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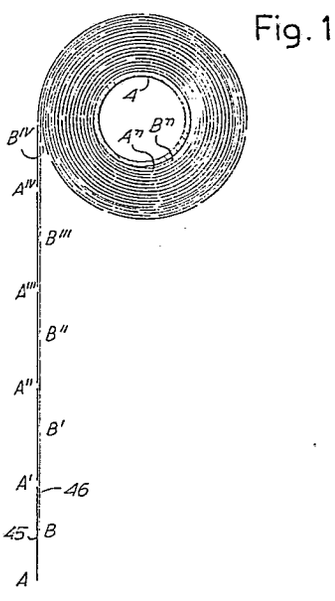
(54) **Method and apparatus for producing rolls of perforated paper strips, a roll manufactured in this way and a dispenser for dispensing sheets from said roll.**

(57) A roll is made up of two strips (45, 46) of material, which are separate and can be separated from each other when supplied; the strips are wound around a core and have respective lines of incision (A, A′, A″....Aⁿ; B, B′, B″....Bⁿ) used for tearing, which are arranged in such a way that the lines of incision (A, A′, A″....Aⁿ) of one of said strips are longitudinally staggered with respect to the lines of incision (B, B′, B″....Bⁿ) of the other of said strips.

Fig. 1



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Description

METHOD AND APPARATUS FOR PRODUCING ROLLS OF PERFORATED PAPER STRIPS, A ROLL MANUFACTURED IN THIS WAY AND A DISPENSER FOR DISPENSING SHEETS FROM SAID ROLL

According to the methods of manufacturing rolls of material in strip form, used hitherto, only one strip can be perforated at a given time, even where the strip consists of several layers. This therefore results in a roll consisting of a single strip with lines of incision coinciding on all the layers which make up the said roll.

When such a roll is placed in a suitable dispenser, the user grips the free end of the strip and pulls it, thus unwinding from the roll an amount of strip material which is, in most cases, much greater than the amount actually needed for the specific use, e.g. for wiping one's hands or for similar uses. Thus, with the rolls according to the state of the art it is not possible to obtain a controlled supply of the material in strip form, produced as a roll, unless use is made of sophisticated and often uneconomical dispensers and material in strip form which is designed for such dispensers. For this reason, the rolls and small rolls, for example of toilet paper, manufactured hitherto, may be unwound by the user as far as the end of the strip, even if the latter is perforated.

In the case of non-perforated strips, in addition to this drawback, there is the fact that the length of the sheets torn off varies considerably, resulting in further significant wastage.

It is possible nowadays for individual sheets with predetermined dimensions to be dispensed, using so-called folded sheets and the like, which sheets, however, are produced using more sophisticated machines which are generally of the fixed format type and are designed to process only strips of material, for example paper, with predetermined physical and mechanical characteristics.

The object of the invention is a roll, a method for manufacturing said roll and an apparatus for implementing said method, that overcome the above mentioned drawbacks. The invention further relates to a suitable dispenser for dispensing sheets of material from said roll. These and other objects, that will become apparent to those skilled in the art by reading the following description, are achieved with a roll, a method for its manufacturing, an apparatus for implementing said method and a dispenser for dispensing such roll as characterised in the appended independent claims.

The method of the invention results in individual sheets with predetermined dimensions being necessarily supplied from a roll consisting of two strips of material, irrespective of their physical and mechanical characteristics. The two strips which are separate and can be separated from each other when supplied may, in turn, consist of one or more layers of material.

The two strips are wound up simultaneously onto the same axis which may, for example, be a cardboard core, but with the respective lines of incision for tearing being separate and always staggered and alternating from one strip to the other.

Thus, advantageously, it is possible to use, in order to achieve the object according to the invention, a special dispenser, also forming part of the invention, which is relatively simple and economical.

In fact it also consists, in addition to the necessary means for supporting the roll of material, of a surface which is always in forced contact with the peripheral surface of the roll itself, so as to brake unwinding of the latter by means of friction.

The so-called frictional surface, forming part of the dispenser, is located in the vicinity of the zone where the material forming the roll is removed, such that it is always possible to grip the end of one of the two strips which alternately present themselves in this location.

