

3

2057304
ADHESIVE APPLICATOR AND METHOD FOR CIGARETTE-
TO-FILTER ADHESION AND SIMILAR APPLICATIONS.
- 1 -

The present invention relates to liquid adhesive applicators, being more particularly concerned with such applicators, and methods of using the same, for providing continuous adhesive coatings on items such as cigarette filter tip papers and the like, with the aid of multiple, small nozzles through which suitable adhesive materials are pumped simultaneously to generate a plurality of parallel fine beads of adhesive upon a continuous web of such papers or the like, with the invention providing for the controlled merging of such beads into a required full, uniform and continuous coating, with control of the degree of merging when desired.

In our earlier United States Letters Patent Nos. 3,595,204; 3,323,510 and 3,174,689, highly successful hot-melt and cold adhesive applicators are described for enabling the application of a wide variety of configurations of adhesive lines, dots, bands, etc. to continuous paper or other webs drawn past appropriate nozzles through which the adhesive (or other fluid) is pumped in a controlled manner. There are occasions, however, particularly where delicate attachments are involved as, for example, in applying filter tip papers to cigarettes, that high-speed, very uniform and continuous coating layers are required throughout the paper, even though a plurality of closely spaced, small nozzles is needed to effect the required depositions. Such nozzles, of course, are limited

in the fineness of their orifices by pumping and clogging considerations and the like, and they generate beads of adhesive, not a flat, continuous uniform coating.

It is primarily to the solution of this problem of developing such
5 a continuous, uniform coating from a plurality of fine, parallel nozzle beads of adhesive, and at high speeds of continuous operation, that the present invention is directed, it being an object of the invention to provide a new and improved adhesive applicator of the multi-nozzle type, and method of operating the same, to effect such continuous coatings
10 for such applications as cigarette-to-filter adhesion and the like.

A further object is to provide such a novel applicator and method with positive control over the degree of merger of the multiple beads of adhesive extruded from the plurality of adjacent nozzle orifices.

An additional object is to provide an improved multi-nozzle fluid
15 applicator of more general utility, as well.

According to the invention there is provided a fluid adhesive applicator comprising a plurality of fine-orifice closely spaced nozzles for dispensing adhesive disposed transversely of a predetermined region; pumping means for simultaneously supplying the nozzles with the fluid
20 adhesive; means for drawing a web of material-to-be-coated longitudinally through said predetermined region in juxtaposition to the orifices of said nozzles simultaneously to receive therefrom a corresponding plurality of closely spaced beads of adhesive upon the web and extending transversely across said web; a recess defining an edge at a position
25 downstream of the nozzles in the direction of travel of the web; and means for deflecting the direction of travel of said web downstream of said nozzles to shear the web against said edge at an acute angle to the extended direction of travel of the web upstream of the nozzles to cause said parallel beads of adhesive to merge into a continuous,
30 uniform, full coating extending transversely across said web.

The invention will now be described with reference to the accompanying drawings, Fig. 1 of which is a combined schematic and isometric view

of a preferred embodiment of the invention, shown applied to the illustrative application of adhesive layers upon cigarette filter tipping paper and the like;

Fig. 2 is a view, upon an expanded scale, partly

longitudinally sectionalized, of the nozzle extruding and shearing section A of Fig. 1; and

Fig. 3 is a view similar to Fig. 2 of a modified nozzle extruding and shearing section A'.

Referring to Fig. 1, fluid adhesive from a reservoir R is fed along a supply line 1 into a positive displacement gear metering pump 3, driven synchronously by a direct machine drive, schematically illustrated at S, which also drives the paper or other web 5, such as the exemplary cigarette filter tipping paper web. Suitable metering pumps of this character are described in said Letters Patent and elsewhere, and include for example, the Acumeter (Newton Lower Falls, Massachusetts) Models 1BUP2, 1BUP4 and 1BUP24 of the assignee of the present invention. The latter model will pump 0.6cc per 1/2 revolution input per nozzle discharge. Appropriate cold adhesives for normal cigarette filter tipping applications and the like are polyvinyl acetate resin emulsions, such as HR Fuller No. 1503 and Swift & Co. No. 2802 AX. The metering pump 3 therefor, is shown applying the fluid to a novel dispensing head 7, having a transverse line of a plurality of relatively small coplanar nozzle discharge or extrusion orifices 7' through which the adhesive is simultaneously extruded as a corresponding plurality of

beads in response to the metered pumping. The return line from the pump 3 to the reservoir R is shown at 1'.

