

EUROPEAN PATENT APPLICATION

Application number: **84302222.9**

Int. Cl.³: **A 24 C 5/58**

Date of filing: **30.03.84**

Priority: **31.03.83 US 480807**
28.02.84 US 584366

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Date of publication of application: **07.11.84**
Bulletin 84/45

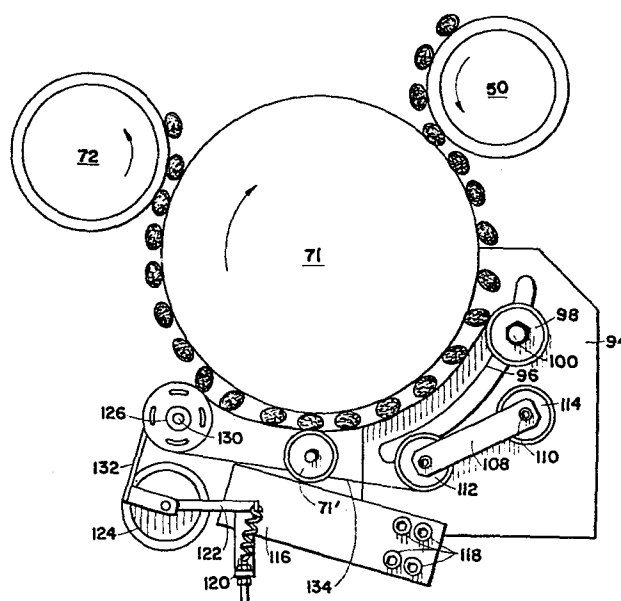
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Designated Contracting States: **DE FR GB IT**

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Method and apparatus for tipping smoking articles.

A method and apparatus are disclosed for wrapping tipping material about an assembly comprising a tobacco rod and a filter plug both having a circular or non-circular cross-section. The cigarette assembly is rolled along the surface of a rolling drum (71) by means of an adjacent pressure element (134) that is moved in the same direction as, but with a different speed from that of, the peripheral surface of the drum. The difference in speed causes the cigarette assembly to roll along the drum surface. The pressure element, which is preferably a belt, is adapted to exert a substantially constant pressure on the cigarette assembly despite the irregular shape of the latter.



METHOD AND APPARATUS FOR
TIPPING SMOKING ARTICLES

The present application pertains generally to methods and apparatus for tipping smoking articles, and pertains more especially to such methods and apparatus for tipping oval smoking articles. In an alternate embodiment, the methods and apparatus of this invention are suitable equally for tipping smoking articles having oval or circular cross-sections.

In the manufacture of cigarettes, it is conventional to make a continuous tobacco rod (a paper tube filled with shredded tobacco or tobacco substitute) and to cut the continuous rod to the length of individual cigarettes. A continuous rod of filter material is extruded and cut into lengths. The resulting filter plugs are collected in trays and placed in the hopper of a tipping machine, which cuts the filter plugs to twice the length of a single filter, joins each double-length filter plug to two filterless cigarettes and severs the resulting assembly to form two complete cigarettes.

The filter plugs are gravity-fed from the hopper into flutes or grooves in the periphery of a rotating drum. The filter plugs are held in place in the flutes by means of vacuum suction exerted from the drum interior. The filter plugs can be

passed from one such drum to another by proper timing of the rotations of the two drums, and by simultaneously deactivating the suction applied to a particular groove of the first drum as that groove comes face-to-face with a groove of the second drum. This permits a filter plug in the first flute to be pulled over into the opposing flute of the second drum by the suction applied to the latter. The filter plugs passed in this manner from one drum to another eventually are transferred to the flutes of a feed drum. In each flute two previously-deposited cigarette rods flank the filter plug end-to-end.

A web of cork or other tipping material is drawn from a roll thereof and has glue applied to one side. The web is cut off in lengths by cork knives, and one edge of each length is applied to a filter-plug-and-cigarette assembly in such a manner as to extend over the entire length of the filter plug and to overlie a small portion of each cigarette rod, the adhesive on the tipping material sticking to the plug and the rod.

