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(54) PRODUCTION OF FILTER PLUGS OR OF FILTER CIGARETTES

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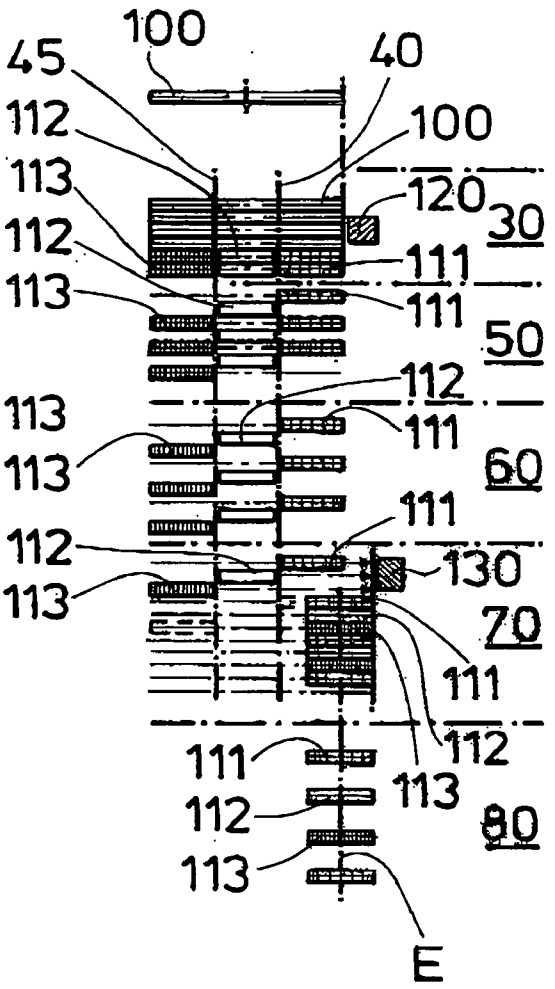
(57) **ABSTRACT**

Method for producing filter plugs from filter rods with a predetermined filter rod length, comprising removing the filter rods from a magazine, selectively cutting the filter rods into filter plugs of one of a first or second predetermined filter plug length. Further, the filter plugs of a respective cut filter rod are coaxially aligned to one another. Staggering the filter plugs, such that filter plugs immediately adjacent another filter plug in a longitudinally axial manner are respectively positionally displaced transverse-axially to one another at a constant staggered spacing. Transferring the filter plugs to a transfer device, so that the filter plugs are positionally displaced to one another at a transverse-axial staggered spacing to the transverse-axially adjacent filter plugs. The filter plugs are staggered in a displaced manner displaced in a longitudinally axial manner to form a row of filter plugs conveyed one behind the other in a transverse-axial manner.



