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Sexstone et al.

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[45] **May 8, 1973**

[54] FILTER PLUG FORMING AND BAGGING MACHINE

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[52] **U.S. Cl.** .....**53/23**, 53/53, 53/123, 83/411 R

[51] **Int. Cl.** **B65b 19/34**

[58] **Field of Search**.....53/23, 123; 83/411 R

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[57] **ABSTRACT**

Filter rods of predetermined length are placed in a hopper and fed to a slitting drum. This drum contains flutes divided into four groups, two of which are separated and their flutes are open whereas the other two groups of flutes are closed. The rods are received in the open flutes and there they are cut by a series of rotary knives into equal sections to provide filter plugs. The adjacent group of closed flutes in the path of rotary travel of the drum permits the cut filter plugs to be directed to a bagging station at which they are enclosed in a bag before the next group of cut filter plugs are permitted to pass through to the bagging station. As the cut filter plugs leave the slitting drum, they are directed into a funnel which has associated therewith a gate. The gate closes off the base of the funnel until the preceding group of cut filter plugs are completely enclosed in a bag. Thereafter, the hate is opened to permit the collected plugs to pass through to the bagging station. At this station a web of heat sealable wrapping material is fed into a tube former which forms the wrapping material into a tube which extends vertically. A heat sealer seals the overlapped marginal side edges of the tube of wrapping material. A pair of opposed and reciprocal heat sealers operates to heat seal and close the lower end of the tube at which the group of cut plugs collect. When the predetermined number of cut filter plugs is collected, the pair of reciprocal heat sealers are reciprocated to heat seal and close the tube above the group of collected plugs. This upper heat sealed zone is cut along an intermediate section to thereby produce a severed bag of filter plugs and at the same time provides the heat sealed and closed lower end of the next bag to be formed. The filled and severed bags are then permitted to drop and be collected in a suitable receptacle.

