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Burrus et al.

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[54] **METHOD AND DEVICE FOR PRODUCING A CIGARETTE FILTER UNIT**

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[51] **Int. Cl.** **A24c 5/50**

[58] **Field of Search** ..... 93/77 FT, 1 C, DIG. 1

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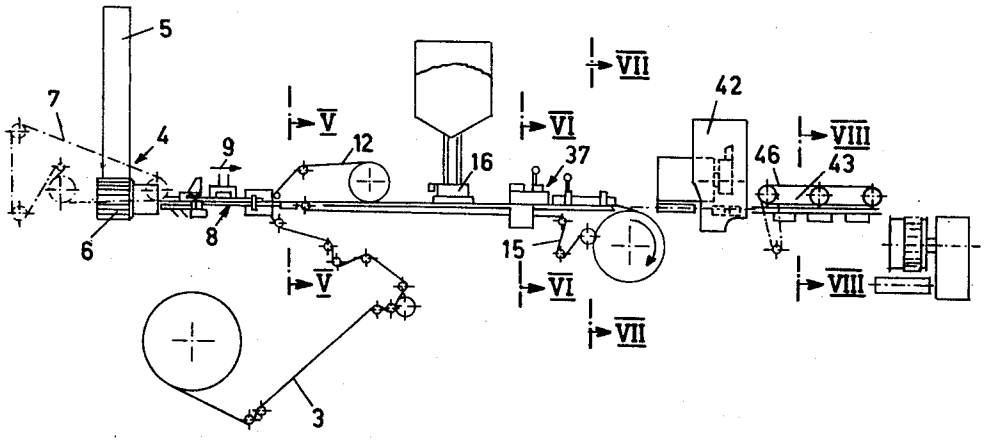
[57] **ABSTRACT**

The invention relates to a method and a device for producing a cigarette filter unit wherein an external cover strip eventually shaped as a tube, is glued around the entire periphery of filter elements which are spaced and aligned axially within said tube, fluent filter material being disposed between adjacent pairs of filter elements within the tube.