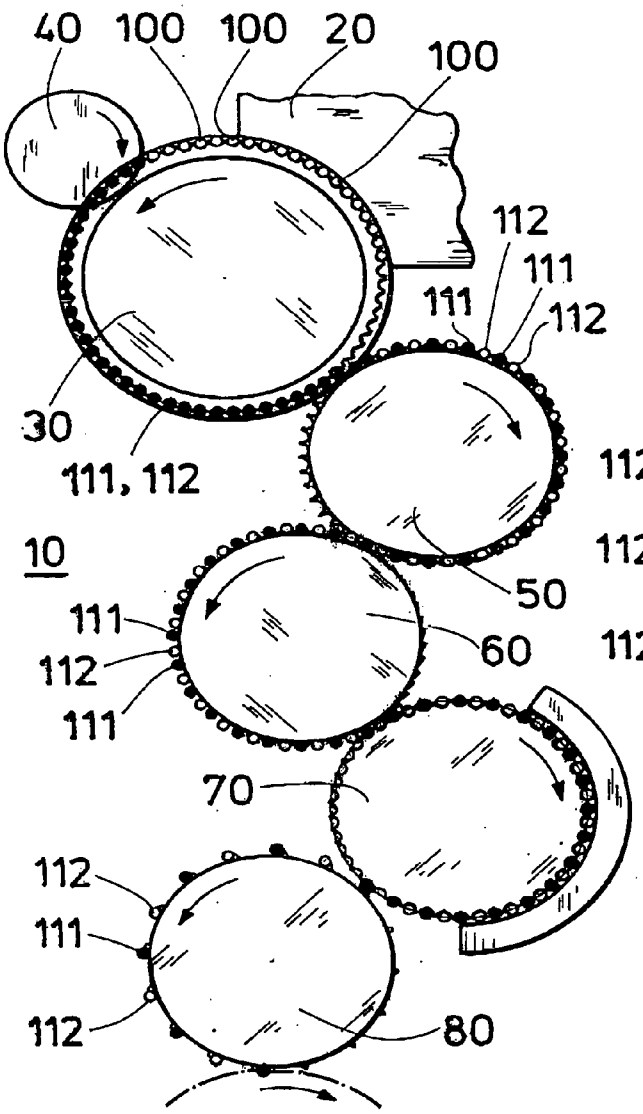

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FIG. 1a

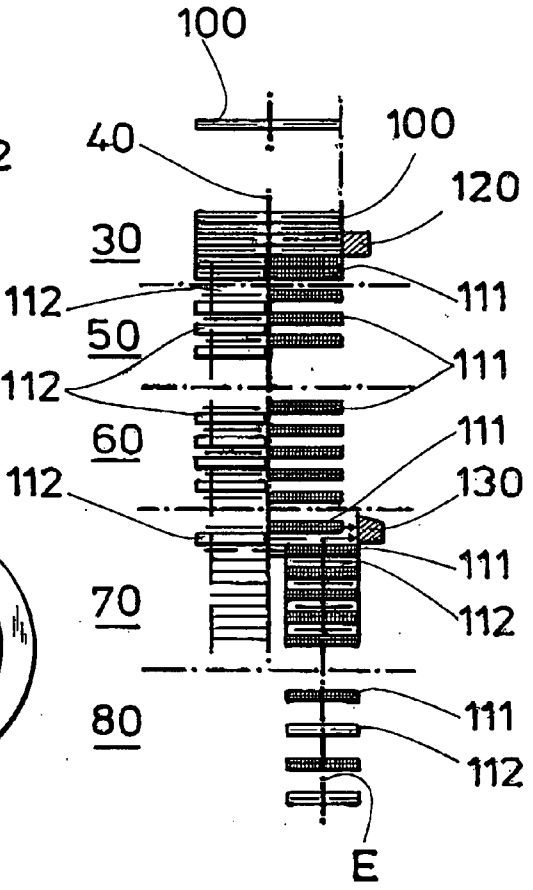
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FIG. 1b

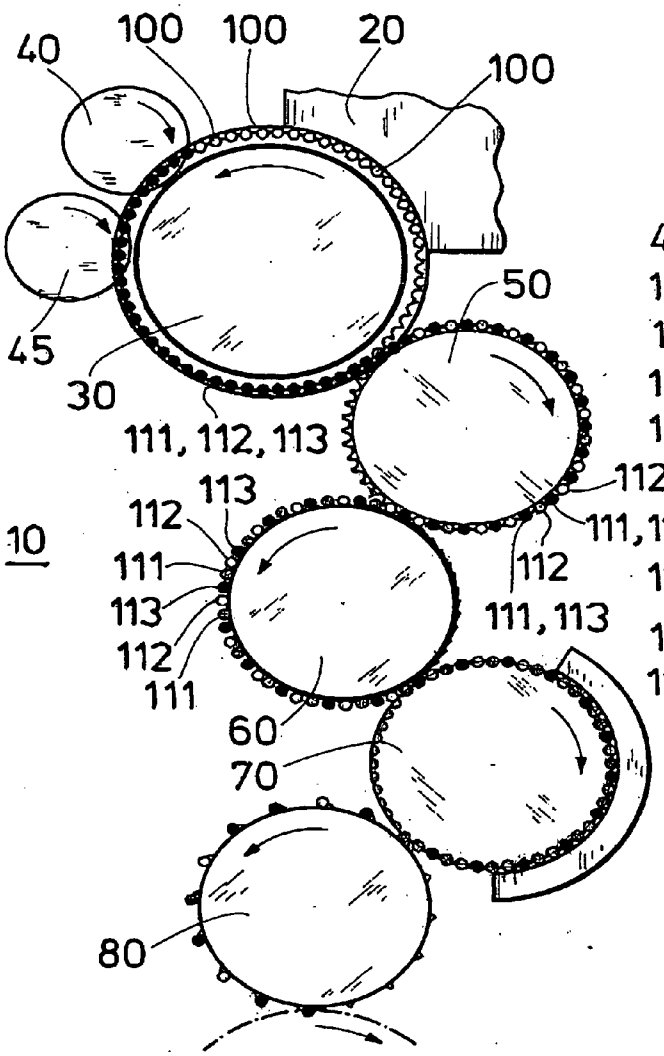
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FIG. 2a