17 Claims, 7 Drawing Figures

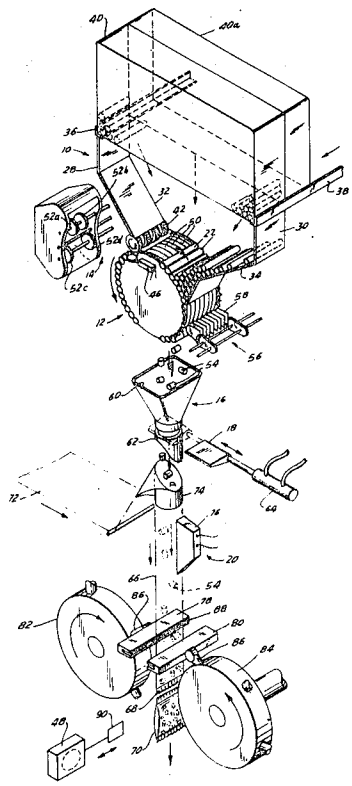

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FIG. 1

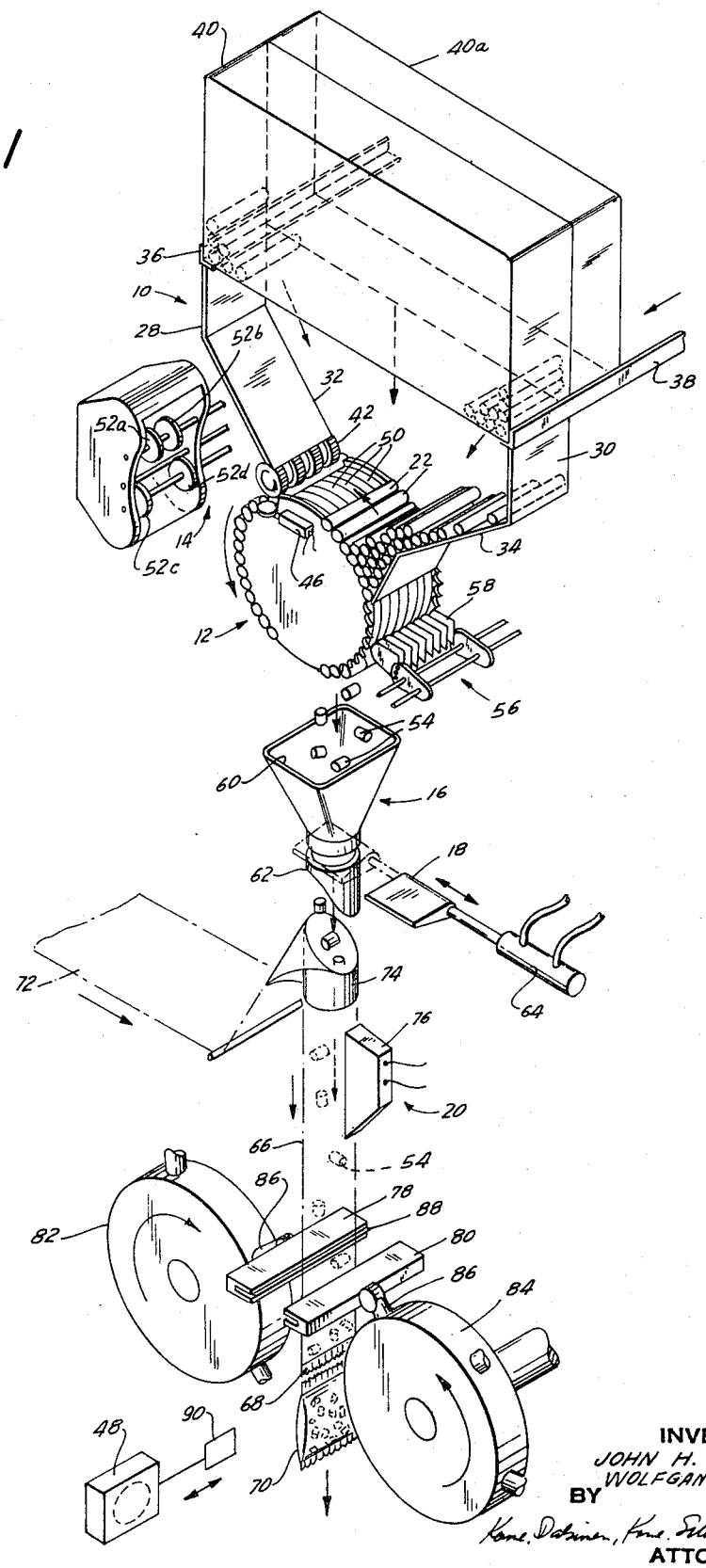

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FIG. 2