Breakage along the line of incision of the strip, to which the pulling force is applied by the user, occurs because the two surfaces which are always in forced contact and form part of the outermost strip of the roll and the dispenser, respectively, create a resistance to unwinding of the roll itself by means of friction.

This resistance to unwinding is such that it allows the roll of material to rotate for as long as the portion of the aforementioned strip is intact inside the part which is located beyond the friction zone and therefore its tractional resistance is greater than the resistance to unwinding caused by friction.

When the line of incision for tearing the said strip has gone beyond, or almost gone beyond the friction zone, the pulling force required to unwind the roll itself must be transmitted to the following strip portion entirely via the said line. Since, along this line, the tractional resistance of the strip in question is considerably lower than in other points and is also less than the resistance of the roll of material to rotation, this strip will break, releasing a sheet of material comprised between the end gripped and pulled and the incision itself.

Obviously, depending on the type of material used and the product which is required, it is possible to vary both the nature of the incisions and the intervals between them on individual strips, as well as the force causing the pressure between the aforementioned surface and that of the roll.

The roll which consists, as mentioned, of two strips of material wound up simultaneously, but with the respective lines of incision separate and alternate, rotating owing to the pulling force which is applied, for example to the first strip before the latter breaks, will cause the second strip to advance as well. This second strip, which previously broke along its own perforation inside the friction zone or immediately thereafter and the end of which is therefore located in this zone, owing to rotation of the roll, caused by the user pulling the first strip, will now advance until its end portion is in the position where it can be removed and where it will stop because the first strip, which caused rotation of the

roll in question, has in the meantime broken.

The second strip, therefore, may now in turn be gripped and pulled, thus causing further rotation of the roll itself, which this time will cause the end piece of the first strip to advance as far as the position where it can be removed.

A cyclical system for removing, from a suitable dispenser, individual sheets with predetermined dimensions obtained alternately from two strips of material making up a roll, has thus been obtained.

The invention also relates to an apparatus designed to produce the manufactured article referred to above and implement the abovementioned process.

Such an apparatus comprises one or two unwinders of the main reels, may comprise one or two embossing groups, two knurling groups; therefore, in order to obtain the type of roll consisting of two strips whose respective lines of incision are separate and alternate, as the method according to the invention requires, the apparatus is provided with one of the following mechanisms:

a) two separate perforation or incision groups which rotate synchronized and whose respective blades have the same peripheral speed,but are able to perforate the respective strips so that they are staggered by an amount which is adjustable and in accordance with the product which is required (the two strips enter separately, but at the same speed into the respective incision groups); upon leaving the two incision groups, the two strips, which are now perforated, are supported and guided by suitable means adjustable in such a way that the length of the corresponding paths traveled before the said strips are combined does not cause a variation in the staggered arrangement obtained, unless such a variation is programmed;

b) a single incision group into which the two strips enter combined and are therefore perforated simultaneously, but leave separated, and a system consisting of suitable adjustable means enable the said strips to travel two separate paths of different length in such a way that, when combined again, the respective lines of incision are alternate and staggered by the amount required.

Such an apparatus may comprise furthermore a longitudinal cutting group; it comprises a winding group, means for extracting the finished rolls and other devices which facilitate operation thereof.

With the method of the invention, the major advantage is obtained that material in strip form, produced as rolls, can be supplied in individual sheets with predetermined dimensions, irrespective of the user's will, thereby resulting in more rationalized handling compared to the use of conventional rolls,

Other advantages are:

1) doubling of the production of the rewinding machine, with the speed remaining the same, since it winds up two strips at the same time, instead of one, which will then be used separately;

2) the material used for manufacturing the strips making up the roll may be of various types without affecting operation of the system as a result;

3) the same result is achieved as for folded sheets and the like, namely individual sheets are supplied, but at a lower production cost because they are obtained using machines which, for the same output, are more economical, less sophisticated and able to produce varying formats (by performing a few adjustments, it is possible to vary both the length and the width of the sheets), unlike the machines for making folded sheets, which are all of the fixed format type;

4) the same machines or equipment used for producing conventional rolls can be used for production;

5) the dispenser by means of which it is pos sible to supply individual sheets with predetermined dimensions from strips produced in roll form is simple and costs relatively little.

Further advantageous features of the present invention are set out in the appended claims.

