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Block et al.

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[54] **APPARATUS FOR PRODUCING FILTER RODS OR THE LIKE**

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[73] Assignee: **Hauni-Werke Korber & Co. KG,** Hamburg, Germany

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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 181,996, Sept. 20, 1971, , which is a continuation-in-part of Ser. No. 861,829, Sept. 29, 1969, abandoned.

[30] **Foreign Application Priority Data**

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Dec. 30, 1970 Germany 2064536

[52] **U.S. Cl.** ..... **93/1 C,** 93/77 FT, 156/178, 156/203, 156/438, 156/466

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

[58] **Field of Search** ..... 156/180, 438, 441, 466, 156/498, 499, 203, 178; 93/1 C, 77 FT

[56] **References Cited**

UNITED STATES PATENTS

2,900,988	8/1959	Crawford et al.	131/267
3,060,814	10/1962	Wagner et al.	93/1
3,619,328	11/1971	Preston et al.	156/461

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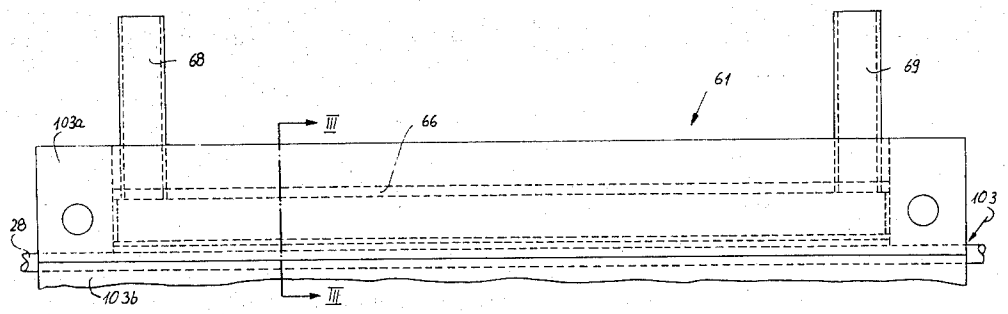
[57] **ABSTRACT**

A filter rod making apparatus wherein a web of wrapping material is draped around a compacted rod-shaped filler of fibrous material to form a tubular wrapper. The marginal portions of the web are bonded to each other by a layer of heat-activatable or heat-hardenable adhesive which is caused to set during travel of the wrapper through a passage of circular cross-sectional outline. A portion of the surface which surrounds the passage is provided on an elongated rib of a heating or cooling device which influences the adhesive and exerts a pressure against the seam which is formed by the overlapping marginal portions of the web.

