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(54) Method and apparatus for separating an outer material from an article.

(57) Apparatus (10) for separating from an article (14) an outer material thereon. The apparatus (10) comprises a conveyor (12) adapted to convey the article (14) at a first predetermined velocity to a separator arrangement (18). The separator arrangement (18) has at least one surface (24) for engagement with the article (14), the surface (24) being adapted to travel at a second predetermined velocity different from the first predetermined velocity, whereby, upon engagement of the article (14) with the surface (24), the material is separated therefrom.

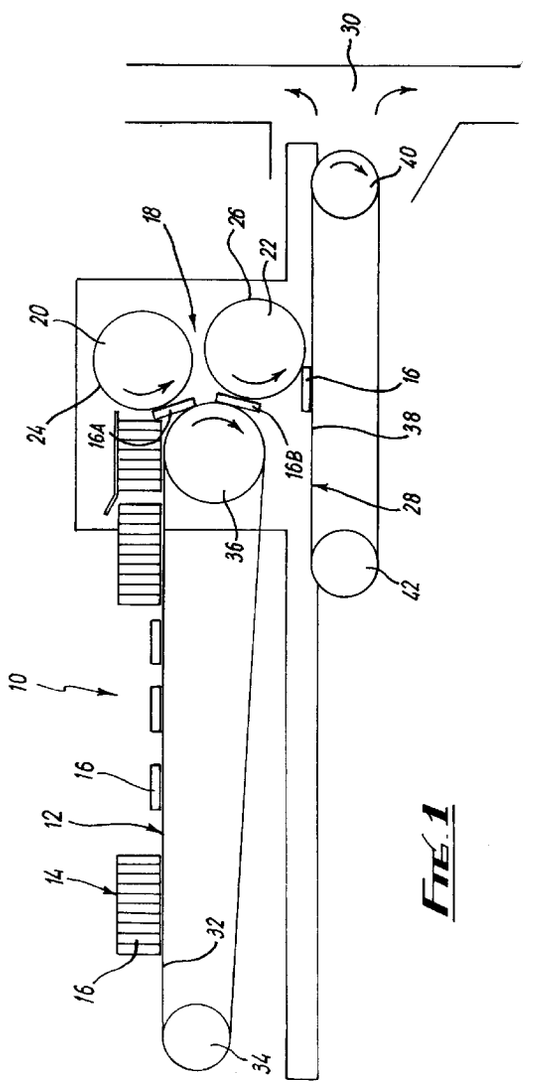

FIG. 1

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This invention relates to apparatus for separating outer materials from articles.

In the tobacco industry, it is often necessary to recycle cigarettes that have been unused and are still in packets wrapped with plastics film or paper. In such cases, automatic unwrapping machines are provided. The disadvantage of such machines is that, frequently, the outer wrapping material is not removed and becomes entrained in the tobacco to be recycled.

It is an object of this invention to obviate and/or mitigate the above disadvantage.

According to one aspect of this invention there is provided apparatus for separating from an article an outer material thereon, said apparatus comprising a conveyor adapted to convey the article at a first predetermined velocity to a separator arrangement the latter having at least one surface for engagement with the article, the surface being adapted to travel at a second predetermined velocity different from the first predetermined velocity, whereby, upon engagement of the article with the surface the material is separated therefrom.

Preferably, the second predetermined velocity is higher than the first predetermined velocity. The first predetermined velocity may be substantially constant.

In a first embodiment, the separator arrangement comprises first and second engagement surfaces, travelling at different predetermined velocities to each other. The first engagement surface may be upstream from the second engagement surface and many have a velocity lower than the velocity of the second engagement surface.

In the first embodiment, first and second conveyors may be provided such that the article may be delivered to the second conveyor from the first conveyor after engagement with said second engagement surface. A third engagement surface may be provided to engage said article on the second conveyor. Preferably, the second conveyor is so arranged that the second engagement surface constitutes the third engagement surface. The second conveyor may have a predetermined velocity greater than the predetermined velocity of the first conveyor.

Preferably the first, second and third engagement surfaces are defined by rollers. Alternatively, the first, second and third engagement surfaces may be defined by wheels having pneumatic tyres thereon. The wheels may be go-kart type wheels, suitably having tyres of a nominal 10" diameter. Conveniently, the tyres may also include an inner tube.

In a second embodiment, the separator arrangement comprises first and second engagement surfaces travelling at substantially the same second predetermined velocity.