4 Claims, 8 Drawing Figures



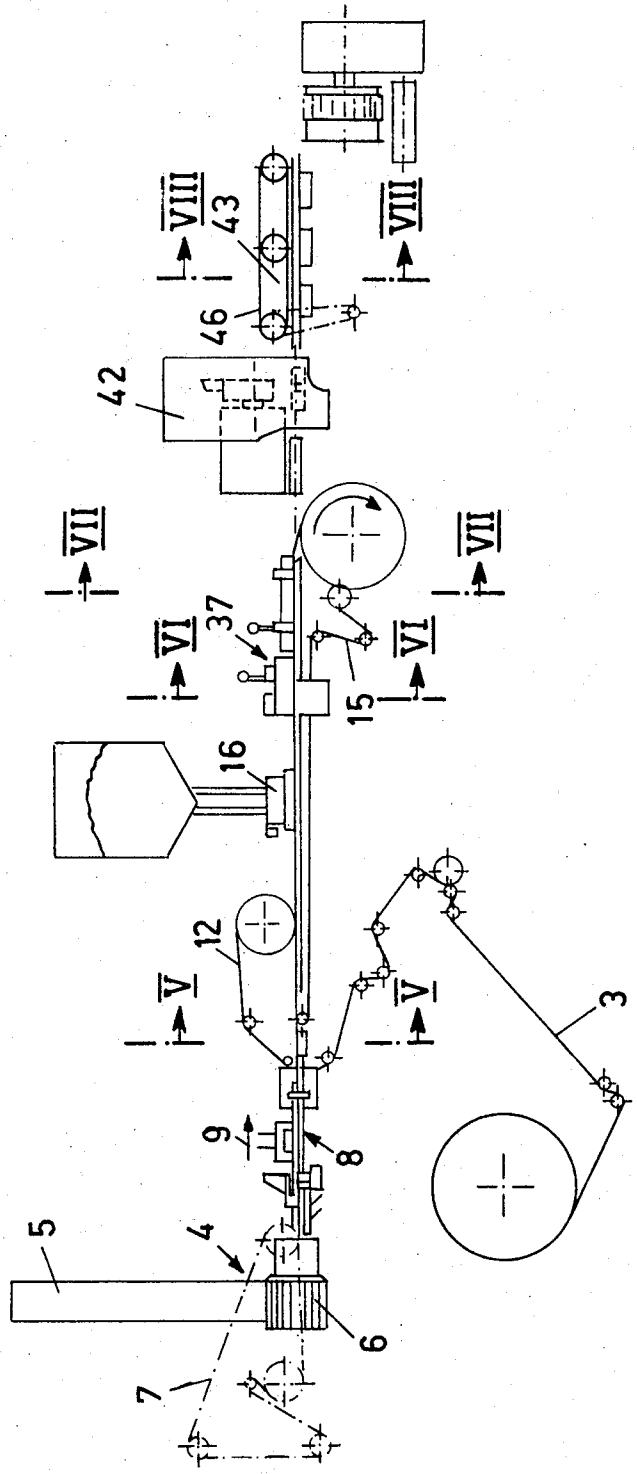


Fig. 1

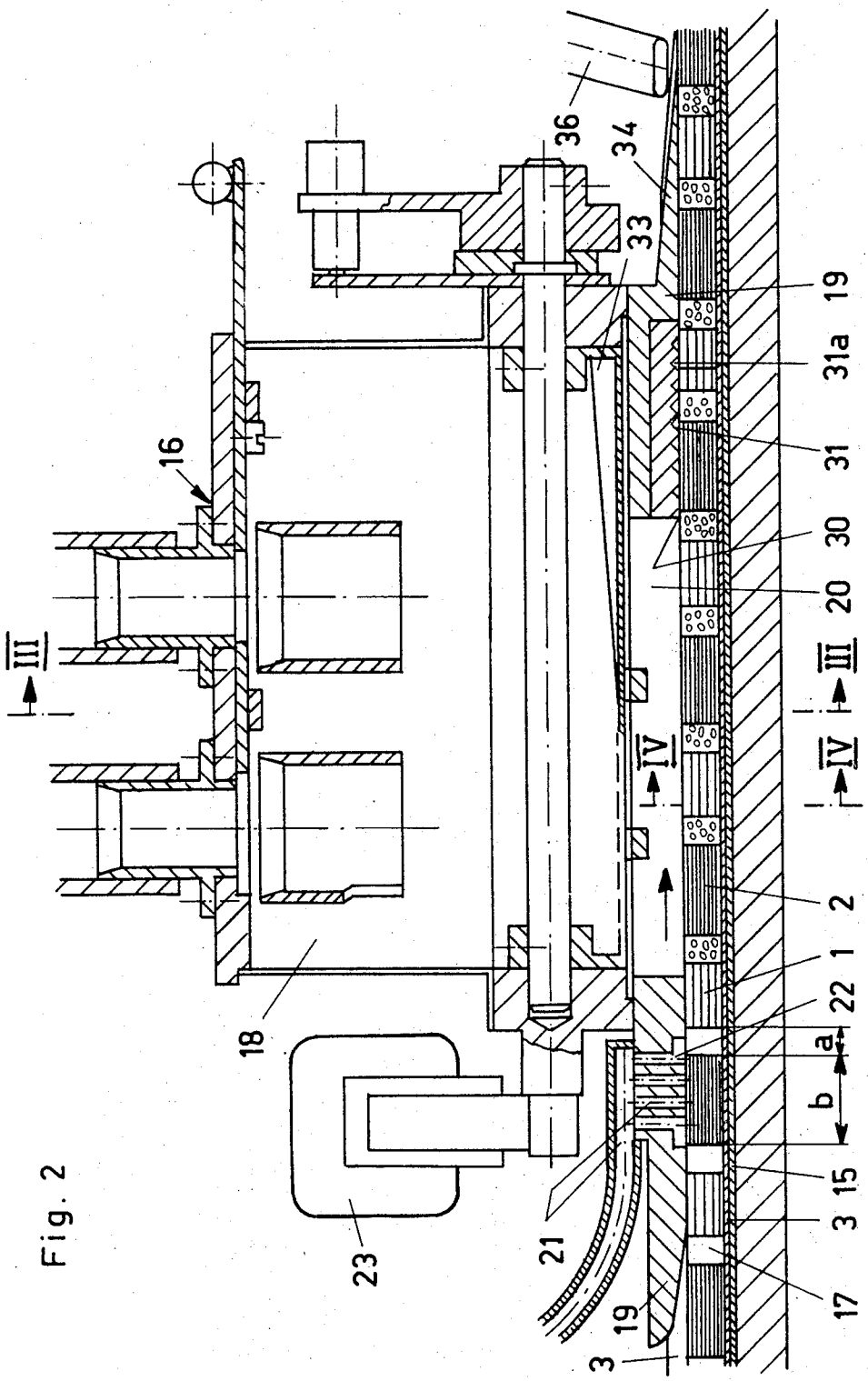


Fig. 2

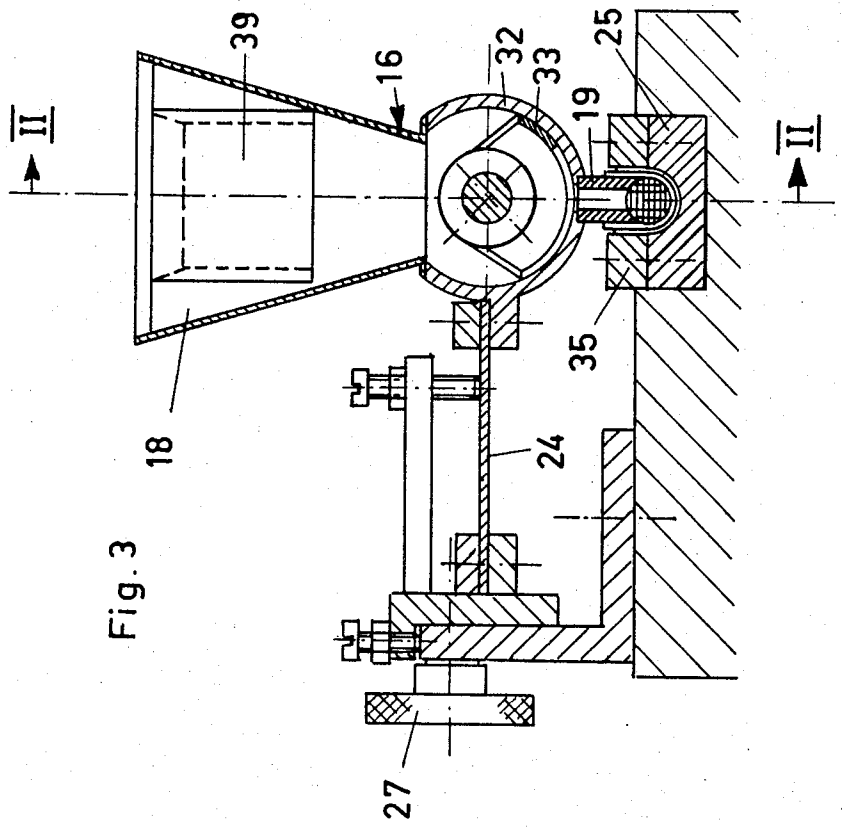


Fig. 3

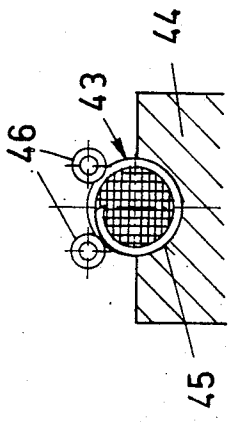


Fig. 8

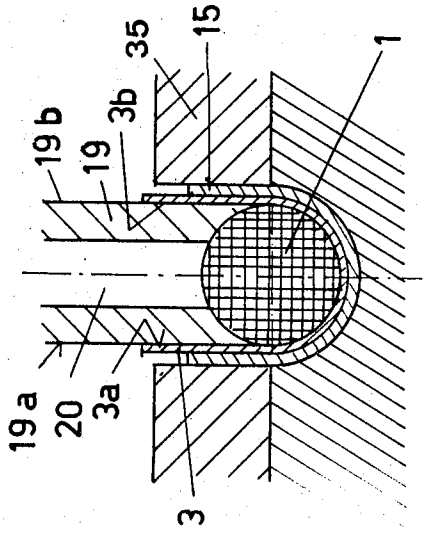


Fig. 4

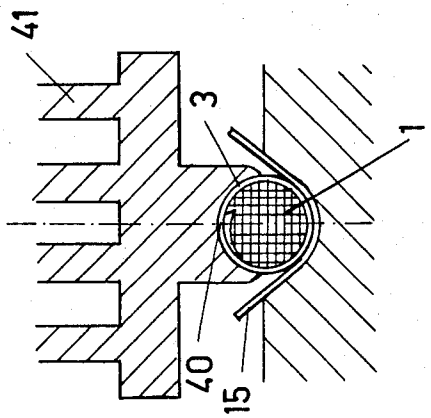


Fig. 7

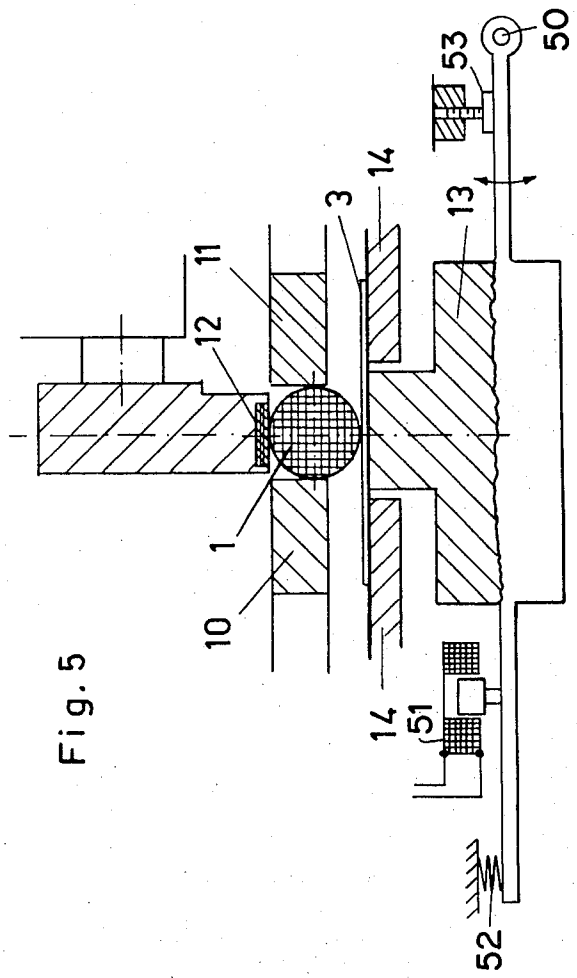


Fig. 5

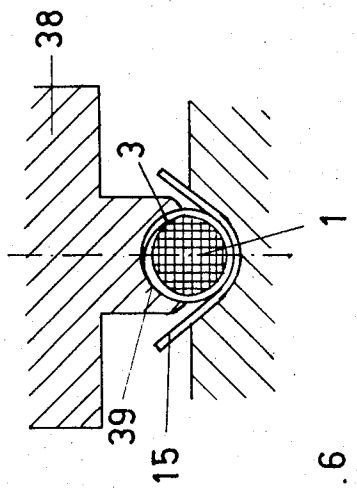


Fig. 6

METHOD AND DEVICE FOR PRODUCING A CIGARETTE FILTER UNIT

The present invention relates to a method and a device for producing a cigarette filter unit having sections of fibrous and fluent filter material arranged alternately within an external tube.

Known methods for producing a cigarette filter unit within which sections of fibrous and fluent filter material are arranged one behind the other generally involve the adhesion of the cover strip surrounding the filter material along its overlapping edge zones. The disadvantage of this is in many cases that fluent filter material penetrates between the outside of the elements comprising fibrous filter material and the cover strip and enters the mouth of the smoker, which is very unpleasant.

The object of the present invention is to create a method which does not have this drawback.