8 Claims, 3 Drawing Figures



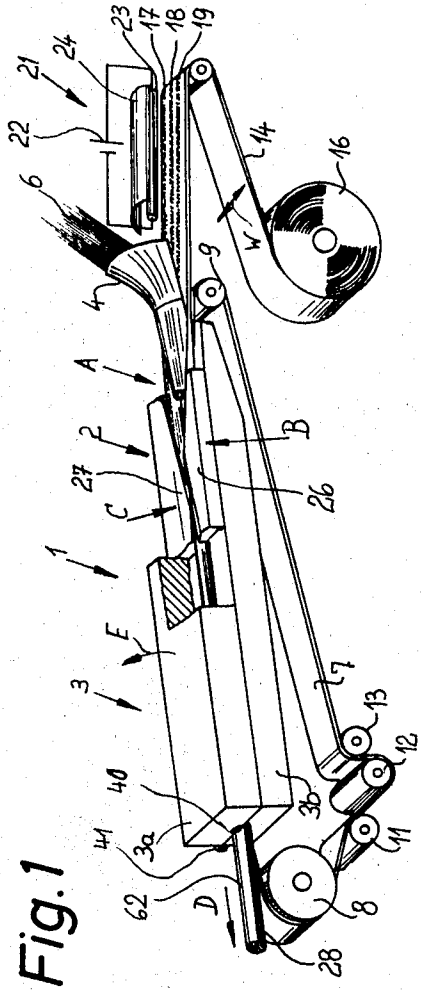

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Fig.1

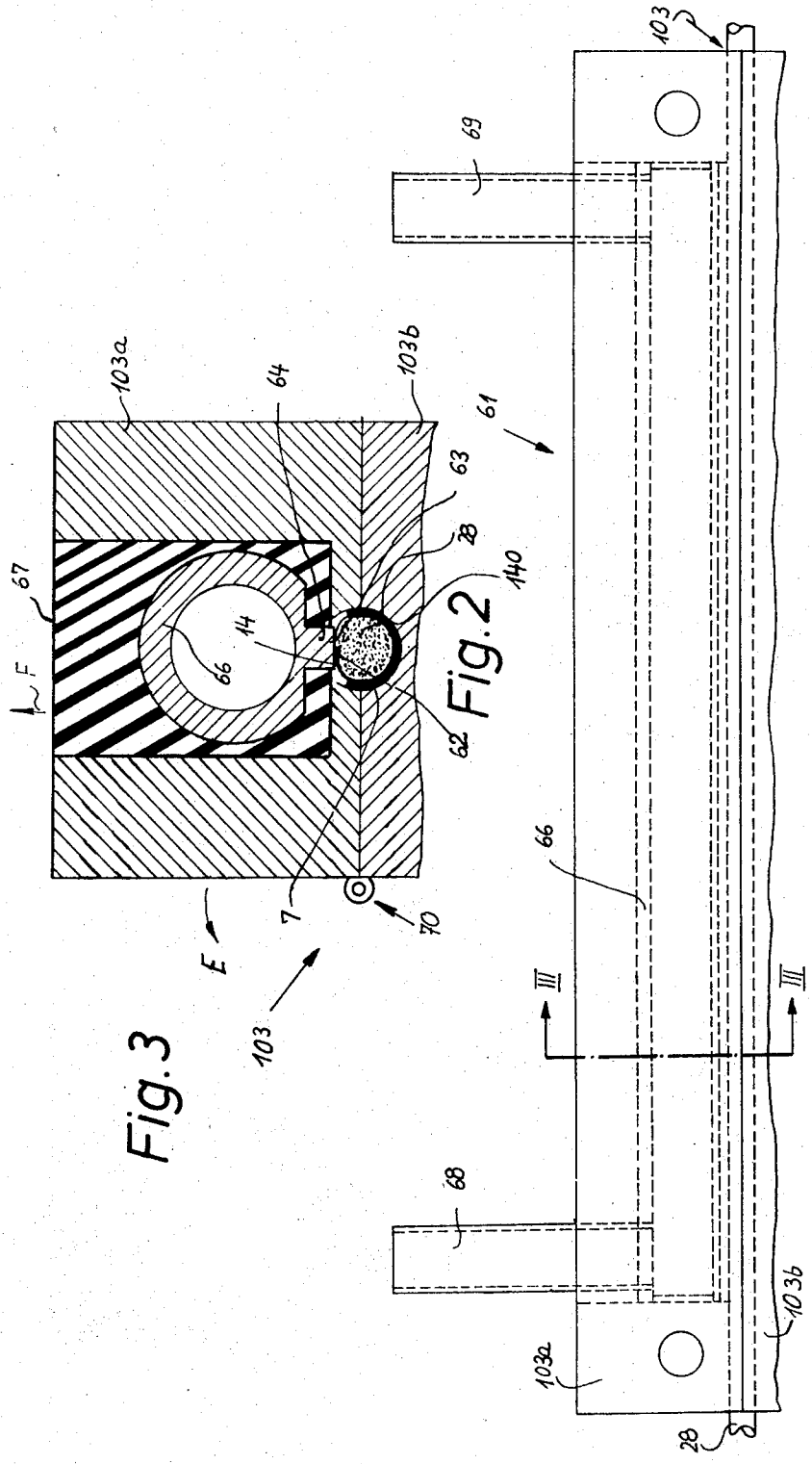
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Fig. 2

Fig. 3

APPARATUS FOR PRODUCING FILTER RODS OR THE LIKE

CROSS-REFERENCE TO RELATED APPLICATION

This is a continuation-in-part of our copending application Ser. No. 181,996 filed Sept. 20, 1971 for "Method and apparatus for forming filter rods or the like," which in turn is a continuation-in-part application of Ser. No. 861,829, filed Sept. 29, 1969, now abandoned.

