i.e. a transverse cross-section of the support surface may be convex). Thus, when the fluid flow is in a transverse direction, the support surface may direct the fluid flow along a convex path.

Each projection may extend in a direction that is normal to the convex support surface. Thus, the projections may flare outwardly from the support surface. Such an arrangement may provide increased spacing between free ends of the projections (compared to an arrangement in which the projections are parallel). This may be beneficial for capturing and guiding hair into the spaces formed between the projections.

Each projection may extend from a base, adjacent to the support surface, to a free end. Each channel may be provided at or proximate to the base of the respective projection in which it is provided. Such positioning of the channels may maximise the proportion of fluid flow passing across the support surface that is able to pass through the channels (so as to minimise disruption of the fluid flow).

The support surface may be a surface of a support member. The support member may comprise a platform from which a plurality of projections project, and a body upon which the platform is supported. The plurality of projections may be integrally formed with the platform. The platform may include a plurality of apertures formed therein. Each aperture may be positioned at the base of a projection of the plurality of projections adjacent a respective channel of the plurality of channels. The body of the support member may comprise a plurality of protrusions. Each protrusion may extend into and plug an aperture formed in the platform so as to define a lower boundary of a respective channel.

This construction of the support member may allow formation of the fluid flow channels during moulding of the platform and projections. That is, this construction may allow die features to extend through a bottom of the platform and into the projections to form the fluid flow channels during a moulding process. This can simplify manufacture by avoiding the need to form the fluid flow channels in a separate step.

Each projection may taper inwardly in a direction from the base of the projection to the free end of the projection. Each projection may thus be wider (in the longitudinal direction) at its base than at its free end. Therefore, the projections may be more closely spaced at their bases than at their free ends. In use, the greater spacing at the free ends of the projections aids in penetration of the projections into a tress of hair. The tapering of the projections aids in guiding hair towards the support surface where the projections are more closely spaced and greater tension can be applied to the hair.

The plurality of projections may be arranged in spaced apart rows (of projections). The rows may comprise, for example, first and second adjacent rows (i.e. transversely adjacent rows). The apparatus may comprise additional rows, for example third and fourth rows of projections. Each row may extend in the longitudinal direction of the support surface. The rows may be substantially parallel to one another. As may be appreciated, each row of projections may extend along a (e.g. strictly) linear path, or may follow a curved, zig-zag, etc. path.

At least some of the channels may be provided in projections of the first row. These channels may be arranged to direct fluid received from the fluid outlet into gaps formed between neighbouring projections of the second row. Configuring the channels in this manner may reduce the disruption of the fluid flow that would otherwise be generated by the second row of projections. This configuration may additionally provide a more even distribution of fluid flow

across the support surface when compared to an arrangement in which fluid flow through channels of the first row is directed through channels of the second row.

The projections of the first row may be offset, in a direction along the first row, from the projections of the second row. In other words, the projections of the first row may be staggered with respect to the projections of the second row. Where the apparatus comprises additional rows, each row may be staggered (e.g. offset longitudinally) with respect to any adjacent rows. Again, this may help to maximise the open area available to fluid discharged from the fluid outlet (i.e. minimising disruption to fluid flow).

The projections of the first row may project at an angle to the projections of the second row such that the first and second rows diverge from one another in a direction away from the support surface. In other words, the rows of projections may flare outwardly from one another. As discussed above, flaring/diverging of the rows of projections can aid in hair penetration while maintaining the ability to apply tension to a tress of hair.

The fluid outlet may comprise an elongate slot and/or a plurality of openings spaced along a linear path. In this way, the fluid outlet may be configured to discharge fluid in the form of blade, sheet or curtain of fluid. The elongate slot and/or linear path may extend longitudinally.

The fluid outlet may extend along an edge of the support surface. For example, the fluid outlet may extend along a longitudinally extending edge (e.g. a long edge) of the support surface.

In some embodiments, each projection of the plurality of projections may be provided with a fluid flow channel.

Each projection of the plurality of projections may be in the form of a comb tooth or brush bristle. The apparatus may therefore be a hair styling comb or brush.

The hair styling apparatus may be in the form of an attachment for a hair styling device configured to supply a fluid flow to the attachment. For example, the attachment may be a brush or comb attachment. The attachment may comprise a mounting portion for releasable mounting to the hair styling device.

