Feb. 28, 1967 G. B. KEITH 3,306,254

APPARATUS FOR APPLYING ADDITIVES TO CIGARETTE FILTER TOW

Filed Jan. 8, 1964

2 Sheets-Sheet 1

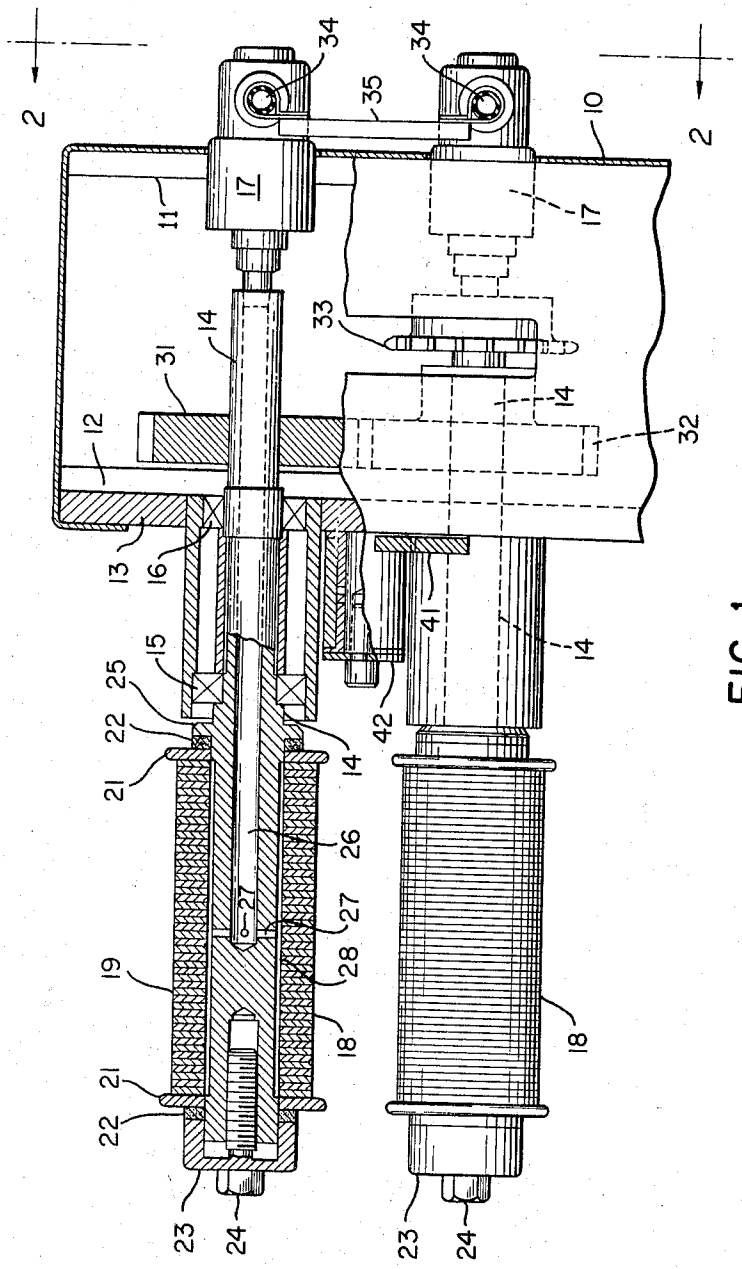


FIG. 1

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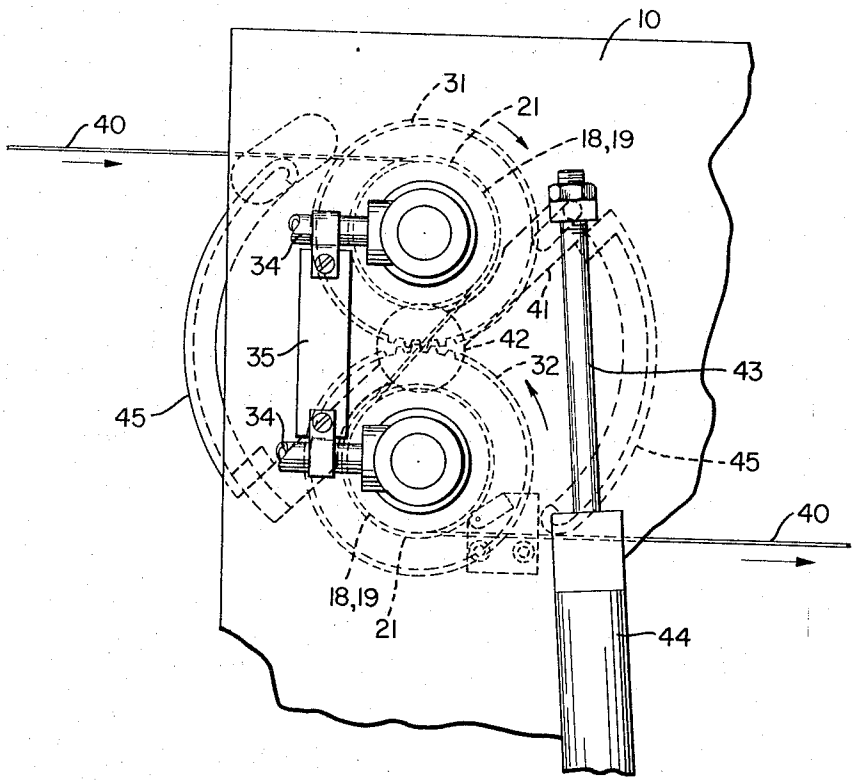


FIG. 2

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APPARATUS FOR APPLYING ADDITIVES TO CIGARETTE FILTER TOW

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6 Claims. (Cl. 118—227)

This invention relates to the application of additives to continuous filament tows and more particularly to apparatus for applying plasticizer or other additives to continuous multifilament tow which tow is suitable for use in the manufacture of cigarette filters.

In the manufacture of cigarette filter tips, it is usually customary to provide a continuous multifilament tow having crips therein, which tow, before being formed into the conventional cylindrical filter, is subjected to several preliminary treatments.

These steps include stretching and relaxing the crimped tow in order to eliminate tangled filaments and to arrange the filaments in substantial parallel relationship.

One process even arranges the crimps across the flat width of the tow so that crimps in adjacent, parallel filaments are out of registry. This advantageous arrangement results in filter tips having uniformity of pressure drop and increases the removal of combustion products from the tobacco smoke.

It has been found desirable to apply an adhesive type material to the tow which has been thus arranged so that when formed into the cylindrical filter tip it will retain the cylindrical shape thereafter.

Various devices have heretofore been employed for aplying this adhesive-like material to the tow, and while effective, have certain undesirable features.

