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TRANSLATION:

**PROCESS AND DEVICE FOR MANUFACTURING PRODUCTS OF THE TOBACCO  
INDUSTRY HAVING VARIABLE TOBACCO DENSITY.**

The present invention concerns a process as well as a device permitting a product of the tobacco industry to be obtained, especially a cigarette, where the tobacco density is variable over the length of said product, or the cigarette, respectively.

A cigarette may be produced composed wholly or in part of expanded shreds of tobacco and/or of expanded ribs of tobacco, these ingredients being presented in the form of small shreds more difficult to work than the usual long shreds of leaf tobacco. A cigarette of this type, obtained by a usual manufacturing process, will have a low value of filling density, i.e., a poor maintaining of the tobacco in the cigarette. If, in order to increase this filling density to a favorable value, the tobacco is squeezed more, or its cramming is increased, respectively, a cigarette is obtained having modified characteristics, as for example the resistance to drawing or the yield.

The problems mentioned above are the same when the cigarette includes a certain proportion of non-expanded short shreds of tobacco, whether these are chosen as forming part of a particular mixture of tobacco or else come from damaging of the shreds of tobacco at the time of the earlier preparation operations.

The compactness of the finished product is checked by a compressibility-measurement apparatus as described in patent EP-A-0,195,173.

Application EP-A-0,354,874 describes a device for trimming a rod of tobacco during manufacture, this device being preceded by a device permitting a portion of the length of the rod to be compressed in order to increase the tobacco density thereof, these higher-density portions corresponding to the ends of the cigarettes, thus avoiding their losing shreds of tobacco at the ends.

A first object of the present invention is to propose a process and a device permitting the obtaining of improved filling of a product of the tobacco industry or more particularly of a



cigarette made up wholly or in part of other raw materials of the tobacco industry than long shreds of tobacco, i.e., starting from expanded shreds and/or ribs of tobacco or from short shreds, which has a favorable compactness when it is measured by a compressibility-measurement apparatus, and which is pleasant to smoke, not necessitating an excessive effort of inhalation.

Another object of the invention is to propose a product of the tobacco industry or more particularly a cigarette of better quality, made up wholly or in part starting from expanded shreds and/or ribs of tobacco or from short shreds, which has an improved filling and favorable compactness when it is measured by a compressibility-measurement apparatus, and which is pleasant to smoke, not necessitating an excessive effort of inhalation.

These objects are obtained by a process answering the characteristics of claims 1 or 2, with the aid of a device possessing the characteristics mentioned in claims 3 to 8. A product of the tobacco industry, especially a cigarette obtained by this process and with the aid of this device, is described in claims 9-13.

The invention is explained in more detail below, vis-à-vis the enclosed drawing comprising the figures where:

Figure 1 represents a general view of a portion of a cigarette-manufacturing machine,

Figure 2 depicts an embodiment of a compression cam,

Figure 3A depicts a portion of a rod of tobacco,

Figure 3B is a graph depicting the variation in density of the tobacco in the rod of Figure 3A,

Figure 4 depicts a compression cam comprising several variations of the compressing means simultaneously, and

Figures 5A, 5B, and 5C are graphs depicting diverse types of variation of the density of tobacco in the rod.

In Figure 1 there is a diagrammatic perspective representation of a downstream portion of a conventional cigarette-manufacturing machine 1 of known type. It includes in particular a tub 10 containing tobacco or other raw materials as described earlier 2, as well as a porous belt 11 driven with a longitudinal movement by two pulleys 12 and 13. A negative pressure is created on the upper part of the lower length of the porous belt 11 in order to draw the shreds of tobacco 2 out of the tub 10 and to form a



rod of tobacco 20, beneath the belt 11 and traveling therewith. The machine 1 then includes a regulation device 14 for the rod of tobacco 20, made up of two dense-end disks 15, preferably of the type described in application EP-A-0,354,874, preceded by a cam compression device 16, rotating synchronously with the advance of the rod 20 and periodically compressing the rod, possibly being supplemented by a checking device 17 for the rod, as described in application EP-A-0,465,414. After trimming, the rod 20 continues its path, subsequently to be separated from the porous belt 11, then to be wrapped in a paper covering and cut into individual cigarettes according to a known manner.