The apparatus may comprise a handle or a mounting portion for mounting the apparatus to a handle (e.g. a handle of the device, when the apparatus is an attachment).

The at least one bleed outlet may be arranged to discharge fluid in a direction towards the handle (or towards a device mounted to the apparatus). This may minimise the possibility of bleed fluid (from the bleed outlet) interacting with a user's hair and disrupting styling.

The at least one bleed outlet may be arranged to discharge fluid in a direction that is different to the direction that fluid is discharged from the fluid outlet. For example, the at least one bleed outlet may be arranged to discharge fluid in a direction that is perpendicular to the direction that

fluid is discharged from the fluid outlet. Thus, the at least one bleed outlet may be arranged to discharge fluid in a longitudinal direction (i.e. when the fluid outlet discharges fluid in a transverse direction).

The at least one bleed outlet may be arranged to discharge fluid onto a projection of the plurality of projections that neighbours the projection on which the bleed outlet is provided. The surface of the neighbouring projection onto which the at least one bleed outlet discharges fluid may be a solid surface (i.e. may be free of any apertures/outlets). This may facilitate diffusion of the fluid discharged from the at least one bleed outlet.

As set forth above, each projection may extend from a base, adjacent to the support surface, to a free end. The at least one bleed outlet may be provided at or proximate to the base of the projection. Providing the at least one bleed outlet close to the support surface may minimise interaction between fluid discharged from the bleed outlet and a user's hair.

The fluid outlet of the apparatus (as described above) may be a first fluid outlet, and the apparatus may comprise a second fluid outlet. The first and second fluid outlets may be spaced on opposite sides of the support surface. The first and second fluid outlets may be arranged to discharge fluid in opposite directions. That is, the first fluid outlet may be arranged to discharge fluid across the support surface in a first direction and the second fluid outlet may be arranged to discharge fluid across the support surface in a second direction that is opposite to the first direction.

As set forth above, the support surface may form part of a support member. The support member may be moveable to open and close the fluid outlet(s). For example, the support member may be configured to be moved, to open or close the fluid outlet(s), by movement of the plurality of projections as they are drawn along a tress of hair in use. In other words, the apparatus may be configured for automatic opening and closing of the fluid outlet(s) as the apparatus is drawn along a tress of hair. The support member may be pivotable to open and close the fluid outlet (or in other embodiments may be e.g. slideable).

The support member may be moveable to at least first and second positions. In the first position the first fluid outlet may be closed (i.e. fluid flow may be restricted) by the support member and the second fluid outlet may be open (i.e. for fluid flow therefrom). In the second position, the second fluid outlet may be closed by the support member and the first fluid outlet may be open. The support member may be further moveable to a third position in which both the first and second fluid outlets are closed by the support member. The third position may represent an intermediate position with respect to the first and second positions.

The support member, projections, fluid outlet(s) and at least one bleed outlet may define a first hair engagement assembly of the hair styling apparatus. The hair styling apparatus may comprise at least one further hair engagement assembly. The apparatus may, for example,

comprise four hair engagement assemblies. The hair engagement assemblies may be arranged circumferentially about the fluid passage.

The apparatus may comprise a plurality of bleed outlets, each provided on a respective projection of the plurality of projections. In some embodiments, all of the projections may be provided with a bleed outlet.

Brief Summary of the Figures

Embodiments will now be discussed with reference to the accompanying figures in which:

Figure 1A is a top view of a hair styling apparatus in the form of an attachment;

Figure 1B is a top view of the hair styling apparatus mounted to a hair styling device;

Figure 2 is a detailed section view of a support member of the hair styling apparatus of Figure 1;

Figures 3, 4 and 5 are respective side, top and perspective view of projections and a platform of the hair styling apparatus of Figure 1; and

Figure 6 is a section view of a portion of a support member of the hair styling apparatus of Figure 1.

Detailed Description

Aspects and embodiments will now be discussed with reference to the accompanying figures. Further aspects and embodiments will be apparent to those skilled in the art.

Figures 1A and 1B illustrate a hair styling apparatus 10 in the form of an attachment for mounting to a hair styling device 1 that is configured to supply a flow of fluid (in this case, air) to the apparatus 10. A body of the device 1, in the form of a handle 5, houses an air mover (in the form of a fan) that moves air from a device inlet 2 to a device outlet (not shown). The device outlet is surrounded by a device mounting portion 3 of the device 1 which allows mounting of the apparatus 10 thereto. Operation of the air mover is controlled by a user interface in the form of a switch 4.