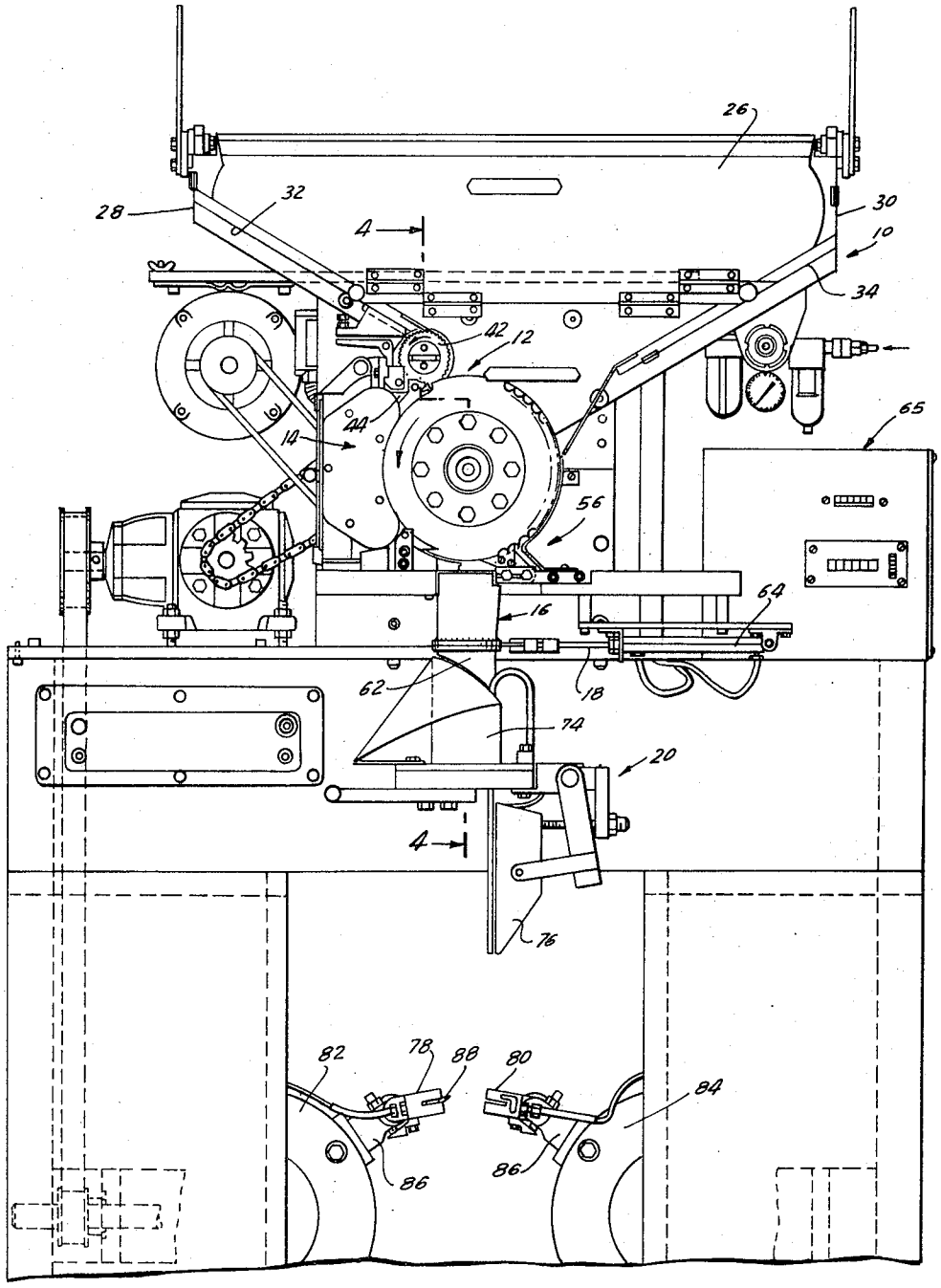

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FIG. 3

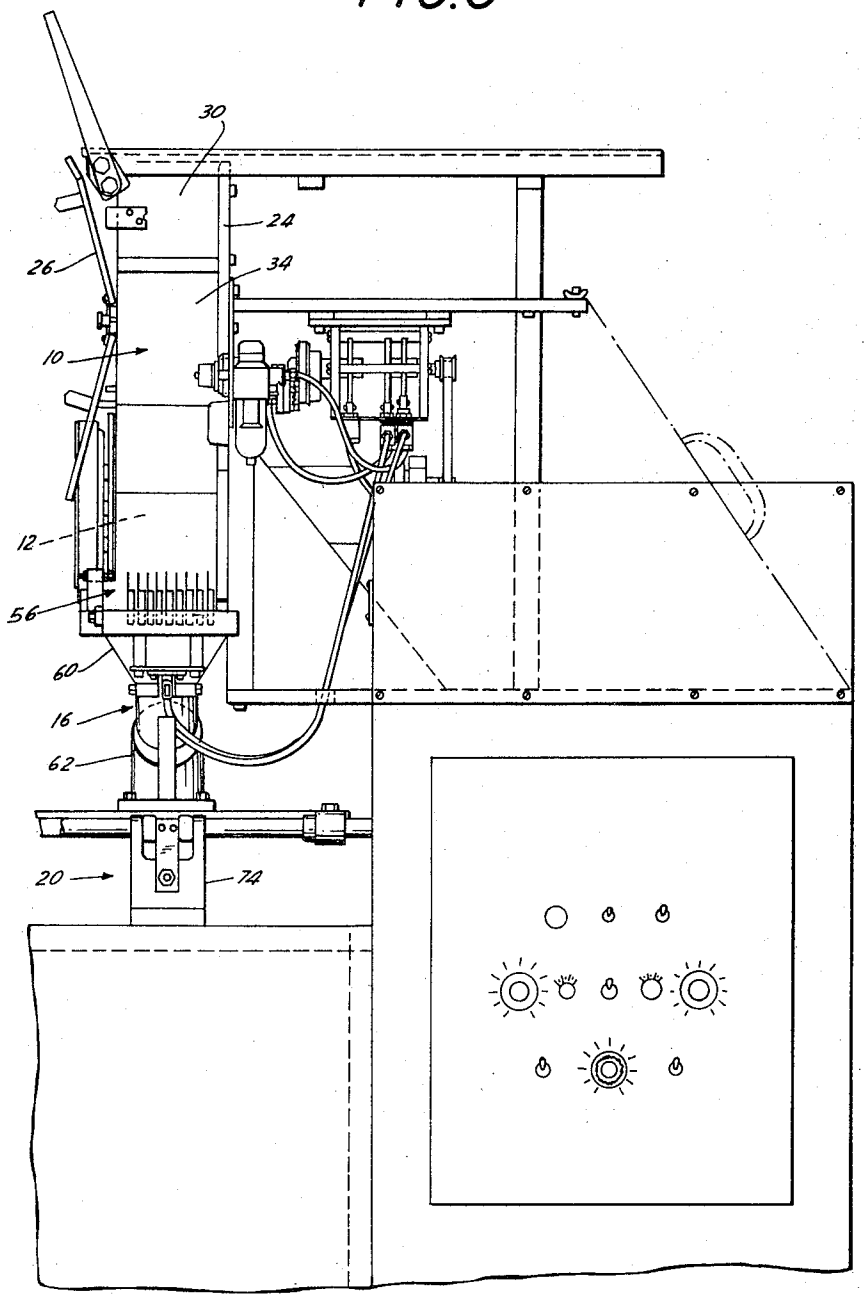

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FIG. 4

