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(71) Applicant: **Coveris Flexibles UK Limited Spalding, Lincolnshire PE11 3ZN (GB)**

(72) Inventor: **Luffman, David Yarm, TS15 9HJ (GB)**

(74) Representative: **Ayre, Nicola Unity Withers & Rogers LLP 4 More London Riverside London SE1 2AU (GB)**

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(54) **A METHOD OF PRODUCING A BAG**

(57) A method of producing a bag comprising the steps of:

- a) continuously feeding a web of plastics material along an apparatus from an input end thereof, the web having a reference mark printed thereon;
- b) operating a castellated rotary blade as the reference mark reaches a predetermined point to perform one of disengagement or engagement with the web, in order to define a perforated cut substantially parallel to the direction of feed;

- c) operating the rotary blade after a predetermined length of the web has passed the blade to perform the other of engagement or disengagement of the blade with the web, to define the perforated cut;
 - d) cutting and welding the bag from the web, the bag having side edges substantially perpendicular to the direction of feed from the web;
- wherein the reference mark is located and the predetermined length is such that the perforated cut does not extend to either side edge.

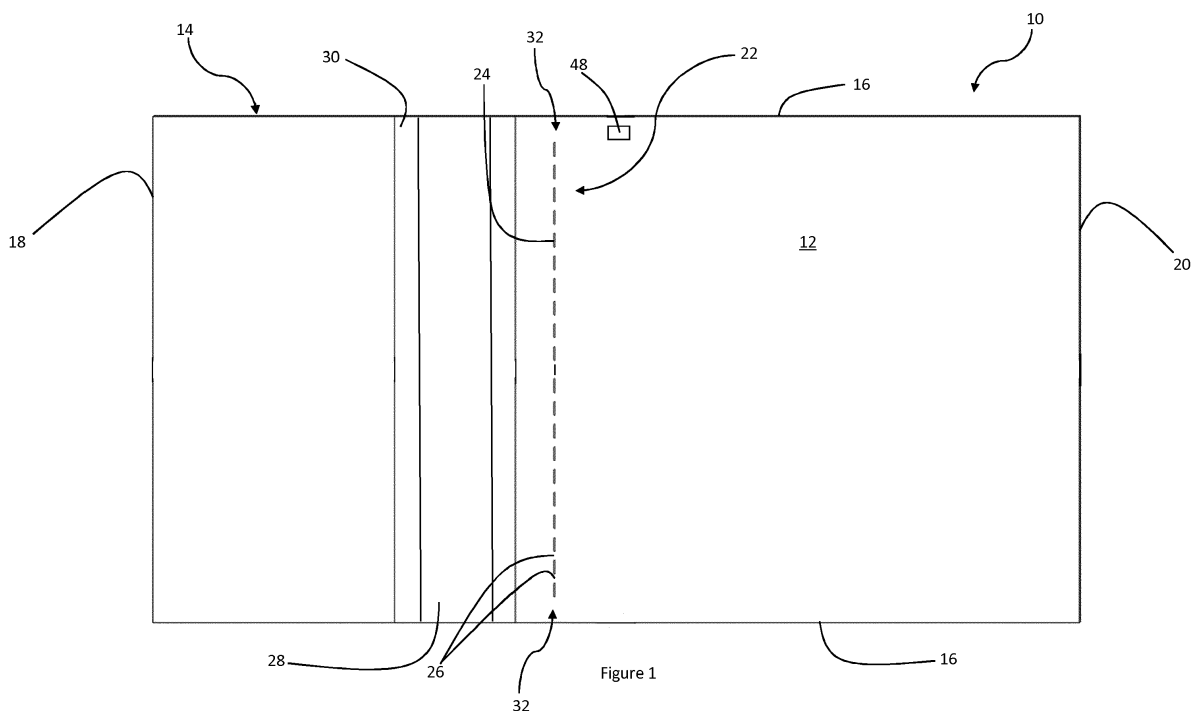


Figure 1

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to a method of manufacturing a bag. The present invention also relates to a bag, and to an apparatus configured to manufacture a bag.

BACKGROUND OF THE INVENTION

[0002] Secure, sealable bags are required for protecting and transporting items such as medical samples and police evidence. Plastics bags of a material such as polyethylene are often used for such applications, as they are lightweight and disposable.

[0003] Such plastics bags are commonly manufactured by folding a web of film into the required shape, creating desired features such as cuts or printed designs, and cutting and welding the web into individual bags. A mouth through which a sample can be placed in the bag is created by making a cut in the web, or by folding the web in such a way as to leave a suitable opening. Once a sample has been placed into a bag the mouth is sealed to protect the contents and prevent contamination, for example with an adhesive strip provided on a carrier tape attached to the bag.

[0004] It is known to hold the mouth in a closed position in order to avoid contamination of the inside of a bag before it is used. The cut for the mouth is made using a castellated rotary blade rather than a continuous blade, so that the opening cut is perforated. That is, ties between the perforations extend over the cut, holding the mouth in a closed position. When the bag is to be used, the ties can easily be torn, so that the mouth is opened and a sample can be placed in the bag. The bag is then sealed closed with e.g. adhesive on a carrier tape or closure flap.