The resulting double cigarette assembly is transferred to a rolling drum, beside which is a metallic rolling block. Each cigarette assembly is rolled along the rolling block by the drum. The rolling action wraps the tipping material around the cigarette assembly, to which it adheres as a result of the glue. Suitable heating elements in the rolling block commonly are used to cure the adhesive rapidly.

The double cigarette assembly is then transferred to a cutter drum, which moves it past a disc knife that severs the assembly into two complete cigarettes. The cigarettes are then inspected and moved to a discharge point, from which they are taken to another machine for packing.

The conventional tipping machine described above is designed to handle cigarettes of circular

cross section. It would be desirable to be able to adapt a standard cigarette tipping machine for use in the rapid, economical, large-scale manufacture of cigarettes having an oval cross section, which have hitherto largely been a luxury product requiring special equipment for virtually every stage of their manufacture. Two particular problems arise in making such an adaptation. First, it is difficult to transfer oval filter plugs from the hopper to a drum of the conventional type in such a manner that every flute will contain a filter plug and so that each filter plug will have the same predetermined orientation about its longitudinal axis (hereinafter, "angular orientation"). Second, it has been found to be impossible, as a practical matter, to wrap tipping material around a cigarette assembly having an oval cross section, using standard tipping machine equipment.

Our copending application No. _____ entitled "Method and Apparatus for Aligning Oval Cigarette Filters", filed on the same day as this application, is directed to a solution of the first problem.

The present invention provides a method for rolling an assembly comprising a tobacco rod and a filter plug, each affixed longitudinally to an edge portion of a piece of tipping material, so as to wrap the tipping material around the assembly to secure the filter plug to the tobacco rod characterised in that it comprises:

locating the assembly on a moving rolling surface;
contacting the assembly with a pressure applying surface which is moving in the same direction as and at a lower speed than the moving rolling surface; and
applying a constant pressure, by means of the

pressure applying surface, to the assembly, to roll it along the rolling surface.

It further provides apparatus for carrying out the above method comprising: a rolling drum (71) capable of receiving paraxially on its periphery an assembly, comprising a tobacco rod and filter plug, each joined longitudinally to an edge portion of a piece of tipping material; and means (94-134) for applying pressure to such an assembly when located on the rolling drum (71), to cause it to roll along the periphery of the rolling drum (71), characterised in that the means (94-134) for applying pressure includes a pressure control means (112,114) which, in use, maintains the pressure exerted by the means (94-134), for applying pressure substantially constant as the assembly rolls along the periphery of the rolling drum (71), regardless of the cross-sectional configuration of the assembly.

An advantage of the invention is that it permits the ready and easy adaptation of existing tipping machines to the production of oval cigarettes.

The invention finds particular application in the manufacture of oval cigarettes. The difference in angular speeds between the rolling drum and the pressure applying means causes the oval cigarette assembly to roll along the surface of the rolling drum. If the difference in speeds is appropriately chosen, the rolling of the cigarette assembly is at such a rate

that the tipping material is wrapped around it reliably and without damage to the cigarette assembly. The rolling drum speed determines the machine through-put.

It is particularly desirable to maintain the pressure exerted by the pressure element on cigarette assemblies between it and the rolling drum at a substantially constant, relatively low value. This minimizes the risk of damage to the oval cigarette assemblies, despite the irregularity of their shape compared to ordinary cigarettes having a circular cross-section. In an alternate embodiment of this invention, slight additional pressure is exerted along the longitudinal axis of the smoking article at a distinct point in its traverse between the pressure element and the rolling drum to ensure secure adhesion of the tipping material. When the alternate embodiment is employed with oval smoking articles, the rotation of the smoking article must be governed so that this slight additional pressure is exerted along the relatively flat portion of the oval to avoid distorting the oval cross-section.

It is most preferred to provide the rolling drum with flutes and to place the cigarette assemblies therein to move them to the first feed point. The rolling process is preferably carried out so that each cigarette assembly rolls a distance which is an integral multiple of the spacing between adjacent flutes, and an integral multiple of the cigarette circumference. If this is done, the wrapped cigarette assembly will lie in a flute, and in the same angular orientation as at the original feed point. This facilitates the transfer of the wrapped cigarette assemblies to the following drums for the remaining steps carried out by the tipping machine.