The first and second engagement surfaces of the second embodiment may be defined by an endless belt arranged to extend between first and second rollers.

At least some of the engagement surfaces may be held in position by suitable resilient urging means.

Preferably, the or each engagement surface comprises a high friction surface which may be in the form of a suitable rubber or plastics material which may be provided with castellations. The rubber material may be synthetic or natural. Preferably, the or each engagement surface is formed of a polyvinylchloride.

The or each conveyor may be in the form of an endless belt, preferably formed of a suitable resilient rubber or plastics material which may be silicone rubber.

According to another aspect of the invention there is provided a method of separating from an article an outer material thereon, said method comprising conveying said article at a first predetermined velocity into engagement with a surface of a separator arrangement causing the surface to travel at a second predetermined velocity different to the first predetermined velocity, whereby, upon engagement of the article with the surface, the material separating from the article.

Preferably, the second predetermined velocity is greater than the first predetermined velocity.

The separator arrangement may be provided with first and second engagement surfaces which may be travelling at the same or different predetermined velocities upon engagement with the article.

An embodiment of the invention will now be described by way of example only with reference to the accompanying drawings, in which:

Fig. 1 is a schematic side view of one embodiment;

Fig. 2 is a schematic side view of another embodiment; and

Fig. 3 is a schematic side view of another embodiment similar to Fig. 1.

Referring to Fig. 1, there is shown apparatus 10 for separating, for example wrapping from an article, for example a package 14 of cigarette packets 16 wrapped in paper. The apparatus comprises a conveyor 12 adapted to convey packages 14 of cigarette packets 16 to a separator 18. The separator 18 comprises first and second rollers 20,22 having high friction surfaces 24,26 respectively, and positioned one above the other, with the roller 20 aligned with the upper pass of the conveyor 12. The conveyor 12 is in the form of an endless belt 32 wound around a pair of rollers 34,36. The apparatus 10 also includes a second conveyor 28 in the form of an endless belt 38 wound around a pair of rollers 40,42. The rollers 20,22 rotate at such a speed that the surfaces 24,26 are travelling at a higher velocity than the velocity of the belt 32 and the belt 38.

The packages 14 of the cigarette packets 16 are fed by the conveyor 12 to the separator 18. Each of the packages 14 is conveyed until it comes into engagement with the surface 24 of the first roller 20, at which time the forward end of the packages 14 has separated from the belt 32. As soon as the surface 24 engages the package 14, the surface 24 skids across the outer wrapping material thereof thereby causing the wrapping to open so that individual cigarette packets 16, as shown at 16A and 16B in Fig. 1, fall downwardly between the rollers 20,36. The direction of rotation of the rollers 20,22 is shown by the arrows.

In the case of packages 14 which are relatively long, the first roller 20 causes the long packages 14 to bend thereby braking any wrapping material securing the packets 16 together thereby facilitating removal of the wrapping material, in the manner as described above.

Each of the cigarette packets 16 is then moved downwardly by the action of the rollers 20 and 36 until the packet 16 comes into engagement with the surface 26 of the second roller 22 which is travelling at a faster speed than the first roller 20. Thus, the surface 26 is travelling faster than the surface 24. As soon as the surface 26 engages the packet 16, any wrapping, for example cellophane, around individual packets 16, is pulled off by the skidding action of the surface 26 against the packet 16. The latter then falls onto the the second conveyor 28 and is fed thereby under the roller 22. The second conveyor 28 is travelling at a higher velocity than the first conveyor 12 and, on contact of the packet 16 with the surface 26 of the roller 22, any packet 16 still wrapped in cellophane will be separated therefrom by the skidding action of the roller 22. The unwrapped packets 16 are then conveyed to a duct 30 at which air is travelling upwardly. The packaging pulled off the packets 16 is sucked upwardly by the air flow and individual packets 16 fall downwardly.

The following is an example of the speeds which could be used in the first embodiment shown in Fig. 1

Surface speed of first conveyor 12 -	3 m/min
Surface speed of first roller 20 -	12 m/min
Surface speed of second roller 22 -	24 m/min
Surface speed of second conveyor 28 -	6 m/min

The second roller 22 may be held in place by a suitable urging means in the form of a spring (not shown).

The apparatus shown in Fig. 1 is also particularly suitable for separating a plurality of articles, for example packets of cigarettes held together by sticky tape. The force exerted on the first packet 16 engaged by the roller 20 would be such as to pull the packet 16 downwardly thereby causing the tape to snap.