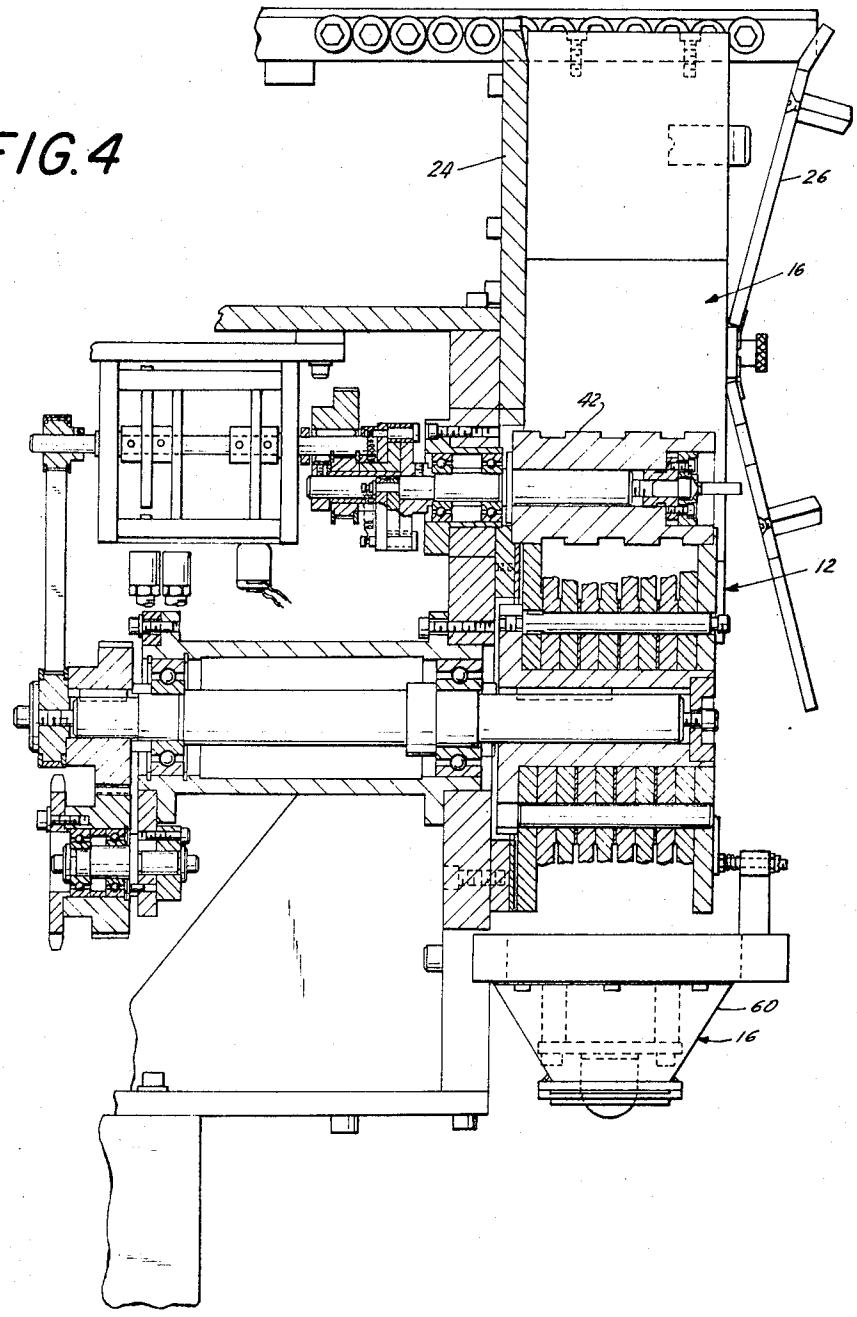

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FIG. 5

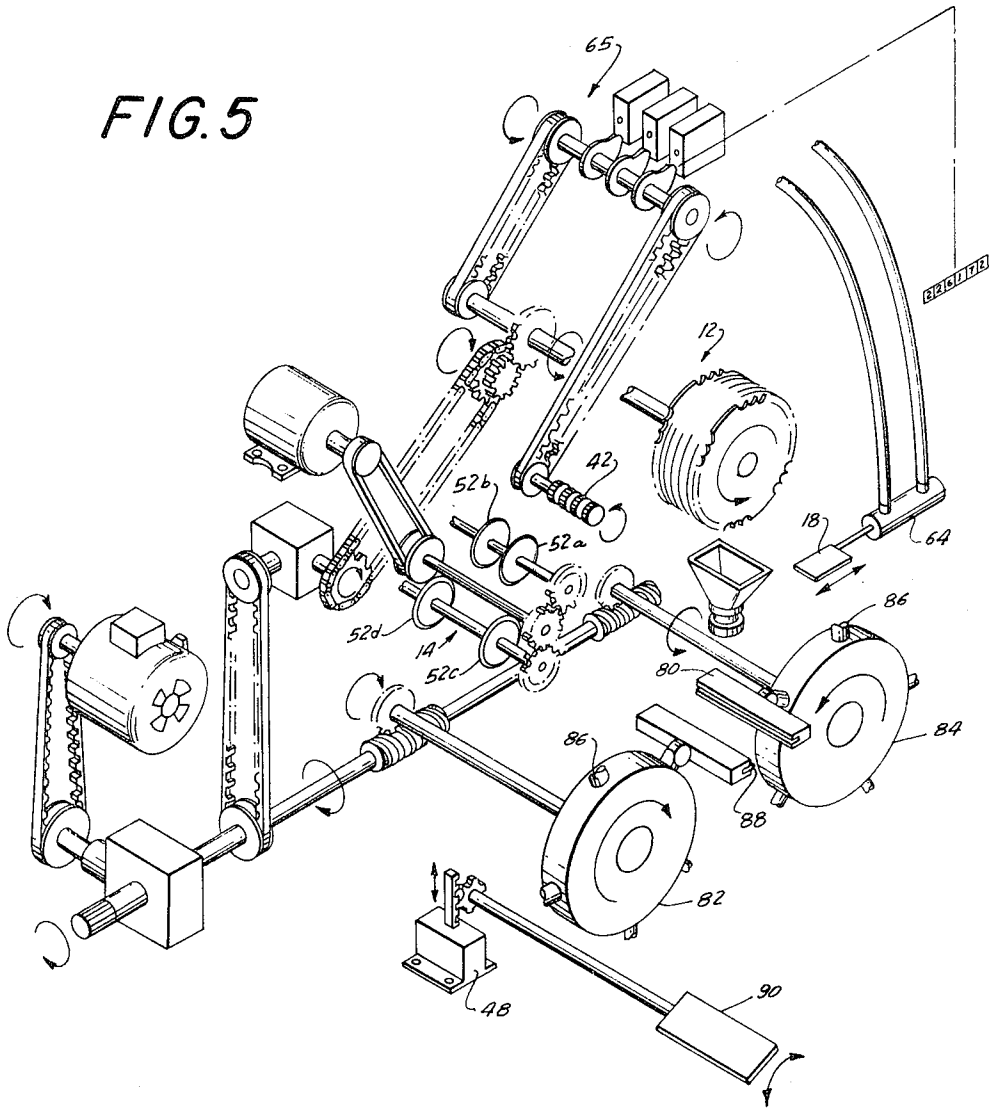

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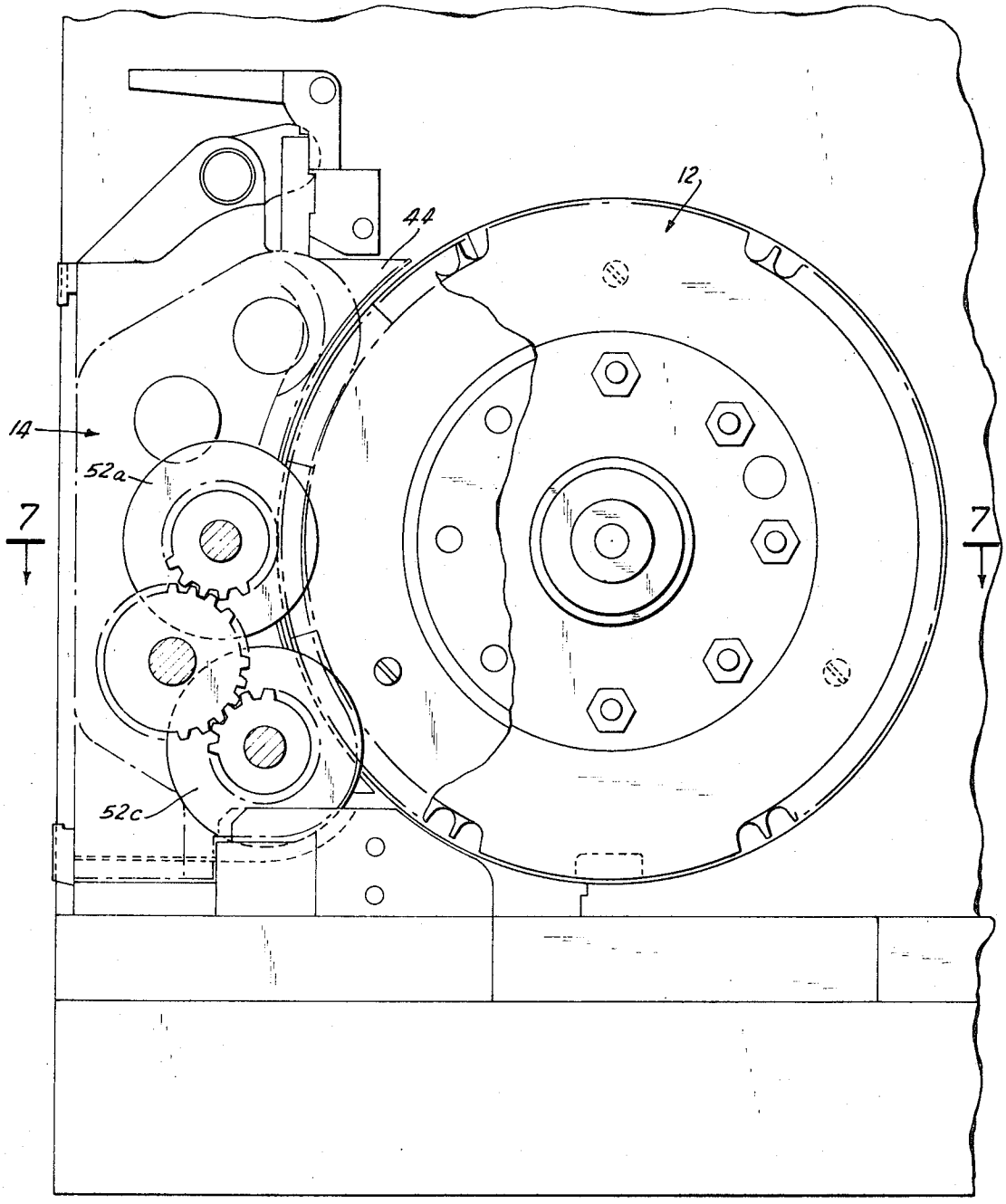
FIG. 6