BACKGROUND OF THE INVENTION

The present invention relates to apparatus for the making of rods wherein a tubular envelope of paper or other suitable wrapping material surrounds a rod-like filler of tobacco, fibrous filter material or the like. More particularly, the invention relates to improvements in apparatus for the making of rods which can be subdivided to yield cigarettes, cigars, cigarillos or filter rod sections.

Cigarettes, filter rod sections and like rod-like articles are normally produced in so-called continuous rod making machines wherein a continuous rod-like filler is confined in a tubular envelope or wrapper. The wrapper is draped around the filler so that its marginal portions overlap and are bonded to each other by a suitable adhesive. The adhesive can be applied to one or both marginal portions of the web which is converted into the wrapper prior to or during draping of the web around the rod-like filler. Such adhesive may be of the heat-activatable type (i.e., an adhesive which must be heated in order to become active and to bond two overlapping portions of a web or strip to each other) or a heat-hardenable adhesive which sets more rapidly if it is subjected to a heating action. If the adhesive is of the heat-activatable type, it may be heated prior to or during placing of the marginal portions of a wrapper into actual contact with each other. As a rule, the heat-activatable adhesive is thereupon cooled so as to insure that it furnishes a satisfactory bond between the two marginal portions. Such cooling can be effected in a tubular guide unit of the apparatus wherein the freshly formed increments of the rod advance toward a suitable cutoff.

It was found that the outline of a wrapped tobacco rod or a filter rod normally deviates from a desired outline, i.e., that the rod is often out of round. This can adversely influence further treatment of the sections which are obtained upon subdivision of the rod. For example, a wrapped tobacco rod section of circular cylindrical outline cannot be properly connected with an oval or substantially oval filter stud because the uniting band which connects one end of the tobacco rod section with one end of the stub is likely to provide at least one path for the inflow of atmospheric air during smoking of the filter cigarette.

It was further found that, when a wrapped tobacco rod or a filter rod is being produced at a very high speed of up to 300 meters per minute, the time which is allowed for the setting of adhesive is so short that the seam of the tubular wrapper is likely to burst open, especially if the wrapper surrounds a rod-like filler of strongly compacted or condensed tobacco shreds or fibrous filter material. As a rule, the seam of the wrapper on the rod is scanned by a suitable detector which automatically arrests the apparatus in response to detection of a defective seam. This causes substantial losses in output.

SUMMARY OF THE INVENTION

An object of the invention is to provide a novel and improved apparatus which is capable of insuring that the cross-sectional outline of a rod wherein a tubular wrapper surrounds a filler of tobacco or other fibrous material does not deviate, or does not appreciably deviate, from a desired or optimum outline even if the rod is produced at a very high rate of speed.

Another object of the invention is to provide a compact, relatively simple and reliable apparatus which insures rapid setting of adhesive in the seam of a tubular wrapper which surrounds a rod-like filler of compacted elastic fibrous material.

A further object of the invention is to provide an apparatus which is particularly suited for the making of filter rods and wherein proper setting of adhesive is insured irrespective of the exact nature of adhesive which is utilized in the seam.

An additional object of the invention is to provide an apparatus which can be rapidly converted for the making of rods from different types of wrapping material and/or different types of adhesive.