Referring to Fig. 2, there is shown apparatus 110 which comprises a conveyor 112 adapted to feed articles, in the form of cigarette packets 114 to a separator 118. The separator 118 comprises a pair of rollers 120,122 around which is wound an endless belt 124 formed of a high friction material. Pinch rollers 126,128 ensure that the belt 124 is kept taut around the rollers 120,122. The conveyor 112 comprises an endless belt 132 wound around a pair of rollers 134,136. The belt 124 is travelling at a greater speed than the belt 132.

The conveyor 112 conveys each of the packets 114, successively into engagement with the endless belt 124 at the roller 120. In view of the fact that the endless belt 124 is travelling faster than the endless belt 132, the endless belt 124 skids across the packets 114 of the roller 120 thereby pulling off the cellophane wrapped around the outside of the packet 114. Thus, each packet 114 passing under the roller 120 is separated from its wrapping material. In the event that the roller 120 should fail to remove the cellophane from around a packet 114, the roller 122 is provided. Thus, any article 114 passing under the roller 120 and not being separated from its packaging will be so separated as it passes under roller 122 which operates in the same way as the roller 120. After passing under roller 122, the cigarettes and the packaging are separated in opposite directions in a duct 130 through which air flows upward, as shown by the arrows, the cellophane travelling upwards and the packets falling downwards.

Pinch rollers 138,140,142,144 and 146 are provided to ensure that the belt 132 is kept taut.

In each of the above embodiments, the high friction material used as the engagement surface can be a suitable rubber or plastics material. An example of such a suitable material is polyvinylchloride which is provided with castellations on its surface, for example, sold under the trade mark GRIPTOP.

Also, in each of the above cases, the endless belt forming the conveyor 12 or 112 is formed of silicone rubber.

The following is an example of the speeds which could be used in the second embodiment as shown in Fig. 2.

Speed of first belt 124 -	20 to 80 m/min
Speed of second belt 132 -	12 m/min

It will be appreciated that the speeds of the various rollers and belts in the embodiments shown in Figs. 1 and 2 can be varied depending upon the nature of the articles to be unwrapped. The selection of optimum speeds would be within the capabilities of a skilled person using trial and error.

An alternative embodiment is shown in Fig. 3 which is similar to the Fig. 1 with the exception that the rollers 20,22 are replaced by wheels 120,122 comprising rims 123 having pneumatic tyres 120A,122A provided thereon. The rims have respective surfaces 24,26. The other feature in Fig. 3 which are the same as in Fig. 1 have been designated with the same reference numeral. The wheels 120,122 are in the form of go-kart wheels and incorporate inner tubes and rubber tyres. The use of the wheels 120,122 provide the necessary friction at the surfaces 24,26 to remove the wrapping around the packets. They also have the advantage, that, by being pneumatic, they are sufficiently compressable to absorb variations in size of the packets. The fact that they are pneumatic also has the advantage that a hard object on the conveyor will cause the tyres to deform resiliently causing less damage than solid rubber rollers. It will be appreciated that any suitable size wheel can be used, but, in the embodiment shown, the tyres are of a nominal 10" diameter.

Various modifications can be made without departing from the scope of the invention. For example, in each of the above embodiments the number of engagement surfaces could be increased or decreased as desired. Also, as explained above, the speeds of the various components could be varied. The apparatus can also be used to unwrap articles other than packets of cigarettes, for example, to unwrap bars of soap.

In an another modification, the apparatus may be extended such that it can open packets of varying size. In such apparatus, there may be a plurality of rollers, endless belts. Preferably, the number of rollers, endless belts or tyres will be greater than three.

There removal of the wrapping material from the packets can be carried out pneumatically, for example by creating a flow of air into which the wrapping material is drawn, by belt, or by gravity.

Whilst endeavouring in the foregoing specification to draw attention to those features of the invention believed to be of particular importance it should be understood that the Applicant claims protection in respect of any patentable feature or combination of features hereinbefore referred to and/or shown in the drawings whether or not particular emphasis has been placed thereon.

Claims

1. Apparatus for separating from an article an outer material thereon, said apparatus comprising a conveyor adapted to convey the article at a first predetermined velocity to a separator arrangement the latter having at least one surface for engagement with the article, the surface being adapted to travel at a second predetermined velocity different from the first predetermined velocity, whereby, upon engagement of the article with the surface, the material is separated therefrom.