A non-limiting example of the invention is illustrated in the accompanying drawing in which:

Fig. 1 is a view, in longitudinal section, of the two strips 45 and 46 making up a roll and the respective incisions from A to A^n and from B to B^n after perforation and corresponding combination and then also during the supply stage.

Fig. 2 is a schematic cross section of the apparatus suitable for manufacturing the roll using the method of the invention, in which: 1 and 3 denote the unwinders of the main supply reels; 35 and 37 the main supply reels; 5 and 29 the expansion rollers; 9 the embossing group; 13 the rollers for supporting and guiding the strip 46; 11 the group for perforating the strip 46; 14 the rollers for guiding and supporting the strip 45; 31 the group for perforating the strip 45; 16 the adjustable or non-adjustable roller where the strips 45 and 46 are combined; 18 a support roller; 19 the hump roller if required; 21 the winding rollers, one of which may carry the counter-cutters for longitudinal cutting; 25 the pressure roller; and 23 the roll being formed. This figure does not show the knurling rollers. The arrows f_1 and f_0 indicate the direction of travel of the two strips.

Fig. 3 shows a schematic cross section of a modified apparatus suitable for manufacturing rolls using the method of the invention, in which: the two strips are perforated simultaneously by a single perforation group indicated by 11; 15 denotes the adjustable roller which enables the path of one of the two strips to be lengthened so as to create staggering of the respective incisions; 27 and 7 the rollers for knurling the individual strips; 17 the roller where the two strips 45 and 46 are combined again; 35 and 37 the two main supply reels; 9 the embossing group; 5 and 29 the expansion cylinders; 13 the rollers which support and guide the two strips in the perforation group; 19

the hump roller; 21 the winding rollers, one of which is able to carry the counter-cutters for longitudinal cutting; 25 the pressure roller; 23 the roll being formed; and f_7 the direction of rotation.

Fig. 4 shows a schematic cross section of a dispenser suitable for supplying two strips of material produced as rolls, in sheets of a given length, in which: 45 denotes the outermost strip; 46 the innermost strip; 4 the cardboard core; 2 a means for supporting the roll; 41 an element angularly movable about a pin 41B and having a friction surface 41A; 47 a spring which pushes the friction surface 41A against the roll acting on the strip 45; 43 the external casing of the dispenser, which forms an opening 43A from which the sheets of material torn from the relevant strip are drawn; f_2 the direction of rotation of the roll; A, A′, A″....A^n the lines of incision on the strip 45; and B′, B″....B^n the lines of incision on the strip 46. The action exerted by the spring 47 (or by an equivalent counterweight means 47X) ensures a substantially constant pressure between the roll and the surface 41A. The spring or the counterweight can be adjustable or interchangeable to set the pressure of the surface 41A on the roll.

Fig. 5 shows a schematic cross section of a modified version of a dispenser for supplying strips of material produced as rolls, in individual sheets of a predetermined length, in which: a means 53 for supporting the roll 58 is movable about an articulation 53A; 50 denotes a counterweight which is adjustably engaged on an arm 53B of said supporting means 53, 53A. The roll 58 is pressed, due to the action of gravity, against a friction surface 55A, which is formed by an element 55; 57 and 59 denote the two strips making up the roll 58; 51 denotes the external casing of the dispenser itself, which supports the element 55; 51A denotes the zone where the sheets are drawn, i.e. removed; f_5 denotes the direction of rotation of the roll; A, A′, A″.... etc. denote the lines of incision on the strip 57; B, B′, B″.... etc. denotes the lines of incision on the strip 59.

Figs. 6 and 7 show a further embodiment of the dispenser, according to which the friction surface (corresponding to the one denoted by 41A and 55A in the previous examples) is replaced with the surface of a cylinder 61, rotatably supported and provided with a breaking means 63, which can be advantageously adjusted, in order to achieve a desired resistance of the strips to be unwound from the roll 65, which may be supported for example by a supporting means similar to that denoted by 53, 53A, 53B.

Figs. 8 and 9 show an embodiment of the dispenser which has, as pressing means, two cylinders 71 and 73, one of which (71) is provided with a breaking means 75 which can be adjustable. The two cylinders are urged one against the other, e.g. by means of springs 77 which act on a shoe supporting the cylinder 73. The strips 78 and 79 of roll 80 are inserted between the two cylinders, that thus exert a resistance against unwinding of the strips themselves.