It should be understood that the scope of one embodiment the invention includes tipping not only strictly elliptical smoking articles, but all

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such articles having a generally rounded but non-circular cross-section, even including one or more flat portions or edges, provided only that any such angularity is not such as to render the apparatus and method disclosed, and their equivalents, unworkable as applied to the shape in question. An alternate embodiment of the invention is applicable equally to cigarettes of circular or non-circular cross-section. Herein, "oval" includes all non-circular shapes to which the invention is applicable.

The invention will now be further described, by way of example, with reference to the drawings, in which:

Figure 1 is a somewhat schematic elevational view of a tipping machine incorporating apparatus for carrying out the method of the invention;

Figure 2 is a detail of Figure 1 showing the preferred embodiments of the apparatus for carrying out the method of the invention; and

Figure 3 is a sectional view taken from line 3-3 of Figure 2.

A tipping machine incorporating the invention moves oval filter plugs from a hopper along a path on which they are cut to twice the length of a single filter and mated end to end with oval filterless cigarettes supplied from a cigarette maker. Tipping material in sheet form, such as cork or tipping paper, is drawn from a roll and has an adhesive applied to one side of it. The tipping material is then cut into lengths, each of which is attached to

an assembly comprising two filterless cigarettes abutting a double-length filter plug between them end-to-end. The rolling drum assembly of the present invention is used to wrap the piece of tipping material around the oval cigarette assembly, firmly securing the filter plug to the tobacco rods. The cigarette assembly is then cut into two oval cigarettes and delivered to the output point of the tipping machine to be transported to the next work station.

When the invention is to be used solely for tipping cigarettes of oval cross-section, except for the plug drum, all drums that would conventionally have flutes of circular-arcuate cross-section instead preferably have oval-arcuate flutes to receive the oval articles in question snugly.

Figure 1 shows an overview of such a tipping machine 10. The tipping machine 10 has a hopper 12 in which filter plugs P two, four times or six times as long as needed for one cigarette are received. Adjacent the bottom opening of the hopper 12, on one side, is a continuous belt 14 mounted on two rollers 16, 18, which drive the belt 14 so as to feed filter plugs downward toward the bottom opening of the hopper 12.

A plug drum 20, described in detail in copending application Serial No. 480,809, is mounted for rotation about a horizontal axis below the bottom opening of the hopper 12. The plug drum 20 has evenly spaced flutes 22 around its circumference and includes a conventional mechanism in its interior for applying vacuum suction to selected flutes 22. As the filter plugs reach the bottom of the hopper 12, each is received in a flute 22 on the plug drum 20 and is held there by means of suction. The rotation of the drum 20 carries the plug out of the hopper 12. To prevent filter plugs not firmly seated in flutes 22

from leaving the hopper 12, a refuser roller 24 is disposed adjacent the hopper opening on the side toward which the filter plugs move as they leave the hopper, i.e., the side opposite the feeder belt 14. The refuser roller 24 rotates in such a direction as to tend to knock filter plugs back into the hopper 12 (clockwise in Figure 1), and is spaced from the plug drum 20 such a distance that a filter plug seated in a flute 22 will clear the refuser roller 24 while a filter plug lying on the periphery of the drum and not in a flute 22 will be kept in the hopper 12 by the refuser roller 24.

Adjacent the plug drum 20 are two slitter disc knives 26, 28 mounted for rotation about respective horizontal axes. The knives 26, 28 are positioned so as to cut each filter plug into three segments of equal length. (If the filter plugs in the hopper 12 are only four times the length of one filter, only one of the two slitter knives shown is needed.) Grinding wheels 30, 32 adjacent each slitter disc 26, 28 sharpen the knives.

Each double length filter plug is transferred from the plug drum 20 to a grading drum 34, which staggers the two or three filter plugs cut from one original plug. Two guide blocks 36, 38 between the plug drum 20 and the grading drum 34 are used to give each oval filter plug the same angular orientation, as disclosed in detail in copending application Serial No. 480,809. After staggering the plugs, the grading drum 34 transfers them in a known manner to a shifting drum 40, where vacuum suction is used in known manner to draw each filter plug toward the axially middle portion of the drum 40, thus combining the two or three staggered parallel series of filter plugs into a single series. The filter plugs are then transferred in the known manner to an accelerating drum 42, which accelerates them

to the desired speed and passes them conventionally to the feed drum 44.