2. Apparatus according to Claim 1, in which the second predetermined velocity is higher than the first predetermined velocity, the first predetermined velocity being substantially constant.

3. Apparatus according to Claim or 2, wherein the separator arrangement comprises first and second engagement surfaces, travelling at different predetermined velocities to each other, the first engagement surface being upstream from the second engagement surface and having a velocity lower than the velocity of the second engagement surface.

4. Apparatus according to Claim 3, wherein first and second conveyors are provided such that the article is delivered to the second conveyor from the first conveyor after engagement with said second engagement surface.

5. Apparatus according to Claim 4, wherein a third engagement surface is provided to engage said article on the second conveyor.

6. Apparatus according to Claim 5, wherein the second conveyor is so arranged that the second engagement surface constitutes the third engagement surface.

7. Apparatus according to Claim 6, wherein the first, second and third engagement surfaces are defined by rollers.

8. Apparatus according to any of Claims 4 to 7, wherein the second conveyor may have a predetermined velocity greater than the predetermined velocity of the first conveyor.

9. Apparatus according to any of Claims 4 to 8, wherein each conveyor is in the form of an endless belt, formed of a suitable resilient rubber or plastics material.

10. Apparatus according to Claim 9, wherein the resilient rubber or plastics material is silicone rubber.

11. Apparatus according to Claim 1 or 2, wherein the separator arrangement comprises first and second engagement surfaces travelling at substantially the same second predetermined velocity.

12. Apparatus according to Claim 11, wherein the first and second engagement surfaces are defined by an endless belt arranged to extend between first and second rollers.

13. Apparatus according to Claim 12, wherein at least one of the first and second engagement surfaces is held in position by suitable resilient urging means.

14. Apparatus according to any of Claims 3 to 10, 12 or 13, wherein each engagement surface comprises a high friction surface in the form of a suitable rubber or plastics material which is provided with castellations.

15. Apparatus according to Claim 14, wherein the rubber material is synthetic or natural.

16. Apparatus according to Claim 14 or 15, wherein each engagement surface is formed of polyvinylchloride.

17. A method of separating from an article an outer material thereon, said method comprising conveying said article at a first predetermined velocity into engagement with a surface of a separator arrangement causing the surface to travel at a second predetermined velocity different to the first predetermined velocity, whereby, upon engagement of the article with the surface, the material separating from the article.

18. A method according to Claim 17, wherein the second predetermined velocity is greater than the first predetermined velocity.

19. A method according to Claim 18 or 19, wherein the separator arrangement is provided with first and second engagement surfaces which travelling at the same or different predetermined velocities upon engagement with the article.