In the device according to the invention, the cam 3 of Figure 2 replaces the cam 16 of Figure 1 in order to permit the making of a rod of tobacco with variable density. As is seen in this figure, the cam 3 is composed of a cylindrical core 30 rotating about an axis in the way indicated, and supporting a certain number of blades extending radially starting from the cylindrical core 20 and comprising support surfaces disposed in such a way as to exert a compression on the rod of tobacco 20 which travels along an axis perpendicular to the axis of rotation of the cam 3. In the embodiment depicted here, the cam 3 is designed to effect one revolution for a length of tobacco rod equivalent to the length of two cigarettes, that is to say that the outside perimeter of the cam equals two lengths of the tobacco part of a cigarette. Hence there are two first blades 31, disposed in opposition one relative to the other on each side of the core 30, each of them comprising a support surface 31A. These support surfaces 31A are intended, in view of their relatively great support length, to compress the tobacco at the ends of each cigarette, i.e., the zones 21 of the rod 20 of Figure 3A, which thus have their density increased. The cam 3 is supplemented by a plurality of other blades, 32, 33, 34, and 35, four in the present case, i.e., two for each cigarette length, the blades each having a support surface 32A, 33A, 34A, and 35A, the support length of which is, in the case depicted here, appreciably less than the support surfaces 31A. The support surfaces 32A, 33A, 34A, and 35A of this embodiment of the cam are disposed on the same cylindrical peripheral envelope as the support

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surfaces 31A, causing them to press in an equal manner on the rod 20, creating compressed zones of equal increased density.

A longitudinal section of a rod 20 obtained with the aid of a cam 3 as described above is depicted in Figure 3A; distinguished there are zones of increased density 21 having a length equivalent to the length of the support surfaces 31A, as well as zones of increased density 22 which correspond to the passage of the support surfaces 32A and 33A or 34A and 35A, each of these zones being separated by a zone 23 of low density corresponding to the passage of the rod between the support surfaces. During the rest of the manufacturing process, the rod will receive its wrapping of paper, then will be cut at the locations marked 24 in order to form the tobacco part of a cigarette. It is noticed in Figure 3A that the zones 23 of low tobacco density all have the same length; this comes from the position of the blades about the core 30, it would be just as possible to dispose the blades at different relative angles so as to lengthen or shorten, respectively, some of these zones.

Figure 3B depicts a curve showing the variation in density  $D$  of the tobacco along the rod of Figure 3A, it is seen that the zones 23 are of low density, value  $D_0$ , and that the zones 21 are of higher density, value  $D_1$ .

The cam 3 of Figure 4 is similar to the preceding one, except that the blades 32, 33, 34, and 35 are, by way of example, each formed in a different way, therefore having a different effect on the rod of tobacco. For example, the support surface 32A of the blade 32 is on a cylindrical peripheral envelope of slightly smaller diameter than that of the cylindrical peripheral envelope of the support surfaces 31A; if the cam 3 had all its blades 32, 33, 34, and 35 conceived in this way, the compression, or the density, respectively, of the zones 22 of the rod 20 would have a density higher than  $D_0$  but lower than  $D_1$ , i.e., a value  $D_2$  as depicted in Figure 5A. Note that it is also possible to have a support surface 32A situated at a higher level than that of the support surfaces 31A, thus increasing the density of the zones 22 in such a way that it is higher than that of the zones 21. Another possible variation is shown by the blade 33, the support surface 33A of which is at the same level as the support surfaces



31A, but the support width of which is less than the width of that of the surfaces 31A, or of the rod 20, respectively; by means of a cam equipped with blades of this type, a rod is obtained of which only one central region of the width has a density as depicted in Figure 3B. The blades 34 of Figure 4 differ from the blade 34 of Figure 2 in the support length of the support surface 34A, which in this case is relatively greater; there is thus obtained a distribution of the densities along the rod as depicted in Figure 5B, showing that the zones 22 are appreciably longer. And finally, the blade 35 of Figure 4 shows a combination of the preceding variations, i.e., having a support surface 35A situated at a lower level than that of the support surfaces 31A, a greater support length and a smaller support width. The central portion of the rod would then have a distribution of density as depicted in Figure 5C. It is obvious that a cam as depicted in Figure 4, comprising such a variety of compression means, will not be encountered, but which appears here solely by way of example of the possible compression or density-increasing means.

On the other hand, a certain number of variations of the cams described above may be found; first of all, the cam may be dimensioned to effect one revolution per cigarette length or else more than two revolutions per cigarette length, the diameter of the cylindrical envelope of the support surfaces, the number of blades and of support surfaces, as well as the speed of rotation of the cam being chosen accordingly, in such a way that the peripheral speed of the support surfaces of the blades corresponds to the speed of longitudinal travel of the rod. Moreover, one may also have intermediate zones of increased density 22 according to a number other than two as in the examples described and depicted; the number of blades, or of support surfaces, respectively, being chosen accordingly. In case there is more than one intermediate zone of increased density 22 over the length of a cigarette, it is also possible for the type of compression to be different between these zones, for example if there are three intermediate zones 22 over a cigarette length, not counting the end zones 21, there may be two lateral zones of high density and of short length, caused by support surfaces similar to the surfaces

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32A of Figure 2, surrounding a central zone 22 of slightly lower density, of greater length, but not extending over the whole width of the rod, caused by a support surface similar to the surface 35A of Figure 3.