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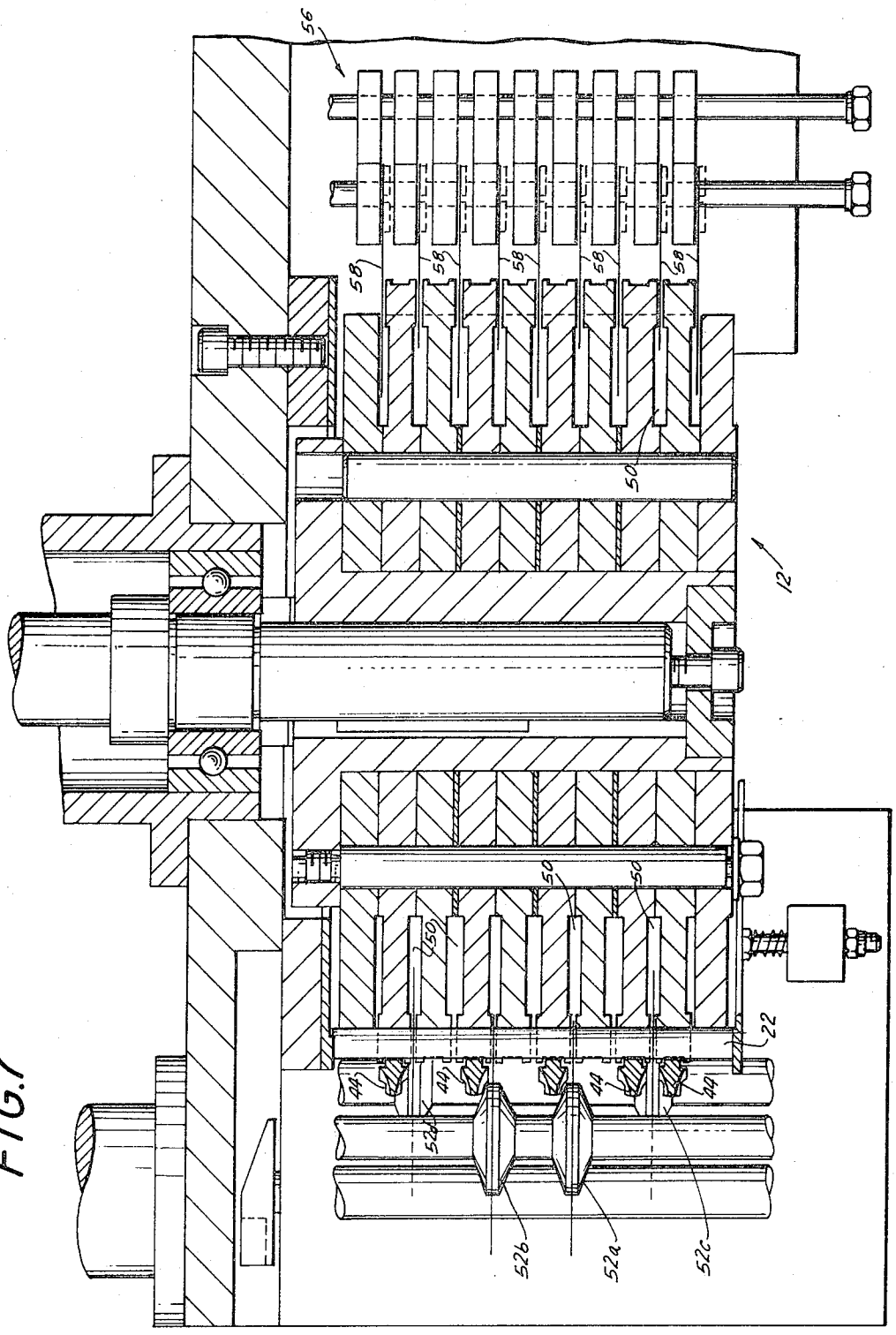

FIG.7

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FILTER PLUG FORMING AND BAGGING MACHINE

BACKGROUND OF THE INVENTION

This application relates to the manufacture of filter plugs designed to be used in the manufacture of filter tip cigarettes by manual techniques of the type disclosed in U.S. Pat. No. 3,491,768 granted Jan. 27, 1970. The machine of that patent is designed to make a filter tip cigarette manually by inserting a filter plug and a charge of tobacco simultaneously into a preformed tube. This tube includes a tipping part which may assume the form of simulated cork at the filter tip end of the manually made cigarette. This preformed tube is commonly referred to as a "spill" in the trade. In accordance with accepted marketing practice, the filter plugs together with these spills are supplied to the smoking consumer as part of a kit which may also include a supply of tobacco, a manual cigarette making machine (as part of the initial purchase by the consumer) and a number of packages for the manually made filter tip cigarettes.