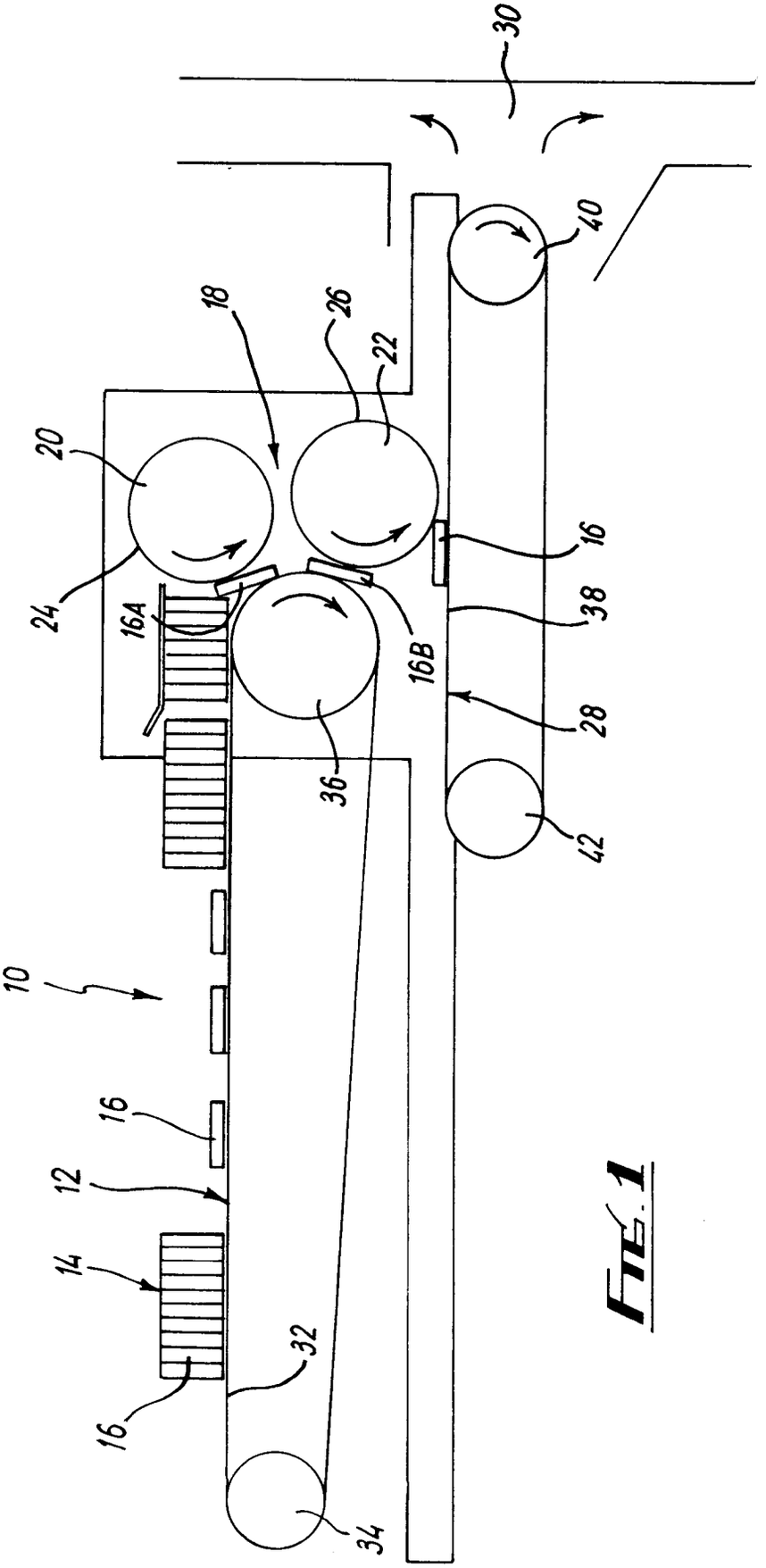

FIG. 1

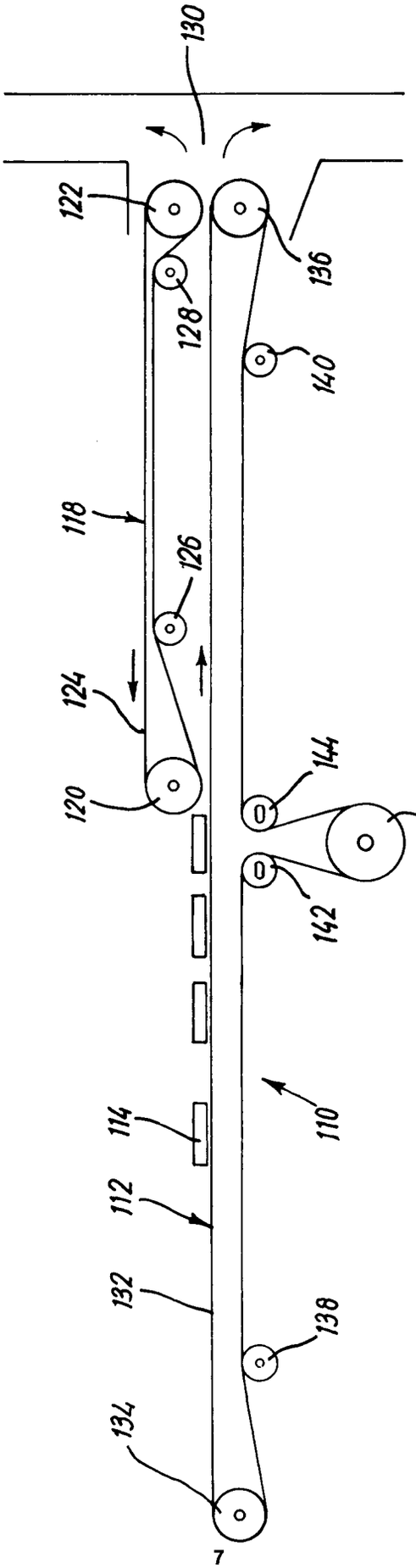
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FIG. 2