At the same time, oval tobacco rods cut to the length of individual cigarettes are received from a cigarette maker. The maker feeds the filterless tobacco rods individually in staggered relationship, longitudinally onto a take-off drum 46. The single-length filterless cigarettes then pass in the known way to the grading drums 48, where the individual cigarettes are transferred to permit alignment for transfer to the feed drum 44. The grading drum 48 then transfers them in the known way to the feed drum 44, on which the filter plugs are then placed in the manner described. The resulting combination of filter plug and cigarettes is moved to the swash-plate drum 50, on which the cigarettes are moved toward each other so that they abut the filter plug end-to-end. While on this drum 50, the resulting double cigarette assembly (the combination of filter plug and tobacco rods) receives a piece of adhesive-coated tipping material.

The tipping material is supplied in the following known manner. A roll 52 of tipping material is mounted for rotation about a horizontal axis. (Two rolls 52 are shown. As one is used up, the second is spliced to the first.) The material is pulled from the roll 52 and is led along a path defined by various rollers 54, past a bath 56 of adhesive, which is preferably heat-activatable. A roller 58 partially immersed in the bath 56 and rotating about a horizontal axis coats an adjacent applicator roller 60 with adhesive. The tipping material web is passed along the surface of the applicator roller 60 so that one surface of the web is coated with the adhesive. The tipping material is then transported to the cork drum 62, which serves as a platen to permit the tipping material, held

against the drum 62 by suction, to be cut into lengths by means of knives 64 mounted on a rotating knife drum 66. Rotary brushes 68, 70 adjacent the cork knife drum 66 remove debris, dust and the like from the cork knives 64.

The rotation of the cork drum 62 brings each piece of tipping material, with the adhesive side exposed, into contact with a cigarette assembly on the swashplate drum 50. The cork drum suction on the tipping material is terminated at the moment of contact with the cigarette assembly, to which the adhesive sticks. The material contacts and adheres to the assembly along a single line, and extends from the assembly like a tab. The tipping material is then wrapped around the assembly by the rolling drum 71 of the invention, as described below.

After completion of the wrapping process, the cigarette assemblies are passed to a transfer drum 72 and thence to a cutting drum 74 adjacent which is a slitter disc knife 76. The slitter knife 76 cuts each double cigarette assembly into two cigarettes. A grinder wheel 78 adjacent the slitter disc knife 76 maintains its sharpness. The cigarettes are then moved by an additional transfer drum 80 to a turning drum 82, which reverses one of the two parallel mirror-image series of cigarettes so that all the cigarettes have the same orientation. The cigarettes proceed to an inspection drum 84, thence to an ejection drum 86 that removes any cigarette identified as defective, and finally to a catcher drum 88 that places the remaining cigarettes on two catcher belts 90 to be taken to the next machine. A guide wheel 92 above the belts 90 decelerates the cigarettes as they are placed on the belts 90.

Figure 2 shows the apparatus of the invention in greater detail. A mounting plate 94 having an arcuate slot 96 is to one side of the rolling

drum 71, the axis of which coincides with the center of curvature of the arcuate slot 96. The cross-section of the slot 96 is T-shaped (see Figure 3). A first roller 98 is mounted for rotation on an axle 100 disposed in the slot 96. A draw bolt is used as the axle shaft of the first roller 98. The draw bolt 100 has a flange 104, which is received in the broad part 106 of the slot 96 (see Figure 3). By means of the draw bolt 100, one can move the first roller 98 to any desired position along the arcuate slot 96 and fix it there. The mounting plate 94 may, if desired, be attached to the body of the tipping machine by means of bolts (not shown) received in horizontal slots (not shown) in the mounting plate, permitting the lateral position of the mounting plate relative to the rolling drum 71 to be adjusted.