To allow mounting of the apparatus 10 to the device 1 (which is held by a user in use), the apparatus 10 comprises a mounting portion 11 that includes circumferentially spaced lugs 12 (that engage with corresponding features of the hair styling device 1). The apparatus 10 also includes a fluid inlet 13 for receipt of fluid (i.e. an airflow) from the hair styling device 1 when mounted thereto. An internal passage (not shown) extends from the inlet 13 into the interior of the apparatus 10.

The apparatus 10 includes four hair engagement assemblies 14, only three of which are visible in Figure 1. The hair engagement assemblies 14 are arranged circumferentially about the

internal passage and are located in respective elongate rectangular openings 18 formed in a tubular housing 19 of the apparatus 10. As a result, the internal passage of the apparatus 10 is partly defined (i.e. bounded) by the hair engagement assemblies 14 and partly defined by inner surfaces of the tubular housing 19.

For brevity, only one of the hair engagement assemblies 14 will be described below. It should be appreciated, however, that all four hair engagement assemblies 14 are the same.

The hair engagement assembly 14 includes a plurality of spaced hair styling projections 15 (in this case, bristles) that project from a support surface 16, which is an outwardly facing surface of a support member 17 of the assembly 14. In the illustrated embodiment, the projections 15 are integrally formed with, and project from, a platform 23 that is embedded in a body 24 of the support member 17.

The support surface 16 is thus defined by a combination of outwardly facing surfaces of both the platform 23 and the body 24 of the support member 17. The support surface 16 is elongate in a longitudinal direction (i.e. in the direction of a central axis of the tubular housing 19) and is convex in a transverse direction that is perpendicular to the longitudinal direction (i.e. the transverse direction extending circumferentially with respect to the tubular housing 19). Thus, the support surface 16 has an inlet end 33 proximate to the fluid inlet 13 (and mounting portion 11) and an opposite, distal end 34 that is distal from the fluid inlet 13.

The hair engagement assembly 14 includes two closable fluid outlets 20 that are each in the form of an elongate slot formed between the support member 17 and a respective long edge 21 of the rectangular opening 18 in the housing 19. In this way, each fluid outlet 20 extends along one of two opposing long edges 22 of the support member 17.

As may be appreciated, each fluid outlet 20 is in fluid communication with the internal fluid passage such that fluid supplied from the hair styling device 1 (to which the apparatus 10 is mounted in use) flows along the fluid passage and can be discharged through one or more of the fluid outlets 20. In other words, the fluid passage functions as a plenum for the fluid outlets 20. As may also be appreciated, the orientation of each fluid outlet 20 means that, when fluid is discharged therefrom, it is discharged in the transverse direction across the support surface 16. Thus, the two fluid outlets 20 of the hair engagement assembly 14 discharge fluid in opposite transverse directions.

The provision of transverse fluid flows across the (transversely) convex support surface 16 means that fluid flow discharged from the outlets 20 attaches (and maintains attached) to the support surface 16. In turn, this helps to draw and maintain hair to, or close to, the support surface 16 to better control hair being styled using the apparatus 10.

As will now be explained, the provision of two fluid outlets 20 (per assembly 14) allows the apparatus 10 to be used in two opposite orientations. In practice, the apparatus 10 is typically moved along a tress of hair in a direction from a user's scalp towards the free end of the tress. To provide control of a user's hair it can be particularly desirable to direct the fluid flow in a direction along the tress of hair towards the free end of the tress. With a single fluid outlet, this would require the user to orientate the apparatus so that the single fluid outlet directs fluid flow in this "desired" direction (towards the free end of the tress). The provision of two fluid outlets 20 directing fluid in opposite directions, as in the present apparatus 10, means that regardless of the orientation of the apparatus 10 one of the fluid outlets 20 will be oriented to discharge fluid in the desired direction.

One issue this presents, however, is that one of the two fluid outlets 20 will, in use, be oriented to discharge fluid in the direction opposite to the desired direction. This additional (undesired) fluid flow can be detrimental to control of the hair. To address this, each of the fluid outlets 20 in the present apparatus 10 is closeable. Specifically, each fluid outlet 20 is configured to be closed when it would otherwise be discharging fluid in the undesired direction (i.e. along the tress towards the user's scalp).