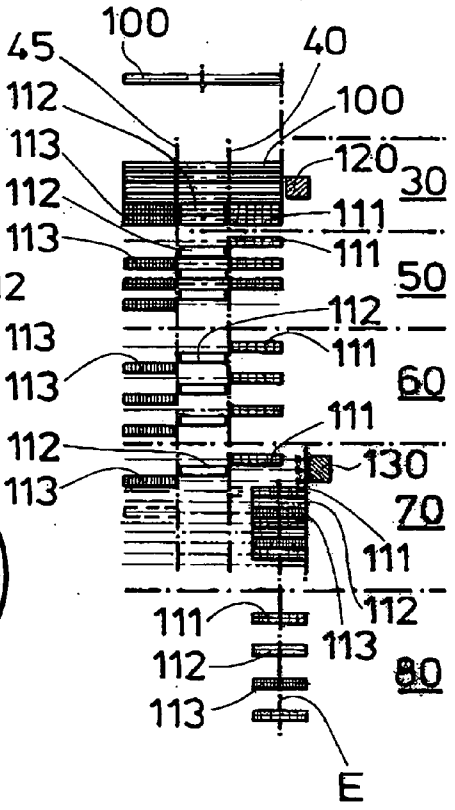
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FIG. 2b

PRODUCTION OF FILTER PLUGS OR OF FILTER CIGARETTES

[0001] The present application claims priority under 35 U.S.C. §119 of German Patent Application No. 10 2005 000 910.7, filed on Jan. 6, 2005, the disclosure of which is expressly incorporated by reference herein in its entirety.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The invention relates to a method for producing filter plugs from filter rods with a predetermined filter rod length and a method for producing filter cigarettes.

[0004] 2. Discussion of Background Information

[0005] Filter tipping machines by the patent applicant are known under the name "MAX." A filter tipping machine is understood to be a device for producing filter cigarettes. The filter tipping machine accommodates double-length cut tobacco rods, and includes a cutting device for by cutting these double-length cut tobacco rods into single-length cut tobacco rods, and a device for and inserting double-length filter plugs between the single-length cut tobacco rods. The machine also includes a joining device for joining the double-length filter plugs to the single-length cut tobacco rods by wrapping with a tipping paper web that is severed by a cutting device from a fed tipping paper strip. Further, a cutting unit for making a cut through the double-length filter plug is provided, so that filter cigarettes of normal unit length can be produced. A single-lane filter tipping machine, may have one sequence or a row of cut tobacco rod-filter plug-cut tobacco rod groups arranged and transported one behind the other in a transverse-axial manner which are fed as a single-lane material flow to a tipping device.

[0006] To feed filter plugs to the cut tobacco rod pairs, filter rods of multiple unit length are removed from a filter magazine at a filter tipping machine and subsequently cut into filter plugs of double unit length. The cut filter plugs are then arranged in a row of filter plugs spaced one behind the other in a transverse-axial manner, which are fed to the cut tobacco rod pairs spaced in a longitudinally axial manner.

[0007] U.S. Pat. No. 4,943,272 (corresponds to DE-T-689 10 669) describes a device for producing cigarette filters. Multiple-length, e.g., triple-length, filter rods are hereby removed from a filter magazine via a removal drum and fed to a cutter drum on which a single cutting knife is arranged After a first cutting of the filter rod, a resulting filter piece is removed from the cutter drum, while the filter rod shortened by a filter piece remains on the cutter drum and is displaced in a longitudinally axial manner up to a stop. Subsequently, the shortened filter rod is cut by the cutting device again, and another filter piece is removed from the cutter drum again. The filter rod shortened by two filter pieces is again displaced in a longitudinally axial manner on the cutter drum up to the stop and guided past the cutting device. Subsequently, the third filter piece of the originally triple-length filter rod is fed from a removal drum to further drums.