[0005] Where the mouth extends across the bag to its edges, it can be difficult to entirely seal it, as adhesive cannot wholly surround the mouth at the edges of the bag. It is known, therefore, to prevent the mouth extending to the very edges of the bag by welding the bag at the ends of the opening cut. The mouth does not then extend to the edges of the bag. The carrier tape or closure flap can be adhered to the obverse face of the bag around all sides of the mouth, thus reducing the chance of leakage or contamination of the contents, and providing a leak resistant container for enclosing items such as sample fluids or other, solid items that may leak fluid.

[0006] There are difficulties with the welding process. It is difficult to maintain a consistent quality, which is particularly important where bags are to be used for medical or police purposes. The welds must be sufficiently flat to ensure that the adhesive strip can form a continuous bond around the mouth without creating channels through which liquid could escape. Welding the ends of the cut is an additional step in the manufacturing process, so that the process is slower, more complex, and creates

additional waste. Welding the ends of the cut can allow tampering with a sealed bag to go unnoticed, as it may be possible to open a bag (e.g. by cutting) at the weld to gain access to the contents, then to re-weld the bag to cover the opening.

[0007] The present invention seeks to overcome, or at least mitigate, the problems of the prior art.

SUMMARY OF THE INVENTION

[0008] According the invention there is provided a method of producing a bag or a series of bags comprising the steps of:

- a) continuously feeding a web of plastics material along an apparatus from an input end thereof, the web having a reference mark printed thereon;
- b) operating a castellated rotary blade as the reference mark reaches a predetermined point to perform one of disengagement or engagement with the web, in order to define a perforated cut substantially parallel to the direction of feed;
- c) operating the rotary blade after a predetermined length of the web has passed the blade to perform the other of engagement or disengagement of the blade with the web, to define the perforated cut;
- d) cutting and welding the bag from the web, the bag having side edges substantially perpendicular to the direction of feed from the web;

wherein the reference mark is located such that, and the predetermined length is such that, the perforated cut does not extend to either side edge.

[0009] An uncut area is left at either end of the perforated cut that will form the mouth of the bag. Adhesive can therefore surround the mouth, creating a seal. Advantageously, there is no requirement for an additional welding step.

[0010] The perforated cut may not extend to within 7mm of either side edge, or may not extend to within 12mm of either side edge.

[0011] These distances provide a suitable margin in which adhesive can be applied to create a seal around the mouth.

[0012] The method may further comprise the step of e) applying adhesive to the web.

[0013] It is convenient to have adhesive for sealing the mouth ready-applied to the bag before use.

[0014] The method may further comprise the step of f) printing a reference mark on the web.

[0015] The method may further comprise the step of g) applying a tamper evident feature to the web.

[0016] Including a tamper evident feature advantageously allows the user to tell if the bag has been opened, or if an attempt to open the bag has been made.

[0017] There is also provided an apparatus configured to manufacture a bag or a series of bags according to the method. The apparatus comprises a drive system for

continuously feeding a web of plastics material along the apparatus from an input end thereof; a castellated rotary blade and a means of engagement/disengagement therefor; and a cutting and welding station for cutting and welding a bag from the web.

[0018] The apparatus may further comprise an adhesive station for applying adhesive to the web. The apparatus may further comprise a printing station for printing a reference mark on the web.

[0019] There is further provided a bag of plastics material comprising obverse and reverse walls with side edges; and a mouth defined by the obverse wall. The mouth comprises a perforated cut extending across the obverse wall substantially perpendicular to the side edges, and wherein the cut does not extend to either side edge.

[0020] The perforated cut may not extend to within 7mm of either side edge, or may not extend to within 12mm of either side edge. The bag may further comprise an adhesive strip configured to overlay the mouth on all sides.

[0021] The bag may further comprise a tamper evident feature, which may be tamper evident ink.

[0022] The bag may be of polyethylene.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023]

Figure 1 is a plan view of a bag according to an embodiment of the invention;

Figure 2 is a perspective view of the bag of Figure 1;

Figure 3 is a schematic view of an apparatus used in manufacturing the bag of Figures 1 and 2, according to an embodiment of the invention; and

Figure 4 is a side view of a rotary blade of the apparatus of Figure 3.

DETAILED DESCRIPTION OF EMOIDMENT(S)

[0024] Figures 1 and 2 show a bag generally indicated at 10. The bag 10 is for use in protecting and transporting food, medical and other samples, police evidence and the like. The bag 10 has opposing obverse 12 and reverse 14 walls of plastics material such as polyethylene. The obverse 12 and reverse 14 walls are joined at opposing side edges 16, and at top 18 and bottom 20 edges, so forming a pouch. In this embodiment, the bag 10 is welded at the side edges 16 and at the top 18. The material is folded to form the bottom edge 20. In alternative embodiments, all of the edges may be formed by welding, or an alternative edge may be formed by folding. In this embodiment the welds are formed at the outmost part of the edges. In an alternative embodiment, the welds are formed inward of the outermost part of the edges, or in both locations.