The breaking means 63 and 75 may be adjustable from the outside.

The dispenser described with reference to the various examples allows the dispensing of sheets from rolls of strip material, having variable width as well as variable length.

Claims

1. A method for manufacturing a roll of material in strip form having a plurality of transversal lines of incision for tearing of single sheets from said strip, characterised in that two strips (45, 46; 57, 59), each having transversal lines of incision regularly spaced apart from each other, are combined in such a way that the lines of incision (A, A′, A″....A^n) of one of said strips are longitudinally staggered with respect to the lines of incision (B, B′, B″....B^n) of the other of said strips, and subsequently wound up in this mutual relationship in order to form a roll.

2. Method according to claim 1, wherein said strips (45, 46) are unwound from a reel or reels, transversely perforated at regular intervals, subsequently combined one to the other with the transversal lines of incision of one of said strips staggered with respect to the lines of incision of the other of said strips, and subsequently wound up to form a roll (23).

3. Method according to claim 2, wherein the transversal lines of incision on the first of said strips are carried out in synchronism with the lines of incision on the second of said strips.

4. Method according to claim 1, wherein two strips (45, 46) are simultaneously perforated transversely while being coupled together, then separated one from the other and mutually staggered and subsequently combined again in such a way that the transversal lines of incision of one of said strips are longitudinally staggered with respect to the ones of the other strip, said two strips being thus wound up to form a roll.

5. A roll of material in strip form having a plurality of transversal lines of incision for tearing of single sheets from said strip, characterized in that it comprises two distinct strips (45, 46; 57, 59) each of which has a plurality of transversal lines of incision (A, A′, A″....A^n; respectively B, B′, B″....B^n) for tearing, the lines of incision of one of said strips being mutually spaced apart of the same amount as the lines of incision of the other of said strips, and the lines of incision of one of said strips being longitudinally staggered with respect to the lines of incision of the other of said strips.

6. Roll according to claim 5, wherein the transversal lines of incision of one of said strips are longitudinally staggered with respect to the lines of incision of the other strip of an amount which corresponds approximately to half the

distance between two adjacent lines of incision on the same strip.

7. Roll according to claim 5 or 6, wherein each of said strips is formed by a plurality of combined layers.

8. An apparatus for making a roll of material in strip form according to claim 5 or 6, comprising means for unwinding a strip from a relevant main reel, incision means for forming transversal lines of incision on said strip, and means for winding the transversely perforated strip of material to form a roll, characterised by: means (1, 5; 3, 29) for simultaneously unwinding two strips (45, 46) from one or two main reels (35, 37); means (13, 15, 17; 13, 13, 14, 14) designed to define separate paths for said strips (45, 46); further means (17) for subsequently combining said strips at the end of said separate paths, said paths being such that when the two strips are combined again the transversal lines of incision (A, A′, A″....A^n) of one (45) of said strips are longitudinally staggered with respect to the lines of incision (B, B′, B″....B^n) of the other (46) of said strips.

9. Apparatus according to claim 8, wherein an incision group (11) is provided in which said strips (45, 46) are fed combined one to the other in order to be simultaneously perforated along said transversal lines of incision; and wherein means (13, 15, 17) defining separate paths for said strips are placed downstream said incision group (11) in order to de-coupling said strips and make them travel along said separate paths.

10. Apparatus according to claim 8, wherein there is provided one incision group (11, 31) for each strip, said groups (11, 31) being placed upstream said means for combining said strips and being synchronized to perforate each of said strips at fixed and equal intervals.

11. Apparatus according to any of the claims 8 to 10, wherein the length of the path travelled by one of said strips (45, 46) is adjustable with respect to the length of the path travelled by the other of said strips.