This closing function (which is most apparent from Figure 2) is achieved in the apparatus 20 by pivotable mounting of the support member 17 to the housing 19. As the apparatus 10 is moved along a tress of hair, the friction between the hair and the projections 15 pulls the projections 15 in a direction that is opposite to the direction of movement of the apparatus 10. This movement of the projections 15 pivots the support member 17 (about a longitudinally extending axis) such that the fluid outlet 20 that is leading in movement along the tress of hair closes and the trailing fluid outlet 20 opens. The closure of the leading fluid outlet 20 is provided by movement (due to pivoting) of the leading long edge 22 of the support member 17 towards the housing 19. Likewise, the opening of the trailing fluid outlet 20 is provided by movement of the trailing long edge 22 of the support member 17 away from the housing 19.

The projections 15 of the apparatus 10 are shown in more detail in Figures 3, 4 and 5. As is apparent from Figure 4 in particular, the projections 15 are arranged in first 25a, second 25b, third 25c and fourth 25d transversely spaced apart rows, each of which extends longitudinally along the support surface 16.

Figures 3 to 6 show the projections 15 in more detail. For the avoidance of confusion, it is noted that these figures show the platform 23 in a reverse orientation to that of Figures 1A and 1B (i.e. the inlet end 33 of the support surface 16 is towards the left of each of these figures, and the distal end 34 of the support surface 16 is towards the right of each of these figures). The shape of each projection 15 is apparent from Figure 3. Each projection 15 tapers inwardly in a direction from a base 32 of the projection (adjacent to the support surface 16) to a free end

26. Thus, each projection 15 is wider (in the longitudinal direction) at its base 32 than at its free end 26. Consequently, the spacing between neighbouring projections 15 in the same row 25a, 25b, 25c, 25d is greater at their free ends 26 than at the support surface 16. The greater spacing at their free ends 26 provides improved hair penetration (i.e. facilitates insertion of the projections 15 into a tress of hair), whilst the reduction in spacing towards the support surface 16 increases the tension that can be applied to a tress of hair as the apparatus 10 is moved along the tress.

A similar varied spacing is provided between neighbouring rows 25a, 25b, 25c, 25d of projections 15. Each projection 15 projects from the support surface 16 in a direction that is approximately normal to the support surface 16. As a result of this, and because the support surface 16 is convex, the rows 25a, 25b, 25c, 25d of projections 15 flare outwardly (i.e. diverge) from one another. That is, the transverse spacing between neighbouring rows 25a, 25b, 25c, 25d of projections 15 increases in a direction moving away from the support surface 16. Accordingly, there is greater transverse spacing between neighbouring rows 25a, 25b, 25c, 25d at the free ends 26 of the projections 15 than at their bases 32. Again, this can improve the tension applied to a tress of hair while maintaining effective hair penetration.

While desirable for providing hair tension, closely spaced projections 15 can be disruptive to fluid flow across the support surface 16. To allow for the more closely spaced projections 15 of the present apparatus 10 (while still maintaining the ability to control a user's hair) each projection 15 includes a fluid flow channel 27 (best seen in Figure 3) extending therethrough. Each fluid flow channel 27 is provided at a base 32 of the projection in which it is formed (such that the support surface 16 defines a lower boundary of the fluid flow channel 27) and has a cross-sectional shape (taken perpendicular to the direction of extension of the fluid flow channel 27) that is elongate in a direction of extension of the projection 15. Further, each fluid flow channel 27 is oriented so as to extend through a respective projection 15 in the transverse direction, which means the fluid flow channels 27 are parallel to the flow of fluid discharged from the fluid outlets 20. Thus, fluid discharged from the fluid outlets 20 is able to flow through the fluid flow channels 27 rather than being obstructed (and diverted) by the projections 15. This ensures that the discharged fluid remains attached to the support surface 16 (via the Coanda effect), which in turn allows the fluid to draw a user's hair to the support surface 16 (i.e. to provide control of the hair).

To further promote flow of fluid across the support surface 16, the rows 25a, 25b, 25c, 25d of projections are arranged in a staggered pattern. This is best seen in Figure 4. Thus, for example, the projections 15 of the first row 25a are offset in the longitudinal direction from the projections 15 of the second (adjacent) row 25b. Likewise, the projections 15 of the third row 25c are longitudinally offset from those of the (adjacent) second row 25b (but are aligned with the projections 15 of the first row 25a). Finally, the projections 15 of the fourth row 25d are

longitudinally offset from the (adjacent) third row 25c, but are aligned with the projections 15 of the second row 25b.