Thus, a product of the tobacco industry or a cigarette composed wholly or in part of other raw materials of the tobacco industry than of long shreds of tobacco, i.e., starting from short shreds, from expanded shreds or ribs, if it is manufactured in the way described above, has one or more intermediate zones of higher density, causing its filling and its measured compactness to be better than those of a cigarette not comprising these intermediate zones of higher density. Such a product has an equivalent maintenance and is as pleasant to smoke as an ordinary product.

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## CLAIMS:

1. Process of manufacture of a rod (20) made up of tobacco and/or of other raw materials of the tobacco industry (2), portions (21) of the length of which are periodically compressed in order to form end zones of cigarettes of higher density, this operation taking place on a cigarette-manufacturing machine (1) when the rod is held and conveyed by a porous belt (11), before the trimming operation (15) of the rod (20),

characterized in that

at least one other portion (22) of the length of the rod (20), disposed between two of said compressed portions (21) corresponding to the end zones, is also compressed, or its density is increased, respectively.

2. Process according to claim 1, characterized in that the compression of said other rod portion (22) is made by the same device (16; 3) as that effecting the compression of said portions (21) corresponding to the end zones.

3. Device permitting a periodic compression, or a periodic increase in the density of tobacco, respectively, of a rod of tobacco and/or of other raw material of the tobacco industry (2), for carrying out a process according to claim 2, comprising a cam (3) rotating along an axis perpendicular to the rod (20) and disposed below said rod and comprising at least a first blade (31) comprising a support surface (31A) intended periodically to compress portions (21) of the rod in order to form the end zones of cigarettes having increased density,

characterized in that

said cam includes at least one other blade (32, 33, 34, 35) comprising a support surface (32A, 33A, 34A, 35A) intended to compress, or to increase the density of tobacco, respectively, of another portion (22) of the rod.

4. Device according to claim 3, characterized in that the length of the support surface (32A, 33A, 34A, 35A) of said





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other blade or blades (32, 33, 34, 35) is less than the length of the support surface (31A) of said first blade or blades (31).

5. Device according to claim 4, characterized in that the height relative to the rod of the support surface (32A, 33A, 34A, 35A) of said other blade or blades (32, 33, 34, 35) is equal to the height of the support surface (31A) of said first blade or blades (31).

6. Device according to claim 4, characterized in that the height relative to the rod of the support surface (32A, 33A, 34A, 35A) of said other blade or blades (32, 33, 34, 35) is different from the height of the support surface (31A) of said first blade or blades (31).

7. Device according to one of the claims 3 to 6, characterized in that the width of the support surface (32A, 33A, 34A, 35A) of said other blade or blades (32, 33, 34, 35) is equal to the width of the support surface (31A) of said first blade or blades (31).

8. Device according to one of the claims 3 to 6, characterized in that the width of the support surface (32A, 33A, 34A, 35A) of said other blade or blades (32, 33, 34, 35) is less than the width of the support surface (31A) of said first blade or blades (31).

9. Product of the tobacco industry, especially cigarette, obtained according to the process of one of the claims 1 to 2 and by a device according to one of the claims 3 to 8, comprising portions (21) of its length compressed at increased density, corresponding to its two ends,

characterized in that

it includes in addition at least one other compressed or increased-density portion (22), respectively, disposed between the two compressed ends.



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10. Product of the tobacco industry according to claim 9, characterized in that the rate of compression, or the density, respectively, of said other portion or portions (22) is equal to the rate of compression, or the density, respectively, of the two ends (21).

11. Product of the tobacco industry according to claim 9, characterized in that the rate of compression, or the density, respectively, of said other portion or portions (22) is different from the rate of compression, or the density, respectively, of the two ends (21).

12. Product of the tobacco industry according to one of the claims 10 or 11, characterized in that it is made up wholly or in part of expanded shreds of tobacco and/or of expanded tobacco ribs and/or of short shreds of tobacco.

13. Product of the tobacco industry according to claim 12, characterized in that its measured compressibility is equivalent to the measured compressibility of a cigarette comprising a preponderant part of non-expanded shreds of leaf tobacco and not comprising said other compressed increased-density portion or portions.



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