Conventional applicators of the stationary wick type, slinger ring type and spray booth type, all drip plasticizer and thus result in plasticizer waste.

Conventional spray applicators require scavenging equipment to remove fumes, and even then, fume leakage occurs where the tow enters and leaves the spray booth.

Thus it is apparent that an improvement at this stage of the cigarette filter making process is quite desirable, and my present invention eliminates many of these undesirable features just described.

An object of the present invention is to provide improved apparatus for applying plasticizer, or other additives, to a moving, continuous multifilament tow.

Another object of this invention is to provide apparatus of the type described which eliminates waste of plasticizer, or other additives, thereby permitting more effective operation than is possible with presently employed apparatus.

Still another object of the invention is to provide an apparatus of the type described which gives a more even and uniform application of additive than is attained by apparatus employed heretofore.

A further object of the invention is to provide apparatus of the type described which can be operated to apply a high or low percentage of additive while maintaining the other advantages described herein.

A still further object of this invention is to provide apparatus of the type described which requires less maintenance.

Yet another object is to provide apparatus for treating cigarette filter tow which enables the production of filter rods having improved uniformity of hardness and pressure drop.

Other objects will appear hereinafter.

The present invention will be further understood by reference to the following detailed description and accompanying drawings in which:

FIG. 1 is an elevational and partially sectional view of my novel apparatus for applying plasticizer and other additives to continuous, multifilament cigarette filter tow.