[0008] The described device for the production of cigarette filters can, moreover, be used as a filter feed device on a filter tipping machine. Furthermore, two filter production devices can be combined in order to obtain a construction for producing double filter pieces.

SUMMARY OF THE INVENTION

[0009] The present invention provides to simplifies the production of filter plugs, e.g., on a filter tipping machine, so that the structural outlay in the case of a change of the filter plug length can be kept as low as possible. Furthermore, the present invention shortens and simplifies the resetting times with a filter tipping machine for a garniture change or a brand change.

[0010] According to an embodiment of the invention, the invention provides a method for producing filter plugs from filter rods with a predetermined filter rod length. The filter rods are removed from a magazine, and are cut respectively into n-fold (n=2, 3, 4 . . .) filter plugs for a predetermined filter plug length by (n−1)-fold cutting devices, or respectively into k-fold (k=2, 3, 4, . . . ; k≠n) filter plugs for a second predetermined filter plug length by (k−1)-fold cutting devices. Further, with a change of the filter plugs to be cut from one predetermined filter plug length to another predetermined filter plug length, the number of cutting devices is increased (k>n) or reduced (k<n). Furthermore, after cutting, the filter plugs of the respective filter rods aligned with one another in a coaxial manner are staggered in a first step. So that the filter plugs positioned immediately adjacent in a longitudinally axial manner are respectively arranged transverse-axially and displaced with respect to one another at a constant staggered spacing. In a further step, the filter plugs can be transferred to a transfer device so that the filter plugs are positionally displaced with respect to one another, at a predetermined transverse-axial staggered spacing to the transverse-axially adjacent filter plugs. Subsequently, the filter plugs displaced in a staggered manner can be shifted in a longitudinally axial manner to form a row of filter plugs conveyed transverse-axially one behind the other.

[0011] In view of a change of filter plug lengths, in particular with length changes of the filter plugs with a change of a cut distribution of the filter rods to be cut, i.e., with a change of the number of cutting devices, there is a large expenditure of time and thus a long production downtime in the production of filter cigarettes or filter rods results.

[0012] According to the invention, a reduction of the resetting times can be achieved with a filter tipping machine or filter production machine through a changed distribution, due to the different process steps and changed assignment of the necessary position and speed changes of the cut filter rods.

[0013] After the filter rods have been cut, the filter plugs obtained are staggered in a first production step, whereby a relative staggering is carried out between two directly adjacent filter plugs. This relative staggering of two filter plugs immediately adjacent in a longitudinally axial manner can be realized with a constant staggered spacing. Further, a filter plug can be positionally displaced and spaced transverse-axially to its previous neighbor. This relative staggering by a constant spacing between the filter plug neighbors can also cause, i. e., with a corresponding number of the cut filter plugs, several filter plugs to lie against one another in one receiving flute of a conveyor. In this manner, the filter

plugs are staggered relative to their respective immediately adjacent neighbor in the longitudinally axial direction.

[0014] According to the invention, a further staggering of the filter plugs displaced and staggered in a transverse-axial manner are transferred to a transfer device. The filter plugs are available in a staggered manner after the transfer device, such that only one filter plug is arranged in one receiving flute of a conveyor organ. To this end, the filter plugs are staggered in the transfer device displaced with respect to one another at a selectable or predetermined spacing in the conveyor direction or in the transverse-axial direction. After the first staggering, if several filter plugs thereby lie in one flute of a conveyor, a different transverse-axial staggered spacing is to be selected on the transfer device than with filter plugs already staggered in the first staggering step. Thus, only one filter plug is respectively arranged in respectively one flute of the conveyor.

[0015] Depending on the first staggering or the first staggering pattern of the filter plugs before the transfer to the transfer device, the transverse-axial staggered spacing to be carried out on the transfer device is to be determined. Thus, during the transfer to a following conveyor, the filter plugs are positionally displaced both in the conveyor direction or in the transverse-axial direction and in the longitudinally axial direction. Through this, only respectively one filter plug lies in the flutes of a conveyor. Its neighbors in the transverse-axial and in the longitudinally axial direction are located in the other flutes displaced by a transverse-axial spacing.