SUMMARY OF THE INVENTION

The present invention has as its prime objective an improved apparatus and method for high speed production of bags containing a predetermined number of filter plugs.

Another object is to provide an apparatus and method for automatically cutting a predetermined number of filter plugs from a number of filter rods and thereafter enclosing this predetermined number of cut filter plugs in a bag.

A further object is to provide an apparatus and method of the foregoing type through which a system is incorporated for assuring against underfilled bags.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings

FIG. 1 is a diagrammatic perspective view of the filter plug forming and bagging machine of this invention showing the filter plugs cut from predetermined length filter rods and then funneled into the open end of a tube of wrapping material and thereafter enclosed in a heat sealed bag formed from this tube;

FIG. 2 is a front elevational view showing the filter plug forming and bagging machine in more detail;

FIG. 3 is an end elevational view of the machine;

FIG. 4 is an enlarged sectional view taken along the line 4—4 of FIG. 2;

FIG. 5 is a diagrammatic perspective view showing the drive of the components of the machine;

FIG. 6 is an enlarged elevational view of the slitting drum and associated plug cutting knives with certain parts broken away and removed; and

FIG. 7 is a sectional view taken along the line 7—7 of FIG. 6.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

In the drawings, the filter plug forming and bagging machine includes a hopper **10** which is adapted to receive and direct filter rods, preferably 105mm in length, and direct them to a slitting drum **12** which is

suitably fluted to receive a predetermined number of these rods and convey them while rotating to a cutting station **14** at which the rods are cut into five equal sections, each of which are 21mm in length. The cut filter plugs are eventually discharged from the drum as a result of the action of gravity and fall into the upper open end of a funnel **16**. A reciprocal gate **18** is associated with the lower end of this funnel and operates to momentarily stop the downward travel of the filter plugs until the preceding group of filter plugs are completely bagged, at which time the gate **18** is reciprocated to permit the detained filter plugs to drop into the upper open end of a tube of the wrapping material which is sealed about the predetermined number of plugs to form the bag of filter plugs. In this connection, the bagging station **20** directs a web of the selected wrapping material and shapes it into a tube, the overlapping marginal side edges of which are heat sealed and a pair of horizontally reciprocal heat sealers cooperate in sealing the lower end of the formed tube and when the predetermined number of cut filter plugs are collected in the tube of wrapping material these heat sealers reciprocate to seal the tube above the collected plugs. At the same time, the sealers seal a zone of the tube of sufficient width to form the sealed lower end of the following bag to be formed. The tube is cut at an intermediate section of this heat sealed zone and the lower formed bag is permitted to drop into a suitable receptacle for collection.

HOPPER

The hopper **10** receives and directs downwardly filter rods **22** of predetermined length, preferably a length of 105mm. The hopper **10** includes a rear wall **24** and a front wall **26** which may be as shown formed of an upper and lower hinged panel to provide easy access to the filter plugs and operating parts associated with the slitting drum **12**. The hopper is also provided with a pair of spaced vertically extending walls **28** and **30** each of which extends respectfully into downwardly and inwardly depending walls **32** and **34**. The upper end of the hopper **10** is open and has associated therewith a pair of tray racks **36** and **38** which serves to support one or several, as the case may be, trays **40** filled with 105mm filter rods. Each tray **40** includes a slat fitted to the tray bottom which may be manually removed from the tray **40** situated above the hopper **10** thereby permitting the filter rods **22** to drop into the hopper **10**. When the tray **40** is emptied of its filter rods **22**, it is removed and the next tray **40***a* on the racks **36** and **38** is shoved into place over the hopper **10** and its bottom lat is eventually removed to permit the contained filter rods to drop into the hopper **10**.

The filter rods **22** and the lower part of the hopper **10** are directed to the slitting drum **12** and specifically the open flutes therein.

SLITTING DRUM

The slitting drum **12** collects a predetermined number of filter rods **22** in its open flutes and transports them to the cutting station **14**. A refuser roller **42** which may have associated therewith a one-way safety clutch turns or rotates in the opposite direction to the drum rotation. This opposed movement tends to agitate the filter rods **22** causing the rods to fill the open flutes

while at the same time permitting only rods that are in the flutes to pass. Should the rods jam for one reason or another, the safety clutch is activated to cause the machine to stop operating.

The slitting drum is made up of a given number of flutes and in accordance with a successful embodiment of the invention the circumference of the drum is divided as follows: 20 open flutes, 7 closed flutes, 20 open flutes and 7 closed flutes. The 105mm filter rods are received in he open flutes and are adapted to be cut at the cutting station 14 into five equal sections of 21mm lengths. Inasmuch as the successful embodiment of the invention contemplates and requires 100 21mm long filter plugs per bag, one revolution of the slitting drum 12 produces cut filter plugs for two bags of 100 filter plugs. The closed flutes of the slitting drum 12 allow sufficient time for the bag forming, sealing and cutting operations at the bagging station 20.

After the rods 22 in the open flutes pass under the refuser roller 42, they are held in place by guides 44 while traversing the cutting station 14 and until the lower discharge point is reached during the travel of the drum 12.