FIG. 2 is an end elevational view taken on the lines 2—2 of FIG. 1 which in particular shows the path of the tow through the apparatus for applying plasticizer and additives to the tow, as well as means for adjusting the tow in respect to the applicators. This means is not shown on FIG. 1.

Referring to FIG. 1, there is shown apparatus suitable for continuously applying plasticizer or other flowable additives to continuous, multifilament cigarette filter tow comprising a vertically positioned frame **10** including side plates **11**, **12** and **13** which are held in position by bolts, not shown. This frame assembly supports a pair of horizontally positioned rotatably hollow shafts **14** suitably mounted in journals such as shown at **15** and **16**. One end of the hollow shafts **14** is in fluid communication with one of a pair of rotating joints **17** which are also supported by frame **10**.

On the opposite end of each hollow shaft **14** is positioned the plasticizer applicator assembly **18**, which comprises the hollow shaft **14** with a plurality of substantially flat washers **19** having apertures therethrough of a diameter larger than that of shaft **14**. The washers **19** are held between circular end plates **21** which in turn are positioned against gaskets **22**. The pressure on the washers **19** is exerted between adjustable cap **23** and shoulder **25**. Bolt **24** furnishes the clamping pressure.

When the washers are concentrically positioned around shaft **14**, as shown in FIG. 1, a cylindrical chamber **28** is formed between the shaft **14** and washers **19**. A plurality of conduits **27** extend from the central bore **26** of shaft **14** to the circumference of this portion of shaft **14** and thus connect the hollow bore **26** of shaft **14** with chamber **28**.

The upper shaft **14** is rotated in a clockwise direction and the lower shaft **14** is rotated in a counterclockwise direction through the interaction of spur gears **31** and **32**, which are rotated by means of sprocket gear **33**, which is driven by conventional means not shown.

Plasticizer is introduced into this device through rotating joints **17**, through conduits **34**, connected thereto by strap **35**. The plasticizer flows under pressure through bore **26**, conduits **27**, into chamber **28**, and thence between the several washers to the outer circumference of the applicator **18** where the continuously moving tow is contacted.

The movement of the tow and tis contact with the peripheral surfaces **18** of the two applicators is more clearly shown in FIG. 2 where tow **40** passes over and partly around the upper applicator in the clockwise direction and in the counterclockwise direction under and partly around the lower applicator. The tow is therefore coated with plasticizer on both sides during a single pass through this apparatus.

Also shown in FIG. 2 is means for changing the angle of contact of the tow with the two applicator surfaces. This means comprises an arm **41** pivoted on member **42**. Arm **41** is actuated by piston rod **43** of piston **44**. When the piston rod is moved outwardly, curved members **45** move away from the tow **40** and permit it to contact the applicator in a horizontal path. When the piston rod **43** is moved inwardly, the curved ends of members **45** lifts the tow **40** thereby increasing the angle of contact between the tow and the applicator surfaces.

My invention will be further understood from a consideration of the following example, which describes a preferred embodiment of the instant invention.

Example I

Cellulose acetate continuous filament crimped tow of

3.2 denier per filament—78,000 total denier—was withdrawn from a tow bale by the apparatus shown in U.S. Patent 3,016,581 and stretched and relaxed as described in that patent to result in an opened tow of parallel filaments with the crimps of adjacent filaments being out of registry.

At this point in the operation of the apparatus shown in said Patent 3,016,581, the tow is introduced into the apparatus of the present invention rather than into the spray chamber of the patent.

As shown in FIG. 2 of the instant drawings, the tow **40** is directed over and partly around the upper applicator and under and around the lower applicator. Plasticizer is caused to flow through the hollow shafts of the applicators and thence between the plurality of washers **19** to the surface of the respective applicators.

The plasticizer employed was triacetin and the pressure on the plasticizer and the rotational speed of the rolls was adjusted until the fibers contained 4 to 30% (preferably 6–15%) by weight of plasticizer.

To produce tow having a plasticizer content thereon within the above ranges, the applicators are preferably rotated at 300–750 r.p.m. and a pressure of 10–150 pounds per square inch is placed on the plasticizer within the device. The temperature of the plasticizer being applied may be controlled by means not shown.