12. A dispenser for material in strip form packaged in a roll according to any of the claims 5 to 7, comprising two combined strips (45, 46; 57, 59), each of which has respective transversal lines of incision (A, A′, A″....A^n; B, B′, B″....B^n), the lines of incision of one of said strips being staggered with respect to the lines of incision of the other of said strips, said dispenser comprising supporting means (2; 53) for said roll, said dispenser characterised in that it further comprises pressure means (41, 47; 50; 53, 55; 61; 71, 73) designed to exert on said strip material unwinding from said roll a resistance to unwinding, adapted to cause tearing of the material along a transversal line of incision when said line of incision has gone beyond the zone of action of said pressure means; the gripping zone of the strip beginning at a distance from said zone of action of said pressure means which is approximately half the distance between two adjacent transversal lines of incision on the same strip, to allow alternate dispensing of the two strips.

13. Dispenser according to claim 12, wherein the pressure exerted by said pressure means (41, 47; 50, 55; 61; 71, 73) on the strip is adjustable.

14. Dispenser according to claim 12 or 13, wherein the thrust exerted by said pressure means (41, 47; 50, 53, 55; 61; 71, 73) is corrected while the diameter of the roll being dispensed changes, in order to keep the pressure on the strip substantially constant.

15. Dispenser according to any of the claims 12 to 14, wherein said pressure means (41, 47; 50, 55; 61) are placed in the vicinity of the zone where the strip leaves the roll being dispensed.

16. Dispenser according to any of the claims 12 to 15, wherein said pressure means comprise a friction surface (41A, 55A) which is in contact with the outer surface of the roll being dispensed.

17. Dispenser according to any of the claims 12 to 15, wherein said pressure means comprise a cylinder (6; 71) which is provided with breaking means (63; 75).

18. Dispenser according to claim 16, wherein the friction surface (41A) is carried by an element (41) hinged (at 41B) to the dispenser casing and urged by a spring means (47) which exerts a substantially constant thrust against the roll.

19. Dispenser according to any of the claims 12 to 15, wherein a supporting means (53, 53B) for the roll (58) is provided, which is hinged (in 53A) to the dispenser casing, said supporting means comprising a counterweight (50) which compensates the reduction of the weight of the roll during dispensing of the strip.

20. Dispenser according to claim 19, wherein the position of said counterweight is adjustable.

21. Dispenser according to claim 17, wherein a pair of cylinders (71, 73) are provided, said cylinders being urged one towards the other, and one of them being provided with breaking means (75).

Fig. 1

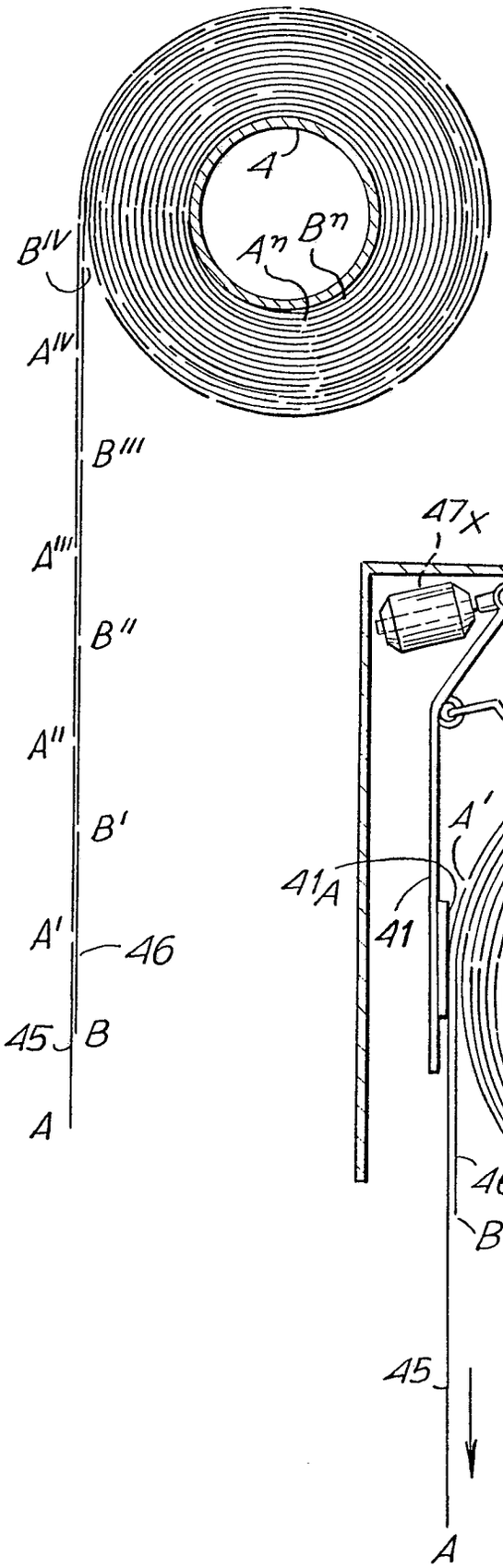
4'
A^n B^n
B^{IV}
A^{IV}
B^{III}
A^{III}
B^{II}
A^{II}
B^{I}
A^{I}
46
45
B
A