The method in accordance with the invention is characterized in that a series of filter elements uniformly spaced apart from each other and aligned axially in respect of each other are continuously attached on a continuously supplied mouthpiece cover strip which is coated on the side which comes into contact with the filter elements by a thermoplastics plastics material, by means of at least localized softening of the thermoplastics plastics coating by means of a first heating device, after which the filter elements and the cover strip are moved, with a view to the formation of chambers which are located between the filter elements and provided with a supply aperture, past a filling member which is provided with at least one filling aperture, a specific quantity of fluent filter material being poured out of the filling member into the chambers located between the filter elements, the edges of the cover strip then being made to overlap with the result that the cover strip forms a closed tube, completely enclosing the filter elements and the fluent filter material, after which the cover strip is connected over the whole periphery of the filter elements with the latter by means of softening the thermoplastics plastics coating by means of a second heating device.

The present invention further provides a device for carrying out the method in accordance with the invention which is characterized in that it has a guide device which shapes the cover strip to form a tube which completely encloses the filter elements and the chambers located between them which are filled with fluent filter material in such a way that the edges of the cover strip overlap one another, and a sealing device provided with an element which is adapted to be heated and to be placed on the tube which is to be sealed with a view to connecting to each other the edges of the cover strip which overlap one another, by the fact that the heatable element is provided with a guide channel which is at least approximately semicircular in shape seen in cross-section, and whose radius of curvature corresponds to the external radius of the tube to be produced, in the fact that there is provided directly behind the guide channel of the heatable element a further analogous guide channel of a cooling member adapted to be placed on the tube with a view to setting the heat-softened adhesive and a further heatable element located, seen along the direction of movement of the tube which is to be sealed, behind the heatable element of the sealing device, a guide channel of which connects the as yet unglued part of the cover strip which has been shaped to form a tube to the filter elements. This device has the further advantage that as a result of the initial welding of that part of the cover strip containing the overlapping edges of the cover strip and the immediate cooling of the same a precise tube diameter is achieved without releasing the welded tube.

In order to avoid damage to the cover strip when the device is stationary it is expedient if the means for attaching the individual filter elements on the cover strip comprise a heating element which is adapted to move towards and away from the side of the cover strip remote from the filter elements, and that an adjusting mechanism is provided to bring the heating element so close to the cover strip when the latter is moved forwards that an adhesive which is located on the cover strip and softens under the influence of heat is softened at least locally, and when the cover strip is stationary moves it so far from the latter that the cover strip is not damaged by the heat radiating from the heating element.

The invention is explained below by way of example with the help of the drawing. These show:

FIG. 1 a diagrammatic side view of a device for producing a cigarette filter unit;

FIG. 2 a section along the line II—II in FIG. 3. through the filling part;

FIG. 3 a section along the line III—III in FIG. 2;

FIG. 4 a section on an enlarged scale along line IV—IV in FIG. 2;

FIG. 5 a section along line V—V in FIG. 1 to show the attachment part;

FIG. 6 a section along line VI—VI in FIG. 1 to show the upper welding part;

FIG. 7 a section along line VII—VII in FIG. 1 to show the cooling part; and

FIG. 8 a section along line VIII—VIII in FIG. 1 to show the lower welding part.

In the device shown in FIG. 1 the supply means for the continuous supply of a series of cylindrical filter elements 1 and 2 made of fibrous material, separated at uniform distances from each other and aligned axially in respect of each other on to a continuously supplied mouthpiece cover strip 3 have for example a machine 4, which is referred to in the cigarette industry as D.A.P.T.C.-machine made by Molins and is described in more detail in U.S. Pat. specification No. 2,957,285. This machine 4 is provided with two storage containers 5 for storing cylindrical filter material pieces made for example from cellulose and acetate and two rotatable cylinders 6 to receive the latter. The machine 4 is driven via the chain drive 7.

Cylinders 6 are provided along their periphery with grooves running parallel to their axes of rotation to receive the pieces of filter material and have a specific number of radially running grooves into which rotatable knives engage with a view to subdividing the rod-shaped pieces of filter material into the smaller filter elements 1 and 2.