[0016] Following the transfer device, a row of filter plugs conveyed one behind the other in a transverse-axial manner is formed from the staggered filter plugs, such that the filter plugs are displaced in a longitudinally axial manner.

[0017] According to another aspect of the invention, it may be advantageous if the predetermined transverse-axial staggered spacing is changed with an increase or a reduction in the number of cutting devices. Accordingly, a different number of cut filter plugs can be also obtained.

[0018] Moreover, the effort for reconfiguration with a garniture change in the filter tipping machine can be reduced when at least one cutting device remains in its fixed position with the increase or reduction of the number of cutting devices. Thus, the at least one fixed cutting device cuts the filter rods before and after a change of the filter rod length or a garniture change. Accordingly, the at least one fixed cutting device does not need to be shifted, which means the resetting times are further shortened.

[0019] With a change of the filter plug length to be cut, a first stop for the filter rods is preferably displaced with respect to the at least one fixed cutting device.

[0020] Furthermore, it is advantageous if at least a second stop, in particular fixed cutting device is activated or deactivated with an increase or reduction of the number of cutting devices.

[0021] Furthermore, it is favorable if the filter plugs are displaced to a second stop in a longitudinally axial manner after the transfer device.

[0022] To this end, it is particularly advantageous if the second stop is changed in its position with a change in the filter plug length. Further, the filter plugs arranged one behind the other in one row are transferred with a predetermined position to further conveyor organs.

[0023] According to another aspect of the invention, the second stop can be changed in its position such that, with a change of the filter plug length, the centers of the previous filter plugs and the centers of the new filter plugs lie in one plane.

[0024] Moreover, the filter plugs can be transferred to a transfer drum as a transfer device.

[0025] Furthermore, the transfer device or the transfer drum can be replaced during a change of the filter plug length.

[0026] The predetermined transverse-axial staggered spacing can be changed during a change of the filter plug length.

[0027] Furthermore, a method for producing filter cigarettes include single double-length filter plugs being inserted between the cut tobacco rods, and the double-length filter plugs being connected to the cut tobacco rods of single length by wrapping a tipping paper web to form filter cigarettes of double unit length. The filter plugs are produced according to the method described above. The production of the filter plugs may take place in a filter feed of a filter tipping machine.

[0028] Other exemplary embodiments and advantages of the present invention may be ascertained by reviewing the present disclosure and the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] The present invention is further described in the detailed description which follows, in reference to the noted plurality of drawings by way of non-limiting examples of exemplary embodiments of the present invention, in which like reference numerals represent similar parts throughout the several views of the drawings, and wherein:

[0030] **FIG. 1***a*: A diagrammatic view of a drum arrangement of a filter feed of a filter tipping machine according to the invention;

[0031] **FIG. 1***b*: A diagrammatic view of a flow chart for the production of filter plugs according to the drum arrangement from **FIG. 1***a*, according to an aspect of the invention;

[0032] **FIG. 2***a*: A diagrammatic view of a drum arrangement of a fitter feed of a filter tipping machine according to an aspect of the invention; and

[0033] **FIG. 2***b*; A diagrammatic view of the flow chart according to the drum arrangement from **FIG. 2***a*, according to an aspect of the invention.

DETAILED DESCRIPTION OF THE PRESENT INVENTION

[0034] The particulars shown herein are by way of example and for purposes of illustrative discussion of the embodiments of the present invention only and are presented in the cause of providing what is believed to be the most useful and readily understood description of the principles and conceptual aspects of the present invention. In this regard, no attempt is made to show structural details of the present invention in more detail than is necessary for the

fundamental understanding of the present invention, the description taken with the drawings making apparent to those skilled in the art how the several forms of the present invention may be embodied in practice.

[0035] **FIGS. 1***a* and **2***a* respectively show diagrammatically one view of a filter feed device **10**, whereby the filter feed device **10** is integrated, e.g., in a filter tipping machine. The filter rods **100** are removed individually from a magazine **20** with filter rods **100** via a removal drum **30** and transported to cutting knives **40**, **45** arranged on the removal drum **30**. Cutting **40**, **45** cut knives the filter rods **100** into several double-length filter plugs according to the number of the cutting knives **40**, **45**.