Fig. 4

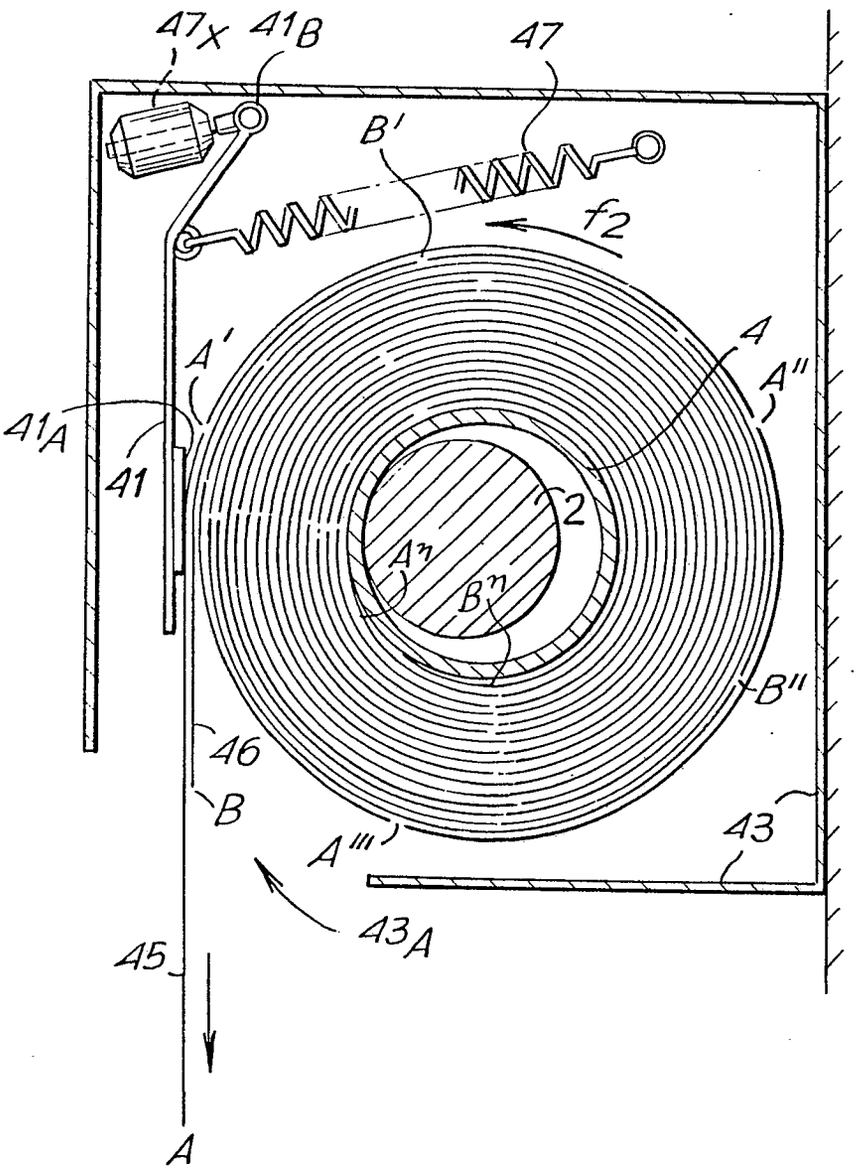
47x
41B
47
B'
f2
A'
4
A''
41A
41
2
A^n
B^n
B''
46
B
43
A^{III}
43A
45
A