The mounting plate 94 also supports one end of a bracket 108 mounted thereon to be pivotable about a horizontal axis 110 and carrying at its free end a tension roller 112 and 114. A spring (not shown) biases the bracket 108 away from the drum 71 (counterclockwise in Figure 1). An additional plate 116 is secured, as by bolts 118, to the mounting plate 94. An arm 120 is secured to and depends vertically from the second plate 116. One end of a spring 126 is secured to the lower end of arm 120 and has its other end attached to bracket 122 to urge roller 124 upward.

A driver roller 126 is mounted on the tipping machine for rotation about a horizontal axis 130 above the pressure roller 124. A scraper 132 is supported by the bracket 122. A continuous belt 134 extends in a loop around the first roller 98, over the top of roller 114, around the tension roller 112, and around the driver roller 126. In the absence of cigarette assemblies on the rolling drum 71, the belt 134 rests against the periphery of the drum 71.

An alternate embodiment of the invention comprises the addition of nip roller 71' and makes the invention suitable for tipping either oval or circular cross-section cigarettes. Nip roller 71' is mounted for rotation beneath endless belt 134 to slightly narrow the gap between belt 134 and rolling drum 71. Nip roller 71' is located along the length of the gap so that, as each cigarette traverses the gap, its tipping paper overlap seam is radially aligned with nip roller 71' at the point where the nip roller makes line contact with belt 134. In the case of oval cigarettes, this point of alignment will be across the minor axis of the oval. The slight additional pressure exerted by nip roller 71' is of short duration, is exerted substantially only along the tipping paper overlap seam, and is insufficient to permanently deform the cigarette from its previous cross-sectional shape.

The operation of the apparatus of the invention will now be described. Each double oval cigarette assembly reaches the nip between the first roller 98 and the rolling drum 71 while riding in a flute on the latter in a predetermined orientation. The belt 134 is driven to move in the same direction as the adjacent periphery of the rolling drum 71, but at a different angular speed as measured about the rolling drum axis. As a result of this difference in speed, an object between the belt 134 and the rolling drum 71 is caused to roll along the surface of the drum 71 while being moved forward along the path between the drum 71 and the belt 134 by the drum's rotation.

As can be seen from the figures, the tipping material is applied to the portion of the cigarette assembly radially farthest from the center of the swashplate drum 50. When drum 50 transfers the cigarette assembly to the rolling drum 71, the sheet of

tipping paper is received more or less flat against the rolling drum surface (neglecting the flute in which the assembly is placed), and trailing the assembly. To wrap the paper around the cigarette assembly, the belt 134 is driven so that its angular speed is less than that of the drum 71, causing the cigarette assemblies to roll along the drum surface retrograde (i.e., counterclockwise in Figure 2).

The tension in the belt 134 is maintained constant by means of the spring (not shown) on the pivotal mount of the tensioning roller bracket 108. As a result, the pressure the belt 134 exerts on a cigarette assembly is substantially constant, despite the oval shape of the cigarette assembly. In the absence of the tensioning device described or an equivalent, the belt would exert a periodically variable pressure on a cigarette assembly, increasing the likelihood of damage to the cigarette. It has been found that the tensioning device described satisfactorily causes the belt 134 to exert substantially constant pressure against as many cigarette assemblies as may be in the gap between the drum 71 and belt 134 at a given time. It will be recognized that this result is essential for the large-scale, high-speed production of oval cigarettes, since it is not economically feasible to pass only one through the gap at a time.

It is highly desirable that the cigarette assemblies have the same orientation relative to the rolling drum 71 upon leaving the gap that they have upon entering. To ensure that this is the case, the length of the gap must be an integral multiple of the perimeter of the cigarette assemblies. This can be adjusted precisely by suitably locating the first roller 98 along the arcuate slot 96.

Heating elements of a known type may, if desired, be provided in the rolling drum 71 to aid in curing the adhesive rapidly.

The apparatus and method described cause the cigarettes to be wrapped relatively slowly even while being moved through the tipping machine at a very high speed. This permits the wrapping operation to be carried out sufficiently slowly to prevent damage to the products while maintaining a high production rate.