After the subdivision of the rod-shaped filter material pieces into the smaller filter elements 1 and 2 the cylinders 6 pass the latter to a transport and distancing device 8, which moves the filter elements 1 and 2 forwards in the direction of the arrow 9 alternating with each other and axially aligned and simultaneously creates equal distances between them.

The filter elements 1 and 2 which are at a uniform distance from each other and aligned axially in respect of each other are continuously supplied to a mouthpiece cover strip 3 which is continuously supplied in like manner, placed on the latter and, as can be seen from FIG. 5, guided in a lateral direction through the guide parts 10 and 11 and kept, by means of a clamping strip 12 which is arranged above the mouthpiece cover srip 3 and rotates synchronous thereto in their positions relative to each other.

The mouthpiece cover strip 3 is coated on the side facing the filter elements 1 and 2 with an adhesive which can be softened by heat, such as for example a thermoplastics plastics material, so that it is possible to attach the individual filter elemtns 1 and 2, immediately after they have been transferred on to the cover strip 3, to the latter with the help of a heating element 13 and thus to render impossible relative displacements towards each other, in other words a change in the distance between them. The mouthpiece cover strip 3, as can be seen from FIG. 5, rests on a support member 14, and the heating element 13 is adapted to be pressed from below through a slotted aperture in the support member 14 against the cover strip 3 and therefore indirectly against the filter elements 1 and 2 which are to be attached. The temperature of the heating element 13 is preferably thermostatically controlled. The arrangement of the heating element 13 is such that when the cover strip 3 is stationary, it is lifted off from the latter in order to prevent the latter burning. This can be effected by any suitable means such as by arranging the heating element 13 for pivotal movement about an axle 50, an electromagnet 51 being used to raise the heating element into contact with the underside of the cover strip 3 against a counterforce exerted by compression spring 52 which serves to withdraw the heating element away from the cover strip 3 when the electromagnet 51 is deenergized. An adjustable stop 53 can be provided to determine the distance that the heating element 13 is raised.

After the individual filter elements 1 and 2 have been attached on the cover strip 3 the latter is led on to an endless conveyor belt 15 and these parts then arrive together in a guide rail which acts as a shaping member, where the cover strip 3 is placed around the filter elements 1 and 2 which are attached to it in at least approximately U-shape during its forward movement.

This structure is then guided by means of the conveyor belt 15 to a filling part 16 which is shown in more detail in FIGS. 2, 3 and 4, said member serving to introduce fluent filter material, such as e.g. activated carbons, into the chambers 17 formed between the individual filter elements 1 and 2. In order that the chambers 17 be properly filled with fluent filter material, the storage container 18 of the filling member 16 is connected on its downward-directed outlet side via a sliding member 19 which rests on the filter elements 1 and 2 and encloses them by at least 180° to a suction device 21 which, seen along the direction of movement of the cover strip 3, is housed in front of the filling aperture 20 of the filling member 16. The width of the sliding member 19 corresponds approximately to the diameter of the filter elements 1 and 2 which are to be encased in the cover strip 3, side surfaces 19*a* and 19*b* (FIG. 4) of the sliding member 19 running parallel to each other and to the direction of movement of the conveyor belt 15 and serve to provide a sealing structure of the surfaces 3a and 3b, which face in opposite directions, of the arms of the cover strip 3 which is in the shape of a U. In this way the limited chambers 17 are formed by the front edges of the filter elements 1 and 2, the cover strip 3 and the sliding surface of sliding member 19.

The distance between the suction aperture 22 located in the sliding surface and the filling aperture 20 is greater than the length *a* of the chambers 17 formed between the filter elements 1 and 2, with the result that during the forward movement of the latter these are completely enclosed in a practically air-tight manner between the suction aperture 22 and the filling aperture 20 as far as the filter elements 1 and 2, with the result that the suction arrangement 21 can evacuate these chambers through filter elements 1 and 2. The arms of the U-shaped cover strip 3 are as a result of the underpressure prevailing in the chambers 17 pressed in practically air-tight manner against the side surfaces 19*a* and 19*b* of slide member 19.