Our invention resides in the provision of an apparatus for producing a rod wherein a rod-like filler of fibrous or like material is confined in a web having overlapping marginal portions which are bonded to each other by at least one layer of heat-activatable or heat-hardenable adhesive. The apparatus comprises a bobbin, a roll or an analogous source of preferably convoluted web (e.g., a strip of paper or reconstituted tobacco), an endless belt or analogous conveyor means for transporting the web lengthwise from the source along a predetermined path, means for feeding a continuous rod-like filler (e.g., tobacco shreds or acetate fibers) into a first portion of the path, and converting means for draping successive increments of the web around successive increments of the filler in a second portion of the path so that the marginal portions of the thus draped web overlap and contact each other whereby the web is converted into a tubular wrapper having a longitudinally extending seam which is formed by the two marginal portions and the layer of adhesive between such marginal portions. The converting means comprises guide means which defines a passage bounded by a surface which influences the outline of the tubular wrapper. In accordance with a feature of the invention, the guide means includes adhesive-influencing means which is adjacent to the seam of the tubular wrapper in the passage. Such adhesive-influencing means preferably includes a (heating and/or cooling) device for influencing the temperature of adhesive and for preferably applying a predetermined pressure to the exterior of the seam in the passage of the guide means.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The improved rod forming apparatus itself, however, both as to its construction and its mode of operation, together with additional features and advantages thereof, will be best understood upon perusal of the following detailed description of certain specific embodiments with reference to the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a fragmentary perspective view of a rod forming apparatus which embodies one form of the invention;

FIG. 2 is a fragmentary side elevational view of a portion of a second rod forming apparatus; and

FIG. 3 is a transverse vertical sectional view as seen in the direction of arrows from the line III—III of FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring first to FIG. 1, there is shown a portion of an apparatus which is utilized for the production of a continuous filter rod 28. The apparatus is of the type known as KDF and produced by Hauni-Werke, Körber and Co., K.G., of Hamburg-Bergedorf, Western Germany. The illustrated portion of the rod forming apparatus comprises a converting assembly 1 which serves to convert a web or strip 14 of paper or the like into a tubular wrapper which forms part of the rod 28 and surrounds a condensed or compacted filler of fibrous material (e.g., acetate fibers). The converting assembly 1 comprises a web folding or draping unit 2 and a rod guide unit 3 which is located immediately downstream of the unit 2, as considered in the direction of lengthwise transport of the web 14 and rod 28 (arrow D).

The means for feeding a rod-like filler into the path for the web 14 immediately upstream of the folding or draping unit 2 includes a conventional horn 4 which receives a loose tow 6 of fibrous filter material from a treating station (not shown) and converts such tow into a rod-like filler which thereupon advances with and at the speed of the web 14. The latter is supplied by a supply reel or bobbin 14 and is transported lengthwise by an endless conveyor belt 7 which is trained over a small roll 9 located below the horn 4, a larger roll or drum 8 which is located at the discharge end of the guide unit 3, and a set of three tensioning rolls 11, 12 and 13. At least one of these rolls is driven to move the upper stretch of the belt 7 in a direction to the left, as viewed in FIG. 1. The treatment of the material of the tow 6 can be carried out in a manner and in an apparatus as disclosed in U.S. Pat. No. 2,900,988 to Crawford.

The convoluted web which forms the roll 16 is provided at one of its sides with three longitudinally extending narrow layers or films 17, 18, 19 of heat-activatable adhesive. The layer 17 is immediately or closely adjacent to one marginal portion of the web 14 and the layers 18, 19 are spaced from each other and may be located substantially midway between the layer 17 and the other marginal portion of the web. A heat-activatable adhesive which can be utilized in the apparatus of FIG. 1 is being produced by the West German Firm BOSTIK GmbH, of Oberursel/Taunus, and is sold under the Catalogue No. 1194.

The means for activating the adhesive of the layers 17, 18 and 19 upstream of the folding or draping unit 2 comprises a heater device 21 which is shown as being located immediately upstream of the horn 4. This heater device comprises an elongated infrared heater 23, a source 22 of electrical energy for the heater 23, and a paraboloid reflector 24 behind the heater.