The operation of the alternate embodiment of the invention is the same except where each cigarette passes the point where nip roller 71' urges belt 134 toward drum 71 to slightly narrow the gap. The slight narrowing of the gap between belt 134 and drum 71 causes a momentary increase in pressure exerted on the tipping paper overlap seam and ensures a secure bond.

With the present invention, it has been found possible to wrap oval cigarettes at rates (up to 5,000 cigarettes per minute) comparable to those attained with round cigarettes using conventional machinery.

CLAIMS

1. A method for rolling an assembly comprising a tobacco rod and a filter plug, each affixed longitudinally to an edge portion of a piece of tipping material, so as to wrap the tipping material around the assembly to secure the filter plug to the tobacco rod characterised in that it comprises:

 locating the assembly on a moving rolling surface;
 contacting the assembly with a pressure applying surface which is moving in the same direction as and at a lower speed than the moving rolling surface; and
 applying a constant pressure, by means of the pressure applying surface, to the assembly, to roll it along the rolling surface.

2. A method according to claim 1 in which the assembly revolves at least once about its own axis.

3. A method according to anyone of claims 1 or 2 in which the assembly revolves an integral number of times about its own axis.

4. A method according to any of claims 1 to 3 in which the assembly is located at a first one of a plurality of receiving stations on the rolling surface before contacting the pressure applying surface.

5. A method according to claim 4 in which the wrapped assembly is removed from contact with the pressure applying surface whilst being located at a second one of the plurality of receiving stations.

6. A method according to claim 4 or 5 in which the assembly is located at the receiving station by means of suction.

7. A method according to any one of claims 1 to 6 further comprising means for applying momentarily increased pressure to the assembly at a predetermined point on the periphery of the assembly.

8. A method according to claim 7 wherein the increased pressure is applied to the point on the periphery of the assembly at which the free edge portion of the tipping material overlaps the edge portion affixed to the rod and plug.

9. Apparatus for carrying out the above method comprising: a rolling drum (71) capable of receiving paraxially on its periphery an assembly, comprising a tobacco rod and filter plug, each joined longitudinally to an edge portion of a piece of tipping material; and means (94-134) for applying pressure to such an assembly when located on the rolling drum (71), to cause it to roll along the periphery of the rolling drum (71), characterised in that the means (94-134) for applying pressure includes a pressure control means (112,114) which, in use, maintains the pressure exerted by the means (94-134) for applying pressure substantially constant as the assembly rolls along the periphery of the rolling drum (71), regardless of the cross-sectional configuration of the assembly.

10. Apparatus according to claim 9 further characterised in that the pressure applying means further comprises a pressure element (134), a surface of which in use, applies pressure to an assembly on the periphery of the rolling drum (71), the said surface being movable generally parallel with the periphery of the rolling drum (71), and at a different angular speed to the rolling drum (71) about the axis of the rolling drum (71).

11. Apparatus according to claim 9 or 10 in which the pressure element (134) is an endless belt.
12. Apparatus according to claim 11 in which the pressure control means (112,114) comprises a resiliently biased tensioning element which presses against the endless belt.
13. Apparatus according to any preceding claim further comprising an auxiliary pressure element (71) for providing momentarily increased pressure to a predetermined point on the periphery of the assembly.
14. Apparatus according to claim 13 in which the pressure element (134) is an endless belt and the auxiliary pressure element (71) is a nip roller in contact with the endless belt.
15. Apparatus according to any preceding claim in which the rolling drum (71) is provided on its periphery with flutes, each flute being adapted for the reception of one assembly and its associated piece of tipping material.
16. Apparatus according to claim 15 in which each flute is provided with means for applying suction to assembly in the flute, to retain it therein.
17. A method for rolling an oval cigarette assembly comprising an oval tobacco rod and an oval filter plug joined longitudinally by an edge portion of a piece of tipping material, so as to wrap the tipping material around the assembly to secure the filter plug to the tobacco rod, comprising:
 - locating the assembly on a rolling surface and in contact with a means for applying pressure to the

assembly;

moving the rolling surface at a first speed;

moving the means for applying pressure in the same direction as the rolling surface at a second speed, lower than the first speed, to roll the assembly along the rolling surface.