[0036] **FIG. 1***a* shows an embodiment of the invention having one cutting knife (reference number **40**) arranged on the removal drum **30**, so that the filter rods **100** removed are cut only once and, thus two filter plugs **111**, **112** are produced from one filter rod **100**. The filter plugs **111**, **112** are arranged on the removal drum **30** in **FIG. 1***a* coaxially to one another in the receiving flutes. Subsequently, the filter plugs **111**, **112** are transferred to a staggering drum **50**, on which the filter plugs **111**, **112** are staggered in a fixed transverse-axial staggered spacing to one another.

[0037] According to an aspect of the invention, **FIG. 2***a* shows two cutting knives **40**, **45** that may be positionally displaced in a longitudinal axial manner with respect to one another, based on the filter rods **100** that are removed. The the filter rods **100** are cut twice, result in three filter plugs **111**, **112**, **113** of equal length. The filter plugs **111**, **112**, **113** (see **FIG. 2***a*) are aligned coaxially to one another on the removal drum **30**. Subsequently, the filter plugs **111**, **112**, **113** are transferred to the staggering drum **50** on which the filter plugs **111**, **112**, **113** are arranged or staggered with respect to their adjacent filter plugs.

[0038] A Thus, relative staggering of the two filter plugs adjacent in the longitudinally axial direction takes place with respect to the filter plugs immediately adjacent in the longitudinally axial direction. In other words: the filter plugs **111** and **112** are arranged respectively staggered with respect to one another at a fixed staggered spacing to one another. Furthermore, the filter rods plugs **112** and **113** are also staggered with respect to one another by a fixed staggered spacing. This ultimately leads to the filter plugs **111** and **113** being arranged in the same receiving flute of the staggering drum **50**, whereby these filter plugs **111**, **113** are staggered in a displaced manner with respect to the center filter plugs **112**, as illustrated in **FIG. 2***b*.

[0039] According to an aspect of the invention, **FIG. 1***a* shows the filter plugs **111**, **112** displaced in a staggered manner being transferred from the staggering drum **50** to a transfer drum **60**. No further staggering of the filter plugs **111**, **112**, which are positionally displaced with respect to one another in a transverse-axial manner is carried out on the transfer drum **60**. Further, the filter plugs **111**, **112** are subsequently transferred in a staggered manner to a pusher drum **70**, such that the filter plugs **111**, **112** are pushed together into a row of filter plugs **111**, **112** arranged one behind the other in a transverse-axial manner and transferred to an accelerator drum **80**. The filter plugs **111**, **112** are conveyed further from the accelerator drum **80** onto a following insert drum (not shown), so that the filter plugs **111**, **112** are inserted between cut tobacco rod pairs spaced in a longitudinally axial manner.

[0040] According to an aspect of the invention, **FIG. 1***b* shows diagrammatically the corresponding flow chart of the process sections on the individual drums of the filter feed device **10**. The transverse-axial staggered spacing on the transfer drum **60**, which is predetermined according to the invention, corresponds to the constant staggered spacing on the staggering drum **50**. The ratio of the staggered spaces on the staggering drum **50** and the transfer drum **60** is 1:1.

[0041] According to another aspect of the invention, where the filter rods **100** are cut twice, **FIG. 2***a* shows the filter plugs **111**, **112**, **113** staggered in a displaced manner on the staggering drum **50** which are transferred in a corresponding manner to the transfer drum **60**. At or during the transfer, the filter plugs **111**, **112**, **113** are respectively staggered in the transverse-axial direction by a specific ratio to one another, that results in a greater staggered spacing being created between the filter plugs **111**, **112**, **113** of each conveyed row.

[0042] Through this increase of the transverse-axial spacing of the filter plugs **111**, **112**, **113** of each row with respect to the leading or trailing filter plugs of each row, the filter plugs **111**, **112**, **113** are staggered so that only one filter plug is arranged in one receiving flute of the transfer drum **60**. Subsequently, the filter plugs **111**, **112**, **113** may be transferred from the transfer drum **60** to the pusher drum **70**, on which the filter plugs **111**, **112**, **113** can be displaced in a longitudinally axial manner to form a row of filter plugs arranged one behind the other in a transverse-axial manner.