The exact details of the folding or draping unit 2 form no part of the present invention. It comprises means for deforming the belt 7 and the web 14 thereon so that these parts form in a zone A a substantially U-shaped trough which confines the filler rod of acetate fibers from below and from two sides. Successive increments of the belt 7, web 14 and rod-like filler thereupon enter a zone B wherein a folder plate 26 bears against the uncoated marginal portion of the web 14 so that such marginal portion is folded over the still exposed upper side of the filler whereby the web 14 is converted into a tube wherein the other marginal portion (which carries the adhesive layer 17) extends tangentially from a tubular portion which surrounds and confines the filler. The cover plate 26 recedes or terminates in a third zone C wherein the adhesive-coated marginal portion of the web 14 is folded down by a second folder plate 27 which thus completes the conversion of the web 14 into a tubular wrapper or envelope wherein the overlapping marginal portions contact each other and are bonded to each other by the adhesive layer 17. The two marginal portions then form with the adhesive layer 17 a longitudinally extending seam 62 which faces upwardly, as viewed in FIG. 1.

The thus obtained rod 28 is then caused to enter an elongated passage 40 defined by a top or cover plate 3*a* and base plate 3*b* of the guide unit 3. The passage 40 is bounded by a cylindrical surface which determines the outline and the diameter of the tubular wrapper of the filter rod 28. The width W of the web 14 and the diameter of the passage 40 are selected in such a way that the seam 62 of a properly formed tubular wrapper of the rod 28 has a predetermined width. The top plate 3*a* of the guide unit 3 defines the upper half of the surface which surrounds the passage 40, and that portion of this upper surface half which contacts the seam 62 can influence the adhesive between the overlapping marginal portions of the seam 62 by withdrawing heat from such adhesive to insure rapid setting whereby the tubular wrapper is strong enough to withstand the tendency of the confined filler to expand as soon as successive increments of the rod 28 leave the guide unit 3. The rod 28 is then transported through a conventional cutoff (not shown) which serves to subdivide the rod into sections or stubs of desired length. Such stubs are ready for transport to a machine for the making of filter cigarettes, cigars or cigarillos, or to storage.

The top plate 3*a* of the guide unit 3 is preferably movable relative to the base plate 3*b* so as to afford access to the surfaces surrounding the passage 40 for periodic inspection and/or cleaning. For example, the plate 3*a* can be pivotally secured to the base plate 3*b* by means of a hinge having a pintle which is indicated at 41 and extends in parallelism with the passage 40. Thus, the plate 3*a* can be pivoted in and counter to the direction indicated by the arrow E.

The main purpose of the guide unit 3 is to hold the tubular wrapper and the filler of the rod 28 against radial expansion during travel through the passage 40 so that each increment of the rod which issues at the discharge end of the passage 40 has a predetermined diameter. Moreover, that portion of the concave surface of the top plate 3*a* which contacts and exerts a pressure against the seam 62 influences the heat-activatable adhesive of the layer 17 to promote its bonding action and to withdraw at least some heat so that the adhesive sets not later than when it advances beyond the plates 3*a* and 3*b*.

The operation of the apparatus which includes the structure of FIG. 1 is as follows:

The drive for the belt **7** is set in motion so that the upper stretch of this belt advances the web **14** lengthwise along a substantially horizontal path. The horn **4** feeds a continuous filler of fibrous material (tow **6**) into that portion of the path which is adjacent to the inlet end (zone A) of the draping unit **2** of the converting assembly **1**. The heater **23** heats the layers **17, 18** and **19** of heat-activatable adhesive at the upper side of the web **14** so that such adhesive is in an optimum condition to furnish a satisfactory bonding action. The underside of the horn **4** has a cutout through which the condensed rod-like filler passes on its way into the path for the web **14.**

The draping of the web **14** around the filler takes place in the zones A, B and C in a manner as described above, and the thus obtained filter rod **28** then enters the passage **40** between the plates **3***a* and **3***b* of the guide unit **3.** The adhesive layer **17** bonds the overlapping marginal portions of the tubular wrapper and the seam **62** is pressed by the concave surface of the plate **3***a* so that its curvature corresponds to that of the remaining portion of the tubular wrapper. The layers **18** and **19** bond the wrapper to the adjacent fibers of the rod-like filler. Even though the filler has a tendency to expand and to open the seam **62,** the treatment of the adhesive layer **17** in the passage **40** normally suffices to insure that the diameter of the wrapper does not change when the rod leaves the guide unit **3** and advances (arrow D) toward the aforementioned cutoff.