The chambers which have been evacuated in this way then pass under the exit slot 20 of the storage container 18 which forms the filling aperture, whereupon the fluent filter material located in th latter is drawn in bursts into the chambers 17 emerging under the sliding surface.

In order to help the chambers 17 to be completely filled and the fluent filter material in the storage container 18 and in the outlet slot 20 to slide downwards, the filling member 16 is provided with a vibrator 23, the effect of this being that the filling part 16 which is suspended in resilient manner on leaf springs 24 (FIG. 3) oscillates at 100 Hz in a vertical plane.

A semicircular-shaped stipping edge 30 is provided at the end of the outlet slot 20 and this limits the cross-section of the filter elements 1 and 2 passing through and strips off surplus fluent filter material. As this stripping edge 30 is subjected to considerable wear while the device is in operation it is located in an exchangeable stripping section 31 which is adapted to be inserted into the slide member 19.

The stripping member 31 is additionally provided on its underside with transverse grooves 31a which strip any grains of the fluent filter material which may still be found on the filter elements away from the latter, pick them up and pass them into the following chambers 17.

In order to modify the size of the outlet slot 20 to suit the size of grain of the fluent filter material, the lower part 32 of the storage container 18 is designed in the shape of a cylinder in which a scoop/trough-shaped closure member 33 is housed, this being adjacent to the inside of this cylinder-shaped part 32 and adapted to rotate around the longitudinal axis of the latter.

This ability of the outlet slot 20 to be sealed off is also advantageous if the operation of the device is interrupted or the filling member 15 is to be raised to release the cover strip 3 which is filled with filter elements 1 and 2 and located thereunder, after the clamping screws 27 have been released. The upper part 35 of the guide rail 25 is so designed in the terminal area 34 of slide member 19 that the cover strip 3 is given the shape of a closed tube, a suction device 36 being provided to suck off any fluent filter material which may possibly be located between the edges of the cover strip.

A closure device 37 is provided to connect the edges of the cover strip which are now overlapping each

other, said device, as can be seen from FIG. **6**, having a heatable element **38** which is adapted to be placed on the tube which is to be sealed.

In order to avoid fluent filter material passing between the outside of the filter elements and the inside of the cover strip and thence into the mouth of the smoker when the filters are attached to the cigarettes, which occurrence is very troublesome, it is important that the cover strip is glued to the filter elements over the whole of their periphery.

To this end the heatable element **38** is provided with a guide channel **39** which is semicircular in shape when seen in cross-section, and whose radius of curvature corresponds to the external radius of the tube which is to be produced. In order to achieve an exact diameter of the tube which is to be produced a further analogous guide channel **40** of a cooling member **41** which is adapted to be placed on to the tube is housed directly behind the guide channel **39** of the heatable element **38**, in order to set the heat-softened plastics material (FIG. **7**).

After the tube has been glued it is led to a separating device **42** in which it is subdivided in such a way that the length of each filter structure amounts to six times the length of one cigarette filter.

A further glueing device **43** is provided (FIGS. **1** and **8**) behind the separating device **42**, and its heating element **44** lies against the tube from below. The guide channel **45** of this heating element has a semicircular-shaped cross-section and connects the part of the cover strip **3** which has been shaped to form a tube which is not yet glued to filter elements **1** and **5**, with the result that the latter are completely glued to the cover strip **3** over the whole of their periphery and no fluent filter material can escape from the chambers **17**, between the filter element surfaces and the cover strip **3**. Endless, coiled rotating wires **46** exert pressure on the upper side of the tube sections.

The chambers of the filters are completely filled in this device, and the complete liberation of the filter element surfaces from fluent filter material and dust from filter materila by the stripping member **31** and the suction device **36** results in a clean cutting surface when the filter elements are separated by the separating device **51**. By glueing the filter elements over their whole periphery to the cover strip there is an additional guarantee that no fluid filter material can pass into the smoker's mouth.