The absence of a filter rod in the open flutes is detected by a normally closed microswitch 46. As will be appreciated, it is not desirable to market bags of filter plugs containing less than the prescribed number, notably 100 in the discussed successful application. To insure this count, the microswitch 46 will send a signal if an open flute does not contain a filter rod 22. When all flutes are filled, no signal is obtained from this switch 46. The signal is generated when an empty flute does not contain a filter rod and is transmitted to a diverter system 48 which operates to remove the underfilled bag from the main production flow.

The periphery of the drum 12 is provided with four equally spaced circumferentially extending knife receiving slits 50 which receive and cooperate with the rod slitting knives at the cutting station 14 in cutting the rods 22 into the selected or prescribed length of filter plugs.

CUTTING STATION

At the cutting station 14 the selected number of rotatably driven cutting knives 52 cut the filter rods 22 in the open flutes of the slitting drum 12 into equal length filter plugs 54. As indicated, the rods 22 are cut into five equal sections having lengths of 21mm and this successful application included four cutting knives 52 at the cutting station 14. During the cutting of the rods 22, the guides 44 also serve as anti-spin control elements. After the rods 22 are cut into the filter plugs 54, the cutting station 14 is eventually passed and the cut filter plugs 54 drop out of the slitting drum 12 into the funnel 16.

In order to assure the complete removal of the cut filter plugs 54 from the open flutes and the periphery of the slitting drum 12, a stripper assembly 56 may be provided. This stripper assembly includes a selected number of fingers 58 of relatively thin material or metal which are adapted to enter the slits 50 which receive the cutting knives 52 as well as a number of other circumferentially extending openings or slits in the periphery of the drum 12. Should there be any filter Plug retained in an open chute, it will most likely be engaged by one of the fingers 58 assuring its removal from the slitting drum 12 and eventual discharge into the funnel 16.

FUNNEL AND COUNTING GATE

As the filter plugs 54 are discharged from the slitting drum 12, they are dropped into the upper enlarged open end 60 of the funnel 16. The lower reduced end 62 has associated therewith gate 18 which is closed as the filter plugs start to drop into the funnel 16. After a predetermined period of time and specifically until the preceding group of plugs has been completely enclosed and sealed at the bagging station 20, the gate 18 is opened to permit the plugs to drop through the lower end 62 into the bagging station 20. In the successful application of this invention, the gate 18 remains closed until about 30 percent of the plugs are in the funnel 16. The opening and closing of the gate 18 may be accomplished by means of a piston and air cylinder assembly 64 coupled to the gate.

When all of the filter plugs 54 have cleared the counting gate 18, the gate is again closed so that there will be time for the bag forming process to be completed at the bagging station. The piston and cylinder assembly 64 may be of the pneumatic type and is controlled by a programmer 65, the cams of which are driven in time sequence and in time relation to the rotation of the slitting drum 12. The cams of the programmer 65 open and close valves which allow air to flow to the proper side of the air cylinder assembly 64 to move the gate 18 in and out in relation to the funnel 16.

BAGGING STATION

At the bagging station the filter plugs drop into a tube 66, the lower end 68 of which has been closed and sealed as the previous bag 70 was sealed and completely enclosed about the previous group of filter plugs. The tube 66 is formed from a web 72 of the selected wrapping material which in the successful application of the invention was cellophane. This web 72 is delivered to a tube former 74 which forms tube 66. The overlapping marginal side edges of the tube are heat sealed together by means of the heat sealer 76.

The ends of the bag 70 are heat sealed by means of the pair of opposed laterally reciprocal heaters 78 and 80 which are reciprocal towards and away from one another by means of a pair of twin wheels 82 and 84 respectively. As the twin wheels 82 and 84 rotate the heat sealers 78 and 80 respectively come together when spaced projecting cams 86 on the wheels are engaged. At the same time one of the sealers contains a knife 88 which as the wheels turn also moves over a cam causing the knife to move out of its accommodating slot through the intermediate portion of the heat sealed zone, thus shearing the bag 70 from the tube 66. As the wheels 82 and 84 continue their rotation, the end heat sealers 78 and 80 disengage or retract permitting the plug filled bag 70 to drop into a box or other suitable collecting receptacle.

DIVERTER SYSTEM

As explained in the above, if an underfilled bag 70 is detected as a result of the actuation of microswitch 46

because of a flute not filled with a filter rod 22, the detector system 48 is actuated to remove this bag from the line. In this connection, the diverter system 48 may include a conventional pin type memory wheel. The signal from the microswitch 46 shifts the appropriate pin on the memory wheel corresponding to the bag 70 that is to be underfilled. This memory wheel in turn activates a diverter 90 at the required time sequence; and the underfilled bag is diverted from the main production flow.

SUMMARY

In summarizing the operation of the apparatus for forming and bagging filter plugs, reference is made to FIGS. 1 and 5, the latter depicting the drive of the several parts and their controls. As will be evident in this figure, the knives 52 at the cutting station 14 are independently driven by a motor whereas the remaining parts take their drive off of the motor associated with the bagging station 20. Thus, the filter rods 22 initially contained in tray 40 find their way down the hopper 10 to one of the open flutes of slitting drum 12. Refuser roll 42 will assure proper entry of the rods 22 in the open flutes to the cutting station 14. There the rods 22 are cut into five sections. In the specific embodiment discussed, the rods are 105mm in length and the filter plugs 54 will be 21mm in length. At the same time, 20 open flutes are provided thereby assuring the formation of 100 filter plugs per group. Should one of the open flutes not be filled with a rod 22, the sensing microswitch 46 will generate a signal which eventually will be received by the diverter system 48 which operates to cause the diverter 90 to eliminate the underfilled bag 70. The cut plugs 54 reach the discharge point on the drum 12 and are dropped into the funnel 16. The stripper assembly 56 assures the removal of all of the cut plugs 54 from the periphery of the drum 12. The gate 18 will close the lower end of the funnel 16 until the previous group of filter plugs 54 are suitably bagged, at which time the programmer 65 will actuate the piston and cylinder assembly 64 to retract gate 18 thereby opening the path for the plugs 54 to drop into the upper open end of the cellophane tube 66. This tube will have its overlapping marginal side edges heat sealed by means of a heat sealer 60. Sufficient time is allotted for the group of filter plugs to accumulate at the lower end of the tube 66 at the sealed lower end 68. Thereafter, the heat sealers 78 and 80 are actuated by the respective timing wheels 82 and 84, the projecting cams 86 of which causes the heaters 78 and 80 to shift inwardly to heat seal the tube 66 above the collected filter plugs 54. At the same time knife 88 will be shifted outwardly to sever the heat sealed zone at an intermediate location thereby producing a completed bag 70 and the sealed lower end 68 of the following bag to be produced.