Fig. 2

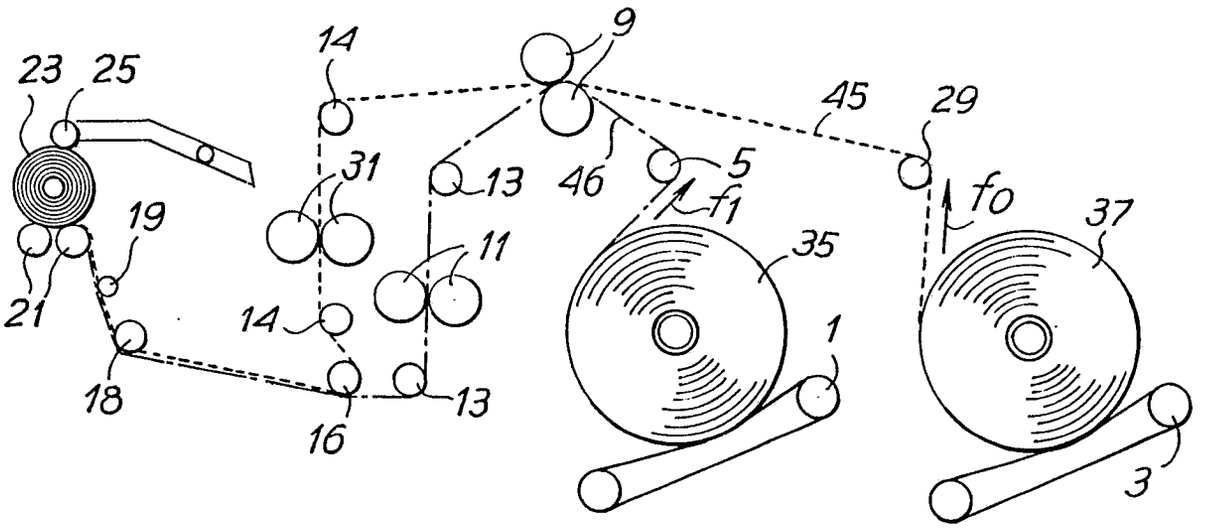
23
25
14
9
45
29
31
13
46
5
f1
fo
37
19
11
35
21
14
1
18
13
16
3

Fig. 3

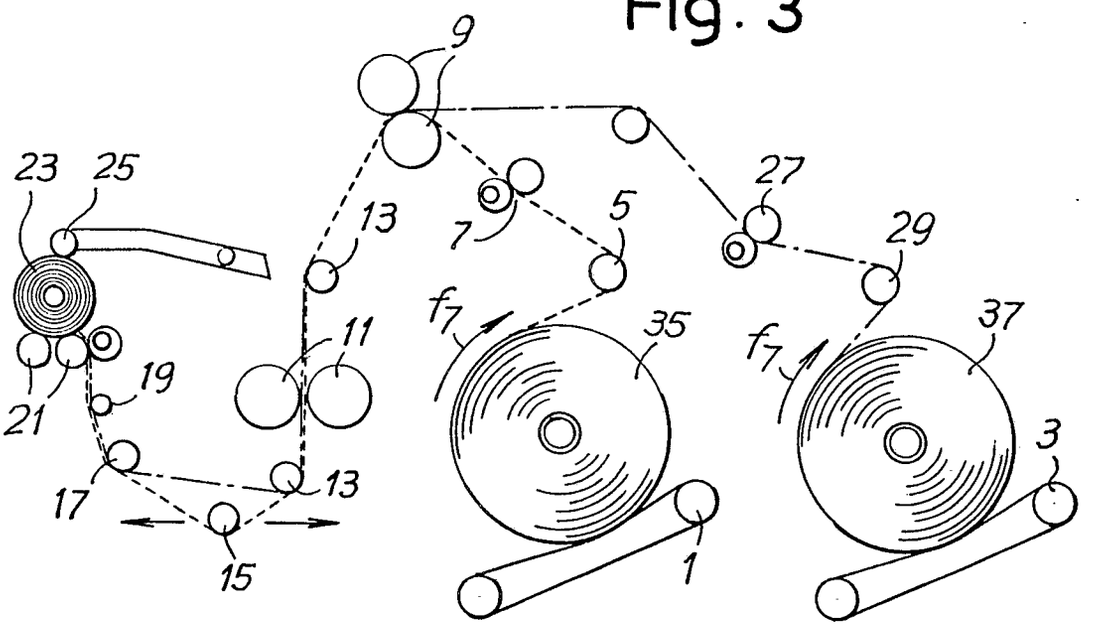
9
23
25
27
13
7
5
29
f1
11
35
37
19
21
3
17
13
15
1