FIGS. **2** and **3** illustrate a portion of a second rod forming apparatus with modified adhesive-influencing means **61.** Such adhesive-influencing means **61** comprises a cooling device which cools the seam **62** of the tubular wrapper which forms part of the filter rod **28.** The cooling device can be said to form part of the guide unit in the apparatus of FIGS. **2** and **3** and comprises an elongated projection or rib **64** having a surface **63** which contacts the seam **62** and whose width, as considered in the circumferential direction of the rod **28,** preferably equals or closely approximates the width of the seam. This insures that the cooling device influences only the layer **17** of heat-activatable adhesive which bonds the overlapping marginal portions of the tubular wrapper to each other. The projection **64** is provided at the outer side of an elongated heat exchanger pipe **66** which forms part of the cooling device and is surrounded by a block **67** of heat-insulating material. The block **67** is mounted in and can be said to form part of the cover plate **103***a* of the guide unit **103.** This cover plate **103***a* is pivotally connected to the base plate **103***b* by a hinge **70** so that the projection **64** can be lifted off the seam **62** in the passage **140** of the guide unit **103.** Furthermore, the block **67** is preferably adjustable in and counter to the direction indicated by the arrow F so that it can move the surface **63** on the projection **64** relative to the plate **103***a* toward or away from the axis of the rod **28** in the passage **140.** The rib **64** and preferably the entire heat exchanger pipe **66** preferably consists of a metallic material (such as copper) having good heat conducting characteristics.

As shown in FIG. **2,** the ends of the pipe **66** are connected with a supply conduit **68** and an evacuating conduit **69** so as to allow for circulation of a suitable coolant, e.g., tap water which withdraws heat from the projection **64** so that the latter can withdraw heat from the adhesive layer **17** in the seam **62.** Instead of water, one can employ another coolant, e.g., an organic fluid such as FRIGEN (trademark). If the coolant is an organic fluid, the cooling device of the adhesive-influencing means **61** preferably includes a heat exchanger wherein the fluid is cooled after it leaves the conduit **69** and prior to reentering the conduit **68.**

The concave surface of the base plate **103***b* of the guide unit **103** is provided with a trough-shaped recess to receive the belt **7** which transports the filter rod **28** through the passage **140** toward the cutoff. The edge portions of the belt **7** may extend into the cover plate **103***a* to insure that the belt **7** surrounds a substantial part of the external surface of the tubular wrapper in the passage **140.** FIG. **3** shows that the pressure which is applied by the surface **63** of the projection **64** may result in slight flattening of the rod **28** in the region of the seam **62.** Such deformation disappears due to innate elasticity of the confined rod-like filler as soon as the rod **28** emerges from the channel **140.** For example, the extent of deformation of the rod **28** by the projection **64** may be in the range of 2 millimeters; this insures the generation of satisfactory pressure which suffices to guarantee that the overlapping marginal portions which form the seam **62** will adhere to each other after they leave the passage **140.** It was found that the just described extent of deformation is amply sufficient to insure that, when the seam **62** emerges from the guide unit **103,** it assumes an arcuate shape which corresponds to that of the remaining portion of the tubular wrapper so that the wrapper of the rod **28** which leaves the guide unit **103** is a substantially circular cylinder. The application of substantial mechanical pressure to the external surface of the seam **62** also promotes the setting of heat-activatable adhesive which forms the layer **17.**

If the adhesive which forms the layer **17** is a conventional heat-hardenable adhesive, the adhesive-influencing means **61** preferably constitutes a heating device which is provided with a pump or the like to circulate a stream of a heated fluid (e.g., oil) whereby such fluid enters by way of the conduit **68** and leaves by way of the conduit **69** to heat the pipe **67** and the projection **64.** The surface **63** then exerts a desirable pressure against the seam **62** and simultaneously heats the adhesive between the overlapping marginal portions of the seam to promote the setting and thus insure that the tubular wrapper which emerges from the guide unit **103** can withstand the tendency of the confined filler to expand.