Instead of triacetin, other non-toxic plasticizers which have non-toxic decomposition products such as methyl phthyolyl, ethyl glycollate, dibutyl phthalate, tripropionin and acetyl triethyl citrate may be employed.

The tow now having the desired amount of plasticizer thereon is conducted as shown, for example, in said Patent 3,016,581 to the filter-forming device where it is formed into the cylindrical filter shape and covered with a proper wrapper.

Some improvement in rod hardness and pressure drop uniformity has been noted with this applicator. This uniformity holds whether a high or low percentage of plasticizer is applied, with no difficulty being encountered in changing from a high to low percentage application. No change in washer pressure is necessary since the variation can be accomplished by regulating the volume pumped and no shutdown is required.

Maintenance on said apparatus has been found to be negligible in comparison to repacking felts and cleaning spray heads in other type applicators. Removal of the washers and dislodging foreign matter of particle size too large to escape between the washers will probably need to be done no oftener than once a year.

The surface of the washer-formed roll in contact with the tow band gives three possible variations which the stationary wick or spray booth type of applicator do not. By driving the roll surface faster or slower than the tow band plasticizer penetration into the tow mat can be controlled. Also the tow and roll surface may be driven at the same speed.

As mentioned above, the washer stack serves as a particle filter protecting the tow from considerable contamination. Only the minutest particle can escape through the space between the washers. Larger particles of foreign matter are permitted to go into the product in all three of the conventional plasticizer application methods.

Considerable difficulty encountered in the other methods of plasticizer application is avoided by this apparatus due to its ability to control the tow band width as it passes over the roll surfaces. The larger the percentage of overdrive of the roll surface over the tow speed the narrower, within limits, the tow band becomes. Obviously this makes possible the complete coverage of the oozing surface and no loss of plasticizer as well as no heavy edges

of unpenetrated tow piled up against the guide washers. Band width control is a problem with all other conventional types of applicators.

While the use of this apparatus at present has been limited to the application of plasticizer and additives to tow in the manufacture of cigarette filters, many modifications are possible as well as multiple uses. Its use as an apparatus for applying emulsion oil to tows for other purposes, for applying a coating of oil, paint, dye, melt or other material to a web of any continuous material are all immediately apparent, as well as the stripping of webbed material with many materials by the selective use of cylindrical spacers instead of washers. The use of various internal heating means to facilitate flow of sluggish liquids or melt becomes apparent.

My invention, therefore, is not to be limited either to the precise details of construction described, or to the exact use alone for which it has to date been used, but is intended to cover all modifications and uses coming within the scope of the appended claims.

I claim:

1. In a device for applying a coating material to continuous filament filter tow including, a pair of rotatable applicator members having inner and outer surfaces, each applicator being further comprised of a drive shaft having an axial passage therein, a plurality of substantially flat discs having apertures therethrough positioned on said shaft and being spaced relative thereto, thereby forming a chamber between the inner surfaces of the discs and the shaft, means for compressing the disc against each other, at least a single passage-way in the shaft connecting the chamber with said axial passage, means for conducting the coating material through the passage into the chamber and thence between the discs to thereby coat the outer surface of the applicator with a layer of said material, means for rotating said applicators in opposite directions, and means including movable members adapted to move into and out of contact with said tow, thereby raising and lowering the tow with respect to the applicators and thus adjusting the angle and area of contact therebetween.

2. In the device of claim **1** wherein said movable members are adapted to pivot about a line parallel with the axis of said applicator members.

3. In the device of claim **1** wherein said movable members are actuated by a piston means.

4. In the device of claim **1** wherein said applicator members are overdriven by said interconnected drive means thereby controlling the width of said tow as it passes over the applicator members.

5. In the device of claim **4** wherein said interconnecting drive means includes interacting spur gears secured on the drive shaft of each of said applicator members.

6. In the device of claim **1** wherein said means for compressing the discs against each other is adjustable thereby permitting the spacing between said discs, and thus the material that flows between said discs to be varied.

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