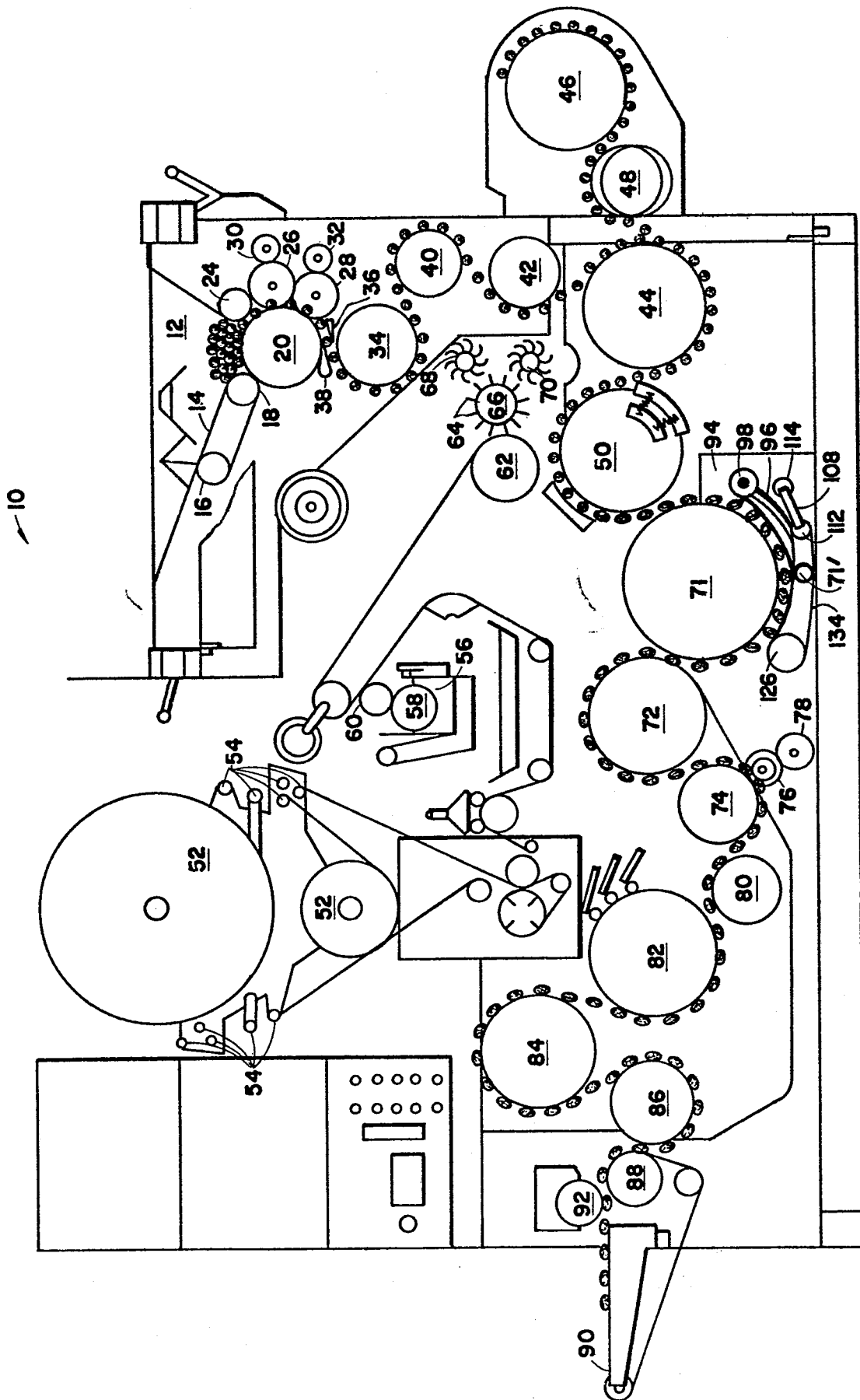
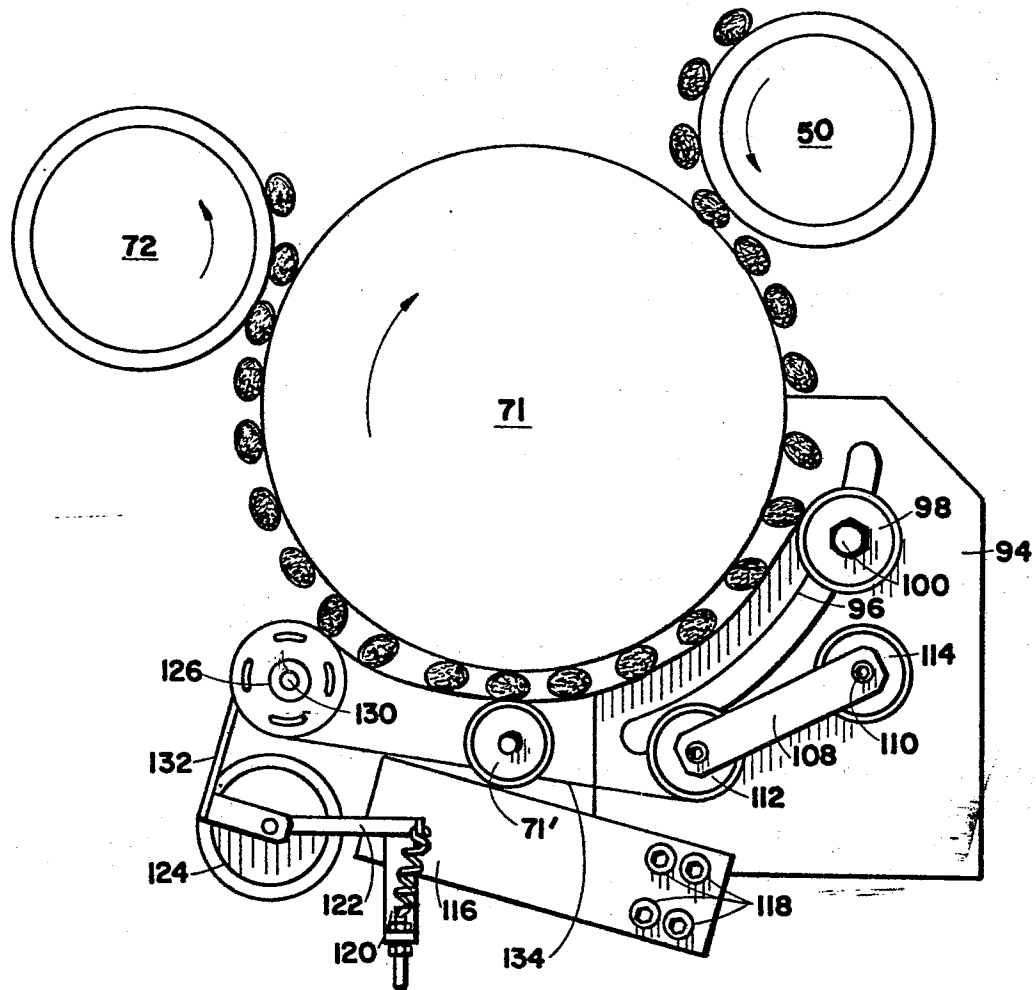
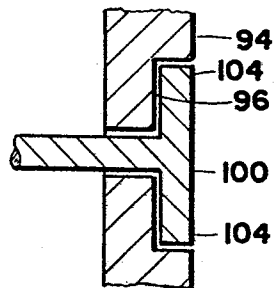


Fig. 1

**Fig. 2****Fig. 3**



European Patent
Office

EUROPEAN SEARCH REPORT

0124289

Application number

EP 84 30 2222

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
X	GB-A-1 158 006 (KÖRBER) * Whole document *	1,2,4- 6,9-12	A 24 C 5/58
X	--- GB-A-1 146 206 (KÖRBER) * Figure 7; page 4, line 69 - page 5, line 71 *	1,3-7, 9-16	
X	--- DE-A-1 911 102 (KÖRBER) * Figure 1; page 4, line 17 - page 7, line 22 *	1,2,4- 6,9-12	
A	--- GB-A-2 078 090 (G.D. SOCIETA PERAZIONI) * Figure 1; abstract *	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl. 3)
			A 24 C
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 10-07-1984	Examiner RIEGEL R.E.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	