When the apparatus is at a standstill, the block **67** is moved in the direction indicated by the arrow F and/or the cover plate **103***a* is pivoted in the direction indicated by the arrow E so as to prevent a burning or charring of the rod **28** in the passage **140.** The apparatus may comprise a suitable device, e.g., an electromagnet or a hydraulic or pneumatic cylinder, which automatically pivots the plate **103***a* to an open position in response to stoppage of the belt **7.** The adjustability of the block **67** with reference to the cover plate **103***a* (in and counter to the direction indicated by the arrow F) is intended to allow for accurate adjustments in the position of the surface **63** relative to the axis of the rod **28** in the passage **140** and to thus compensate for different thicknesses of wrapping material which forms the web **14.** Furthermore, the position of the projection **64** with reference to the axis of the rod **28** might necessitate some adjustment if a first type of heat-activatable or heat-hardenable adhesive (layer **17**) is replaced with a

different type of adhesive which might require the application of a more or less pronounced pressure against the exposed side of the seam **62.**

The pressure which the projection **64** must apply against the seam **62** is normally a function of the speed at which the web **14** is being conveyed through the passage **140,** i.e., the pressure must be increased by moving the projection **64** inwardly if the speed of the belt **7** increases.

An important advantage of the improved apparatus is that it insures satisfactory setting of adhesive in the seam **62** regardless of whether the adhesive is of the heat-activatable or heat-hardenable type. Moreover, the adjustability of the projection **64** and/or cover plate **3***a* or **103***a* renders it possible to select an optimum pressure for different types of wrapping material and/or different types of adhesive. Also, the slight deformation of rod **28** in the passage **140** insures that the tubular wrapper of the rod assumes a circular cylindrical outline after it emerges from the guide unit **103.**

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features which fairly constitute essential characteristics of the generic and specific aspects of our contribution to the art and, therefore, such adaptations should and are intended to be comprehended within the meaning and range or equivalence of the claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims:

1. Apparatus for producing a rod wherein a rod-like filler of fibrous or analogous material is confined in a web having overlapping marginal portions which are bonded to each other by at least one layer of adhesive, comprising a source of web; conveyor means for transporting the web lengthwise from said source along a predetermined path; means for feeding a continuous rod-like elastic filler into a first portion of said path; and converting means for draping successive increments of the web around successive increments of the filler in a second portion of said path so that the marginal portions of the thus draped web overlap and contact each other whereby the web is converted into a substantially cylindrical wrapper having a longitudinally extending seam and surrounding the filler in compacted condition of the filler, said converting means comprising guide means defining a passage for said tubular wrapper and including adhesive-influencing means engaging the seam of the wrapper in said passage, said guide means having a first surface bounding the major part of said passage and said adhesive-influencing means comprising a projection extending inwardly beyond said first surface and having a seam-engaging second surface of a width which is substantially equal to the width of the seam, said second surface being in contact with said wrapper only in the region of the seam and having a configuration to temporarily flatten the seam.

2. Apparatus as defined in claim **1,** further comprising means for moving said projection with reference to said first surface.

3. Apparatus as defined in claim **1,** wherein said projection is movable substantially radially of said passage to thereby regulate the pressure which is applied to said seam.

4. Apparatus as defined in claim **1,** wherein said adhesive-influencing means comprises a cooling device.

5. Apparatus as defined in claim **1,** wherein said guide means comprises a plurality of separable portions and said projection is provided in one of said separable portions.

6. Apparatus as defined in claim **1,** wherein said adhesive-influencing means further comprises a heating device.

7. Apparatus as defined in claim **1,** wherein said adhesive-influencing means further includes a device for changing the temperature of adhesive.

8. Apparatus as defined in claim **7,** wherein said device includes a heat exchanger.

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