[0043] As a result of the greater number of filter plugs to be conveyed from one filter rod, a different transverse-axial staggered spacing can be carried out on the transfer drum **60**. The ratio of the transverse-axial staggered spacing on the transfer drum **60** to the constant staggered spacing on the staggering drum **50** can be 1:1.5 (see **FIG. 2***a* or **FIG. 2***b*). In order to carry out the transverse-axial staggered spacing on the transfer drum **60**, the transfer ratio between the staggering drum **50** and the transfer drum **60** can be embodied to be variable to realize a desired or predetermined transverse-axial staggered spacing. In order to achieve this, all the drums of the drum run are preferably provided with individual drives.

[0044] The transfer drum **60** from **FIG. 1***a* can be replaced to this end by a corresponding transfer drum **60** for the exemplary embodiment in **FIG. 2***a*, through which the resetting times can be reduced at the filter feed device **10**. Alternatively, the different transfer drum embodiments **60** can be arranged to be slidable along an axis.

[0045] Moreover, according to an aspect of the invention, the cutting knife **40** can be arranged in a fixed manner on the removal drum **30**. Further, the filter rods may be cut by cutting knife **40**, for example, as shown in **FIG. 1***a* and **FIG. 2***a*.

[0046] According to an aspect of the invention, the filter rods **100** may be cut into different filter plugs lengths, depending on the application For example, an adjustable stop **120** may be arranged on the removal drum **30**, so that the longitudinal axial spacing between the cutting knife **40** and stop **120**, e.g., a wall of the magazine **20**, can be adjusted according to the filter plug length to be cut.

[0047] According to another aspect of the invention, the filter rods **100** may be cut once (see **FIG. 1***a* and **FIG. 1***b*),

so that the cutting knife **45** (**FIG. 2***a*) can be removed or swung clear, so that only the cutting knife **40** cuts the filter rods **110** in the center. Further, **FIG. 2***a* shows the second cutting knife **45** arranged on the removal drum **30** so that, after corresponding positioning of stop **120**, the filter rods **100** (see **FIG. 2***a* and **2***b*) may be cut twice by the cutting knives **40**, **45**.

[**0048**] Moreover, a further stop **130** can be provided on the pusher drum **70**, so that the filter plugs **111**, **112** and **113** are pushed against this stop **130** in a longitudinally axial manner. Stop **130** can also be arranged to be adjustable in a longitudinally axial manner with respect to the filter plugs **111**, **112** or **113**, so that the displacement paths of the filter plugs **111**, **112**, **113** (see **FIG. 1***a* or **FIG. 1***b* and **FIG. 2***a* or **2***b*) can be of different lengths. In order to align the filter plugs of different lengths centrally on an insertion plane E in both exemplary embodiments shown, the second stop **130** can be adjusted in its position accordingly. The insertion plane E is shown for example, in a fixed manner on the filter tipping machine.

[**0049**] The stop **130** may also be aligned such that the centers of the filter plugs **111**, **112** (**FIG. 1***b*) or **111**, **112**, **113** (**FIG. 2***b*) are always arranged centrally in the insertion plane E.

[**0050**] It is possible through the stops **120** and **130**, which can be variably positioned in a longitudinally axial or horizontal manner, to utilize the same conveyor organs **30**, **50**, **60**, **70** and **80** for both exemplary embodiments or at one filter tipping machine without replacement during a garniture change. Through the use of the conveyor organs for filter plugs to be produced in different lengths, the resetting times at a filter tipping machine or a filter production machine are likewise greatly shortened, since no replacement of the corresponding conveyor organs or conversion needs to take place.

[**0051**] It is noted that the foregoing examples have been provided merely for the purpose of explanation and are in no way to be construed as limiting of the present invention. While the present invention has been described with reference to an exemplary embodiment, it is understood that the words which have been used herein are words of description and illustration, rather than words of limitation. Changes may be made, within the purview of the appended claims, as presently stated and as amended, without departing from the scope and spirit of the present invention in its aspects. Although the present invention has been described herein with reference to particular means, materials and embodiments, the present invention is not intended to be limited to the particulars disclosed herein; rather, the present invention extends to all functionally equivalent structures, methods and uses, such as are within the scope of the appended claims.