What we claim is:

1. The method for making a triple filter unit for subsequent attachment to the end of a tobacco-filled cigarette and wherein said filter unit is constituted by two cylindrical filter elements of a fibrous material separated by a cylindrical filter element composed of granular filter material, which comprises the steps of;

arranging a series of said fibrous filter elements in longitudinal spaced relation along a longitudinally traveling cover strip intermediate the side edges thereof, said cover strip having a width which exceeds the circumference of the filter elements and being provided with a heat-softenable adhesive surface engageable with the surface of the filter elements,

heating said traveling cover strip so as to effect softening of the adhesive surface thereof,

wrapping said heated cover strip longitudinally to form an upstanding substantially U-shaped enclosure which surrounds and becomes adhered to the lower surface portions of said longitudinally spaced filter elements,

passing said U-shaped cover strip with the lower surface portions of said filter elements adhered thereto through a filling station wherein granular filter material is discharged from a source of supply through the top opening provided by the upstanding portions of said U-shaped enclosure into the spaces existing between the ends of consecutive filter elements,

thereafter wrapping the upstanding portions of said U-shaped cover strip around the remaining surface portions of said filter elements to form an overlapped joint which thereby completes a full enclosure of the filter elements by said cover strip, and

heating said wrapped around cover strip thereby to effect adhesion between the overlapped portions of said cover strip as well as between said cover strip and all other remaining non-adhering surface portions of said filter elements.

2. The method as defined in claim **1** wherein the heating of said wrapped around cover strip is effected in two steps separated by a cooling step, the first of such heating steps serving to effect adhesion between the overlapped portions of said cover strip as well as adhesion between the upper half of said cover strip and the corresponding upper surface portions of said filter elements, said cooling step serving to set the adhesive and establish the final diameter of said cover strip, and said second heating step serving to effect adhesion between the lower half of said cover strip and the corresponding remaining non-adhering lower surface portions of said filter elements.

3. Apparatus for making a triple filter unit for subsequent attachment to the end of a tobacco-filled cigarette and wherein said filter unit is constituted by two cylindrical filter elements of a fibrous material separated by a cylindrical filter element composed of granular material which comprises;

means for arranging a series of said fibrous filter elements in longitudinal spaced relation along a longitudinally traveling cover strip intermediate the side edges thereof, said cover strip having a width which exceeds the circumference of the filter elements and being provided with a heat-softenable adhesive surface engageable with the surface of the filter elements,

means for heating the central portion of said traveling cover strip so as to effect softening of the adhesive surface thereof,

means for wrapping said heated cover strip longitudinally to form an upstanding substantially U-shaped enclosure which surrounds and becomes adhered to the lower surface portions of said longitudinally spaced filter elements,

a filling station through which said U-shaped enclosure is passed and wherein granular material is discharged from a source of supply through the top opening provided by the upstanding portions of said U-shaped enclosure into the spaces existing between the ends of consecutive filtered elements,

first guide means through which said U-shaped enclosure is passed after leaving said filling station and wherein the upstanding portions of said enclosure

are overlapped to form a tube totally enclosing said fibrous filter element and the granular filled spaces therebetween, said guide means including an adhesive softening heating element having a substantially semicircular heating surface contacting the overlapped portions of said tube and whose radius of curvature corresponds to the desired outside radius of the tube, said heating element serving to adhere the upper surface portions of said filter elements to said tube,

second guide means through which said tube is passed after leaving said first guide means, said second guide means including a substantially semicircular cooled surface whose radius of curvature corresponds to the desired outside radius of the tube and which contacts the surface portions thereof heated by said first guide means to solidify the heat-softened adhesive, and

third guide means through which said tube is passed after leaving said second guide means, said third guide means including a substantially semi-circular adhesive softening heating surface contacing the lower half of said tube and which serves to adhere the remaining non-joined surface portions thereof to the corresponding surface portions of said filter elements.

4. Apparatus as defined in claim **3** for making a triple filter unit for cigarettes wherein said means for heating the central portion of said traveling cover strip includes a heating element mounted for movement towards and away from the side of the cover strip remote from the fibrous filter elements, and an adjustment mechanism for bringing said heating element close to the cover strip when the latter is traveling so as to soften the adhesive surface in contact with the filter elements, and for moving said heating element away from said cover strip when the latter is stationary thereby to prevent damage to said cover strip by the heat radiated from said heating element.

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