Fig. 5

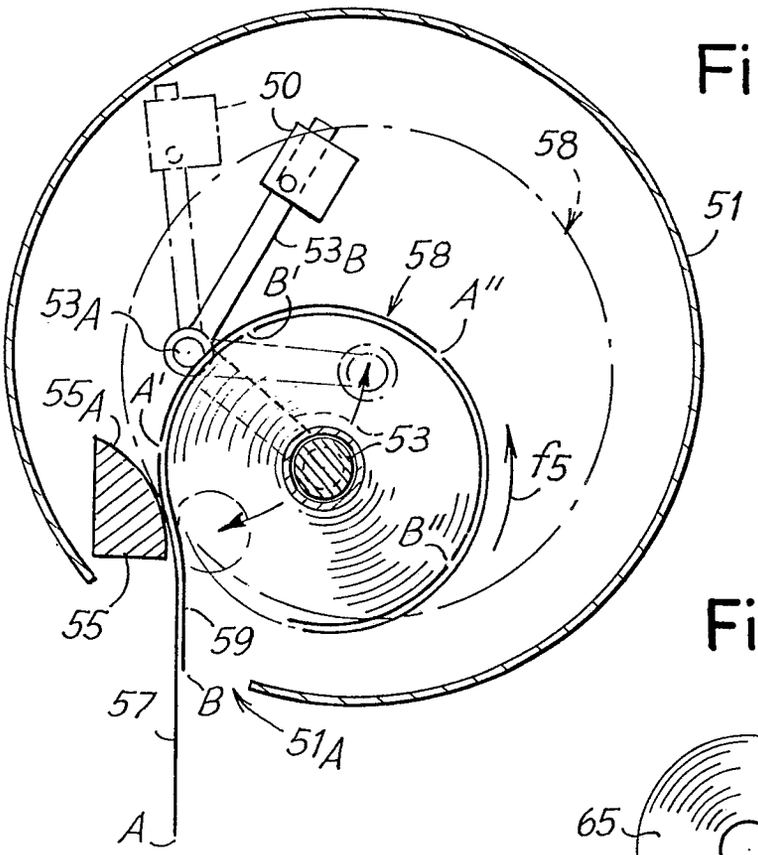

Fig. 6 Fig. 7

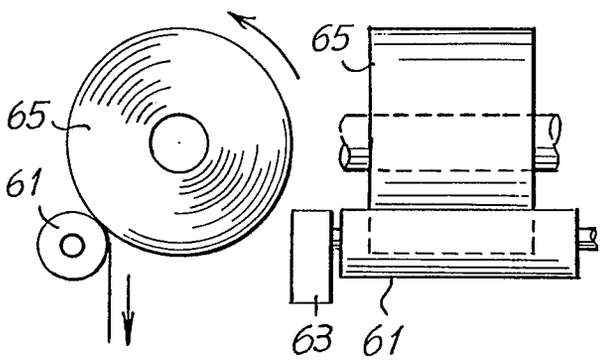

Fig. 9

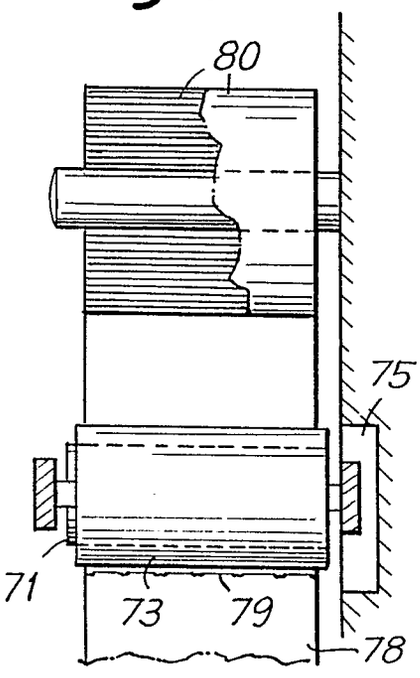

Fig. 8