What is claimed:

1. A method for producing filter plugs from filter rods with a predetermined filter rod length, comprising:

removing the filter rods from a magazine;

selectively cutting the filter rods into filter plugs of one of a first or second predetermined filter plug length, wherein the filter plugs of a respective cut filter rod are coaxially aligned to one another;

staggering the filter plugs, such that filter plugs immediately adjacent another filter plug in a longitudinally axial manner are respectively positionally displaced transverse-axially to one another at a constant staggered spacing;

transferring the filter plugs to a transfer device, so that the filter plugs are positionally displaced to one another at a transverse-axial staggered spacing to the transverse-axially adjacent filter plugs, and the filter plugs staggered in a displaced manner are displaced in a longitudinally axial manner to form a row of filter plugs conveyed one behind the other in a transverse-axial manner.

2. The method in accordance with claim 1, wherein the selective cutting of the filter rods changes a number of filter plugs cut from a filter rod.

3. The method in accordance with claim 2, wherein changing the number of filter plugs cut comprises increasing or decreasing the number of cutting devices used.

4. The method in accordance with claim 1, wherein the selectively cutting forms at least one of n-fold filter plugs having an n-fold filter plug length and k-fold filter plugs having an k-fold filter plug length.

5. The method in accordance with claim 4, wherein a number of cutting devices for cutting n-fold filter plugs of n-fold filter plug lengths is n−1-fold cutting devices, and a number of cutting devices for cutting k-fold filter plugs of k-fold filter plug lengths is k−1-fold cutting devices.

6. The method in accordance with claim 3, wherein the transverse-axial staggered spacing is changed with a increase or a reduction in the number of cutting devices.

7. The method in accordance with claim 6, wherein at least one fixed cutting device remains in a fixed position as the number of cutting devices increases or decreases.

8. The method in accordance with claim 7, wherein a change in the selective cutting of the filter rods comprises displacing a first stop for the filter rods with respect to the at least one fixed cutting device.

9. The method in accordance with claim 1, wherein the increase or decrease in the number of cutting devices comprises one of activating or deactivating at least one second cutting device.

10. The method in accordance with claim 9, wherein the second cutting device is positionally fixed.

11. The method in accordance with claim 1, after the transfer device, displacing the filter plugs in a longitudinally axial manner to a second stop.

12. The method in accordance with claim 11, wherein, to change the filter plug length, the second stop is changed in position.

13. The method in accordance with claim 12, wherein the second stop is changed in position such that, after the change in the filter plug length, centers of previous filter plugs lengths and centers of new filter plugs lengths, lie in one plane.

14. The method in accordance with claim 13, wherein the filter plugs are transferred to a transfer drum by the transfer device.

15. The method in accordance with claim 14, wherein the transfer drum or the transfer device is replaced with the change of the filter plug length.

16. The method in accordance with claim 15, wherein the predetermined transverse-axial staggered spacing is changed with the change of the filter plug length.

17. A method for producing filter cigarettes, comprising:

producing filter plugs in accordance with claim 1, wherein the filter plugs are double-length filter plugs;

cutting double-length tobacco rods into single-length tobacco rods;

inserting the double-length filter plugs between the single-length tobacco rods;

joining the double-length filter plugs to the single-length tobacco rods by wrapping a tipping paper web to form filter cigarettes of double unit length.

18. A method for producing filter plugs from filter rods with a predetermined filter rod length, comprising:

removing the filter rods from a magazine;

cutting the filter rods to form filter plugs of a predetermined filter plug length; and

changing the cutting of filter rods to form filter plugs of another predetermined filter plug length, wherein in the changing of the cutting, a number of cutting devices is increased or decreased;

wherein the filter plugs are aligned coaxially to one another and are staggered after cutting, such that the filter plugs immediately adjacent in a longitudinally axial manner are respectively positionally displaced transverse-axially to one another at a constant staggered spacing;

transferring the filter plugs to a transfer device, so that the filter plugs are arranged respectively staggered with respect to one another at a fixed staggered spacing to one another, and the filter plugs staggered in a displaced manner are displaced in a longitudinally axial manner to form a row of filter plugs conveyed one behind the other in a transverse-axial manner, which results in an overall reduction in a production downtime.

19. The method in accordance with claim 18, wherein the transfer device includes a transfer drum having a plurality of receiving flutes, and only one filter plug is arranged in a respective receiving flute.

* * * * *