In accordance with the present invention, the transverse line of orifices 7', one of which is more particularly shown in Fig. 2 as each preceded by a converging extrusion nozzle section 7'' within the head 7, is oriented substantially parallel or at a slight angle to the paper or other web 5, drawn longitudinally upwardly past the same between web support bars 9. The bars 9 may be adjustable, as illustrated, to retract at machine shut-down to bring the web away from the nozzle head 7. The extrusion head or nozzle 7 is provided within a short distance beyond the plane of the orifices 7' upward in the direction of web travel, say within a thirty-second an inch or so, with an L-shaped recess 11 defining a shearing edge 11' over which the juxtaposed web 5 is drawn under tension at an acute angle "a" with respect to the direction of the web travel at the predetermined region of the orifice 7' in order to effect a positively directed shearing action upon the transverse line of adhesive beads 2, Fig. 2, extruded upon the web 5 at the orifices 7'. With appropriate dimensions relative to the number and fineness of orifices 7', tension of the web 5 and angle a, it has been found that such a plurality of separate extruded adhesive beads becomes shearingly merged at 2' into a full or continuous and uniform adhesive coating C upon the web 5.

The coated web 5 continues over roll 13 to and over a vacuum drum 15 where the coated paper is cut into sections, schematically shown at 5', by a rotary knife cylinder 17. The cut sections 5' of coated paper, which are to serve as the filter tip paper, are carried down to an adjacent cigarette-carrying drum 19 such that the cut filter paper section 5' will wrap around the two butted filters F and F' of the double cigarettes 4-4', the same being slit at 6 by a intermediate cutting knife 21 to provide a severed pair of cigarettes, as described in our further Letters Patent No. 4,090,520 and as is well-known, each having filter tip paper applied to its filter and secured thereto by the adhesive coatings of the invention. In order to avoid the knife 21 becoming contaminated with adhesive, moreover, the plurality of transversely aligned orifices 7' may be separated into two groups so that the coating C comprises two spaced coated portions, with the spacing centrally disposed to align with the cutter 21.

As an operational example, lines speeds of the order of 80 meters per minute have been obtained with two sets of adjacent nozzle orifices 7', a dozen orifices in each set and each of the order of 2mm. orifice diameter, spaced about 2mm. apart, and with tension over the shearing edge 11', at an acute angle α of about 25 degrees, of the order of 2 pounds

per inch of web width, using cigarette filter paper of the simulated cork paper type, about 0.05mm. thick. The family of polyvinyl acetate adhesives used have an approximate elongation ratio of 1000 to 2000 %, thus permitting the spreading of the adhesive to a very finite and controlled coating film thickness.

While in the embodiment of Figs. 1 and 2, the adhesive is extruded with the nozzle orifices 7' slightly separated from the web 5 drawn thereby, there are circumstances where it may be desirable for the orifices substantially to touch, and be wiped by the web 5, as more particularly shown in Fig. 3. This can be effected with the more horizontally oriented and closer position of the orifice plane; but with the same immediately subsequent type of shearing action being effected at the recess shear edge 11'.

Through adjustment of such orientation, orifice dimensions and spacing, web tension and angle α , coupled with the before-described synchronous adhesive metering and web line speed, a high degree of control can readily be effected upon the degree of multiple adhesive bead merging or smearing and coating extent, uniformity and thickness.