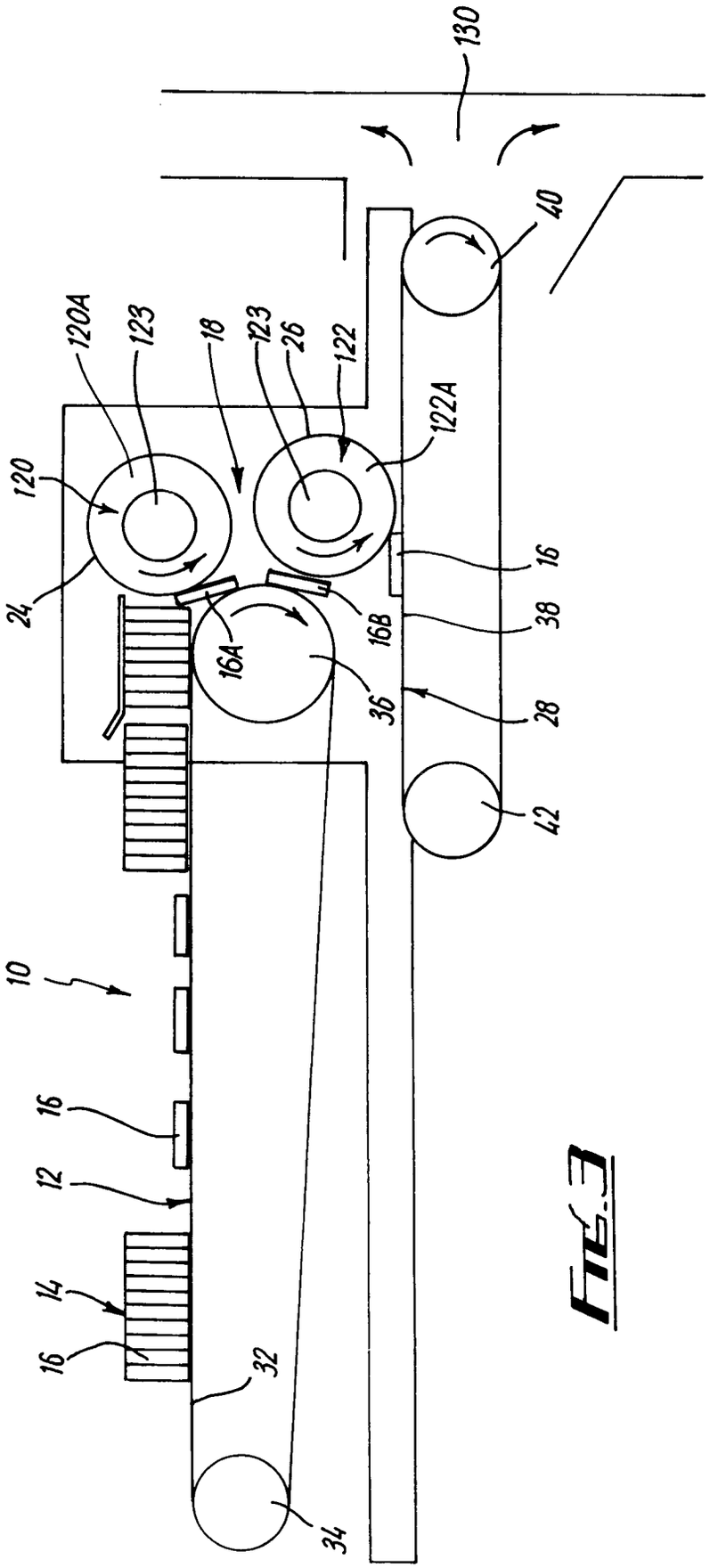
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FIG. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 94 30 5047

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.6)
X	EP-A-0 242 202 (IMPERIAL TOBACCO) * column 2, line 36 - column 3, line 51; figures *	1-5, 17-19	B65B69/00
Y		9	
A		7	
Y	EP-A-0 443 502 (MATSUSHITA ELECTRIC) * column 9, line 44 - column 11, line 51; figures *	9	
A		1,17	
A	US-A-4 034 868 (W. ROWLAND)		
A	EP-A-0 534 623 (REYNOLDS TOBACCO)		

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	12 October 1994	Jagusiak, A

CATEGORY OF CITED DOCUMENTS

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