A consequence of this configuration is that each fluid flow channel 27 is arranged to direct fluid into gaps formed between neighbouring projections 15 in the subsequent (i.e. downstream) row 25a, 25b, 25c, 25d of projections. Again, this reduces disruption of fluid flow across the support surface 16 so as to increase the ability of the fluid to control a user's hair.

In addition to the fluid flow channels 27, each projection 15 further includes a bleed outlet 28 that is in fluid communication with the fluid passage (via a bleed channel 29). These bleed outlets 28 are apparent in Figure 4 but are best illustrated by Figure 6, which is a detailed view of a portion of the support member 17 at the inlet end 33 of the support surface 17. As described above with respect to Figure 1, each of the fluid outlets 20 is closeable (by pivoting of the support member 17). In normal use, one fluid outlet 20 of each engagement assembly 14 is open. However, in a resting position, both fluid outlets 20 can be substantially closed. The support members 17 of the hair engagement assemblies 14 may be in respective resting positions when the corresponding projections 15 (of the respective assembly 14) are not engaged in a tress of hair. In use, due to the circumferential arrangement of the hair engagement assemblies 14 around the styling apparatus 10, at least some of the assemblies 14 will not be in engagement with a tress of hair, so the corresponding support members 17 may be in resting positions. At start-up (when no assembly 14 is engaged with hair) all of the support members 17 may be in resting positions. Further, at start-up, the fluid pressure generated by fluid entering the internal fluid passage can force both long edges 22 of each the support member 17 against the housing 19 (so as to increase any seal at the closed fluid outlets 20).

When a majority of the fluid outlets 20 are closed, there is a risk of pressure build-up in the internal fluid passage. The bleed outlets 28 prevent this build-up of fluid pressure by allowing fluid to escape from the fluid passage.

Each bleed outlet 28 is arranged at the base 32 of a projection 15 and is oriented to discharge fluid in a lateral direction from the projection 15 (i.e. substantially perpendicular to the direction of extension of the projection 15). More specifically, each bleed outlet 28 is positioned on a surface of its respective projection 15 that faces towards the mounting portion 11. For those projections 15 at the end of their respective row 25a, 25b, 25c, 25d nearest to the mounting portion 11, this means bleed fluid is directed towards the mounting portion 11 (and thus, in use, towards the mounting portion 3 and handle 5 of the hair styling device 1). For the remaining projections 15, bleed fluid is directed onto a (non-outlet) side of a neighbouring projection 15 which diffuses the bleed fluid. This arrangement has been found to minimise disruption to fluid flow flowing across the support surface 16.

Figure 6 also illustrates the construction of the support member 17. As previously described, the support member 17 is formed of a platform 23 (from which the projections 15 project) and a body 24. The platform 23 includes a plurality of apertures 30 formed at the base 32 of each projection 15 so as to be adjacent to (and so as to communicate with) the fluid flow channel 27 of the projection 15. This allows formation of the fluid flow channels 27 during moulding of the integral platform 23 and projections 15. That is, it allows die features to extend through the bottom of the platform 23 and into the projections 15 to form the fluid flow channels 27 during the moulding process. This simplifies manufacture by avoiding the need to form the fluid flow channels 27 in a separate step. The apertures 30 are then plugged by respective protrusions 31 formed on an upper surface of the body 24 of the support member 17 when the body 24 and platform 23 are brought together. Distal (upper) ends of these protrusions 31 thus define lower boundaries of the fluid flow channels 27.

The exemplary embodiments set forth above are considered to be illustrative and not limiting. Various changes to the described embodiments may be made without departing from the spirit and scope of the invention.

For the avoidance of any doubt, any theoretical explanations provided herein are provided for the purposes of improving the understanding of a reader. The inventors do not wish to be bound by any of these theoretical explanations.

Any section headings used herein are for organizational purposes only and are not to be construed as limiting the subject matter described.

Throughout this specification, including the claims which follow, unless the context requires otherwise, the word “comprise” and “include”, and variations such as “comprises”, “comprising”, and “including” will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of integers or steps.

It must be noted that, as used in the specification and the appended claims, the singular forms “a,” “an,” and “the” include plural referents unless the context clearly dictates otherwise. Ranges may be expressed herein as from “about” one particular value, and/or to “about” another particular value. When such a range is expressed, another embodiment includes from the one particular value and/or to the other particular value. Similarly, when values are expressed as approximations, by the use of the antecedent “about,” it will be understood that the particular value forms another embodiment. The term “about” in relation to a numerical value is optional and means for example +/- 10%.