A further feature of this invention, as distinguished from prior gravure adhesive applicators, and the like, resides

in the obviating of the problem of adjusting the adhesive properties to enable a desired compromise between tack and adhesion in view of the very different properties of the dissimilar material multi-elements of the cigarette and, for example, the acetate adhesive. The invention, on the contrary, enables any adhesive property variation to be effected for any desired result in view of the inherent nature of the extrusion and shearing process thereof.

While the invention has been described in connection with the utilization of cold adhesives, furthermore, which are preferred for the above utilization, it is to be understood that the method and apparatus of the invention are also useful with hot-melt adhesives wherein performance analagous thereto may be desired. In the event that radiation-curing may in some cases be required for the adhesive, moreover, it is evident that such subsequent curing may also be employable with the system of the invention. Clearly, of course, the technique is applicable with other articles than the illustrative cigarettes filter application; and further modifications will occur to those skilled in this art, such being considered to fall within the scope of the invention as defined in the appended claims.

CLAIMS

1. A fluid adhesive applicator comprising a plurality of fine-orifice
closely spaced nozzles for dispensing adhesive disposed transversely
of a predetermined region; pumping means for simultaneously supplying
the nozzles with the fluid adhesive; means for drawing a web of material-
5 to-be-coated longitudinally through said predetermined region in
juxtaposition to the orifices of said nozzles simultaneously to receive
therefrom a corresponding plurality of closely spaced beads of adhesive
upon the web and extending transversely across said web; a recess defining
an edge at a position downstream of the nozzles in the direction of
10 travel of the web; and means for deflecting the direction of travel
of said web downstream of said nozzles to shear the web against said
edge at an acute angle to the extended direction of travel of the web
upstream of the nozzles to cause said parallel beads of adhesive to
merge into a continuous, uniform, full coating extending transversely
15 across said web.

2. A fluid adhesive applicator as claimed in claim 1 and in which
said nozzles are disposed in a housing comprising small, closely
- spaced orifices through a portion of the housing, and said edge comprises
an L-shaped recess in the portion of the housing.



3. A fluid adhesive applicator as claimed in claim 1 and in which the orifices of said nozzles are in substantial contact with the web as it is drawn there-by, with the web being drawn thereafter at an acute angle upward over said edge to effect
5 the adhesive shearing that results in the merging of said adhesive beads into said continuous coating.

4. A fluid adhesive applicator as claimed in claim 1 and in which the orifices of said nozzles are out of contact with the web as it is drawn there-by, with the web being drawn over said
10 edge at said acute angle to effect the adhesive shearing that results in the merging of said adhesive beads into said continuous coating.

5. Apparatus as claimed in claim 1 and in which the said nozzle orifices are slightly displaced from the web as drawn thereover.

15 6. Apparatus as claimed in claim 1 and in which said nozzle orifices substantially touch the web as drawn thereover.

7. Apparatus as claimed in claim 1 and in which means is provided for adjusting at least one of the web tension against said edge and said acute angle to control the merging of the adhesive
20 beads into said uniform coating.



- 33
8. Apparatus as claimed in claim 1 and in which the said plurality of nozzle orifices is divided into two groups spaced transversely from one another to define a space on the web between the resulting pairs of adhesive coatings produced by the said groups.
9. Apparatus as claimed in claim 8 and in which said web comprises cigarette filter paper, and means is provided for cutting the same into sections and wrapping the sections about butted cigarette filters, with the coatings of each of said pair of coatings being adhered to said filters.
10. A method of fluid adhesive application comprising depositing at a predetermined region a plurality of in-line closely spaced parallel beads of adhesive transversely upon a web as the web is longitudinally drawn through said region; deflecting the parallel-bead-coated web at an acute angle over an edge positioned downstream of the region of bead deposition; and controlling the size of the beads and degree of deflection relative to the speed of drawing of the web to shear the beads at said edge and merge the same into a uniform, continuous, full adhesive coating transversely across said web.
11. A fluid adhesive applicator substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.
12. A method of fluid adhesive application substantially as hereinbefore described with reference to the accompanying drawings.