Thus, the several aforenoted objects and advantages are most effectively attained. Although a single preferred embodiment of the invention has been disclosed and described in detail herein, it should be understood that this invention is in no sense limited thereby and its scope is to be determined by that of the appended claims.

What is claimed is:

1. A filter plug bagging machine for cutting a predetermined number of plugs from filter rods and thereafter enclosing the plugs in a bag, the machine comprising:

a hopper for receiving a plurality of filter rods;

a slitting drum having a predetermined number of open flutes for receiving a corresponding number of rods from the hopper;

knife means associated with the drum for cutting the rods in the flutes, into plugs;

gate means for momentarily stopping the travel of plugs cut by the knife means until the preceding predetermined number of cut plugs have been bagged;

funnel means for directing the cut plugs as a group to a bagging station; and

a bag forming means at the bagging station for forming a bag of selected material from the cut plugs.

2. The invention in accordance with claim 1 wherein the hopper includes an upper entrance and a lower exit for receiving rods and directing them to the slitting drum respectively, and a tray rack means at the entrance end of the hopper for receiving and supporting a tray containing filter rods.

3. The invention in accordance with claim 1 wherein the slitting drum includes two series of open flutes separated by a predetermined number of closed flutes, means for rotating the slitting drum whereupon one revolution of said drum will produce two groups of cut plugs.

4. The invention in accordance with claim 1 wherein the knife means includes a series of rotatably driven knives that cooperate with surfaces of the slitting drum, which cooperation results in cutting of the plugs from the rods.

5. The invention in accordance with claim 1 wherein detector means are associated with the slitting drum for detecting the absence of a rod in one of the open flutes an thereafter generating a signal in response to the open flute, and diverter means responsive to a signal from the detector means for diverting the bag of cut plugs that would be underfilled as a result of the empty flute.

6. The invention in accordance with claim 5 wherein the detector means comprises a microswitch and the diverter means includes a memory wheel system which receives the signal from the microswitch which stores the signal, a diverter of the diverter means is actuated by the memory system to divert the underfilled bag.

7. The invention in accordance with claim 1 wherein the means for directing the cut plugs as a group includes a funnel and a gate associated with the funnel for causing a number of the plugs to collect in the funnel and means for opening the gate for permitting the collected plugs to pass to the bagging station.

8. The invention in accordance with claim 1 wherein a stripper is associated with the slitting drum to strip any cut plugs that may stick to the drum after cutting by the knife means.

9. The invention in accordance with claim 1 wherein means are provided for directing a web of the selected material to the bagging station, means for forming the web into a tube, the means for directing the cut plugs as a group acts to direct the group of plugs into the tube, means for sealing adjacent side edges of the web in

forming the tube, means for sealing the lower end of the tube such that the group of plugs collect adjacent the sealed lower end of the tube and for sealing the tube above the group of collected plugs to thereby form a bag containing the group of cut plugs and means for severing the bag from the tube.

10. The invention in accordance with claim 9 wherein the means for sealing the adjacent side edges and the lower end of the tube and that portion of the tube above the collected plugs are heat sealing means and the web of selected material is heat sealable.

11. A method of forming and bagging a predetermined number of filter plugs for use in the manual formation of a filter tip cigarette comprising the steps of:

providing the plurality of filter rods of predetermined length and of selected filtering material;

feeding the filter rods;

intercepting the filter rods and carrying them to a cutting station;

cutting the rods into filter plugs having a predetermined length;

momentarily gating the path of travel and stopping the travel of plugs that are cut until the preceding predetermined number of cut filter plugs are bagged;

directing the cut filter plugs into an upper open end of a tube of the selected wrapping material, the bottom end of said tube being sealed;

collecting a predetermined number of the filter plugs in the tube and thereafter sealing the tube above the collected filter plugs; and

severing the enclosed filter plugs from the tube.

12. The invention in accordance with claim 11 wherein the filter rods are intercepted and conveyed to the cutting station by a fluted drum having a predetermined number of open flutes for receiving filter rods to provide a predetermine number of filter rods to be presented to the cutting station and thereby providing a predetermined number of filter plugs to be bagged, detecting the absence of a filter rod in a flute and transmitting a signal in response to the absence of a filter rod in a flute, and diverting the ultimately formed bag that is underfilled because of the absence of a filter rod as detected in one of the flutes.

13. The invention in accordance with claim 11 including preventing the jamming of filter rods at the entrance to the cutting station.

14. The invention in accordance with claim 11 wherein the filter plugs are intercepted and diverted to the bagging station as they exit from the cutting station.

15. The invention in accordance with claim 11 wherein the cut filter plugs are intercepted by a closed gate and thereafter permitted to drop to the bagging station by opening the gate following the enclosing of the preceding group of cut filter plugs in a bag.

16. The invention in accordance with claim 11 including feeding a web of the selected bagging material and directing it to a tube forming station for purposes of forming said tube, heat sealing the marginal side edges of the tube together and heat sealing the tube below and above the selected group of filter plugs.

17. The invention in accordance with claim 16 wherein cutting the heat sealed zone above the collected filter plugs at an intermediate location to thereby form a completed bag of filter plugs and at the same time form the sealed lower end of the tube for the following bag to be produced.

* * * * *