Claims:

1. A hair styling apparatus comprising:

   a support surface;

   a fluid outlet arranged to discharge fluid across the support surface;

   a plurality of spaced hair styling projections projecting from the support surface for styling a user's hair; and

   a plurality of fluid flow channels, each channel extending through a respective projection of the plurality of projections for passage of fluid discharged from the fluid outlet.

2. A hair styling apparatus according to claim 1 wherein each channel extends through its respective projection in a direction that is substantially parallel to the direction in which fluid is discharged from the fluid outlet.

3. A hair styling apparatus according to claim 1 or 2 wherein the support surface is elongate in a longitudinal direction and the fluid outlet is arranged to discharge fluid in a transverse direction across the support surface.

4. A hair styling apparatus according to any one of the preceding claims wherein the support surface is convex.

5. A hair styling apparatus according to claim 4, when dependent on claim 3, wherein a transverse cross-section of the support surface is convex.

6. A hair styling apparatus according to claim 4 or 5 wherein each projection extends in a direction that is normal to the convex support surface.

7. A hair styling apparatus according to any one of the preceding claims wherein each projection extends from a base, adjacent to the support surface, to a free end.

8. A hair styling apparatus according to claim 7 wherein each channel is provided at or proximate to the base of the respective projection in which it is provided.

9. A hair styling apparatus according to claim 8 wherein the support surface is a surface of a support member, and wherein the support member comprises:

a platform from which the plurality of projections project, the platform comprising a plurality of apertures formed therein, each aperture positioned at the base of a projection of the plurality of projections adjacent to a respective channel of the plurality of channels; and

a body upon which the platform is supported, the body comprising a plurality of protrusions, each protrusion extending into and plugging an aperture formed in the platform so as to define a lower boundary of a respective channel.

10. A hair styling apparatus according to any one of claims 7 to 9 wherein each projection tapers inwardly in a direction from the base of the projection to the free end of the projection.

11. A hair styling apparatus according to any one of the preceding claims wherein the plurality of projections are arranged in spaced apart rows, the rows comprising first and second adjacent rows.

12. A hair styling apparatus according to claim 11, when dependent on claim 3, wherein each row extends in the longitudinal direction.

13. A hair styling apparatus according to claim 11 or 12 wherein at least some of the channels are provided in projections of the first row and are arranged to direct fluid received from the fluid outlet into gaps formed between neighbouring projections of the second row.

14. A hair styling apparatus according to any one of claims 11 to 13 wherein the projections of the first row are offset, in a direction along the first row, from the projections of the second row.

15. A hair styling apparatus according to any one of claims 11 to 14 wherein the projections of the first row project at an angle to the projections of the second row such that the first and second rows diverge from one another in a direction away from the support surface.

16. A hair styling apparatus according to any one of the preceding claims wherein the fluid outlet comprises an elongate slot and/or a plurality of openings spaced along a linear path.

17. A hair styling apparatus according to claim 16, when dependent on claim 3, wherein the elongate slot and/or linear path extends longitudinally.

18. A hair styling apparatus according to any one of the preceding claims wherein each projection of the plurality of projections is in the form of a comb tooth or brush bristle.

19. A hair styling apparatus according to any one of the preceding claims that is in the form of an attachment for a hair styling device configured to supply a fluid flow to the attachment, the attachment comprising a mounting portion for releasable mounting to the hair styling device.

Intellectual Property Office

Application No:	GB2213616.2	**Examiner:**	Mr Patrick Lucas
Claims searched:	1-19	**Date of search:**	22 February 2023

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
A	n/a	WO 2020/151029 A1 (SHEN ZHEN SANWIN) See figures 1-3 and paragraphs [0038] to [0041].
A	n/a	GB 2548820 A (DYSON TECHNOLOGY) See figures 1-6d.

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^{X} :

Worldwide search of patent documents classified in the following areas of the IPC

A45D

The following online and other databases have been used in the preparation of this search report

WPI, EPODOC, Patent Fulltext

International Classification:

Subclass	Subgroup	Valid From
A45D	0020/50	01/01/2006
A45D	0020/12	01/01/2006
A45D	0020/52	01/01/2006