[0025] The obverse wall 12 defines a mouth 22 that provides access to the bag 10 so that an item can be

placed inside the pouch. The mouth 22 is a perforated cut 24 that extends across the obverse wall 12 substantially perpendicular to the side edges 16. The perforated nature of the cut 24 leaves ties 26 between the perforations, so that the ties 26 hold the obverse wall 12 together at the mouth 22. The ties 26 prevent the mouth 22 from unwanted opening, so that the bag 10 does not become contaminated prior to use. This is of particular importance in bags used for purposes such as police evidence and medical samples, especially when a liquid is to be contained within the bag. As described above, when the bag 10 is to be used, the user tears the ties 26 so that the mouth 22 is opened. The width of the ties 26 can be changed depending on the desired tear strength needed to open the mouth 22, i.e. the wider the ties 26, the higher the force required for the mouth 22 to be opened.

[0026] Once an item has been placed in the bag 10, the bag 10 can be sealed. An adhesive strip 28 is provided for sealing the bag 10. In this embodiment, the adhesive strip 28 is provided on a carrier tape 30 adjacent the mouth 22, the tape 30 being configured to be folded over the mouth 22 so that the adhesive strip covers the mouth 22. In an alternative embodiment, the carrier tape is located on the opposite side of the mouth.

[0027] As shown in Figure 1, the mouth 22 does not extend the full width of the obverse wall 12, so that an unbroken portion 32 is left at either end of the mouth 22. The adhesive strip 28 extends beyond the ends of the mouth 22. When the tape 30 is folded down to secure the bag 10, the adhesive strip 28 therefore surrounds the mouth 22, extending over the portions 32 at either end of the mouth 22, so that a seal is formed around the mouth 22. Leakage from the bag 10 is thus inhibited. The adhesive strip 28 of this embodiment is configured to extend beyond the mouth 22 by at least approximately 7mm at each end. In an alternative embodiment, the adhesive strip is configured to extend beyond the mouth by at least approximately 5mm at each end. In a further alternative embodiment, the adhesive strip is configured to extend beyond the mouth by at least approximately 12mm at each end.

[0028] One suitable adhesive is hot melt pressure sensitive adhesive such as Beardow Adams A15 2016. Other suitable adhesives can be used, such as solvent based adhesive, cold applied adhesive or UV cured adhesive.

[0029] The adhesive strip 28 is covered with a release liner 34 of a material such as metallised polyethylene terephthalate or other suitable material in order to protect against unwanted adhesion before the bag 10 is in use. The protective release liner 34 is easily peeled away from the adhesive strip 28 at the required time. In an alternative embodiment, the adhesive strip has mitred corners in order to aid removal of the release liner.

[0030] In alternative embodiments, adhesive may be applied around the mouth and covered with a protective strip, then exposed before sealing so that a part of the bag can be folded down over the adhesive. Alternatively, a separate adhesive tape can be used.

[0031] Tamper evident features can be included with the adhesive strip 28. For example, specialist tamper evident ink may be printed on the obverse wall 12 around the mouth 24, where the adhesive of the adhesive strip 28 will be applied, e.g. as described in GB2488507, or other specialist coatings or can be applied. Alternatively, the adhesive carrier tape may be treated with specialist tamper evident ink, e.g. as described in GB2279936. Alternatively, other tamper evident features can be used, such as die cuts that are configured to fail when the carrier tape is adjusted, frangible materials, or laminates that are configured to de-laminate and so show tamper evidence.

[0032] The bag 10 is intended for single use. When the bag 10 is no longer needed, e.g. if a sample is to be removed from the sealed bag 10, the bag is torn or cut open.

[0033] The bag 10 is manufactured as follows, with reference to the apparatus shown in Figure 3. A web 40 of polythene or other suitable material is fed from a roll 42 at an input end 43 of a conversion line or apparatus 44. A drive system 45 controls the roll 42 and the speed of flow of the web 40. The web 40 is passed through a printing station 46, where a reference mark 48 is printed on to the bag 10. In this embodiment the reference mark 48 is printed on the obverse wall 12. In alternative embodiments the reference mark is elsewhere on the bag, e.g. on the reverse wall. The reference mark 48 is shown in Figures 1 and 2 as a rectangular shape, as an example only. The reference mark 48 can be some other shape, or can be a word or pattern that is otherwise included in the design of the bag. Alternatively, the reference mark is a contrast in a colour or colours printed on the bag.

[0034] The printed web 40 then passes under a rotary blade 52, which defines the perforated cut 24. The use of a rotary blade 52 rather than a knife blade advantageously increases production efficiency. A rotary blade wears at a reduced rate in comparison to a knife blade. Use of a rotary blade therefore increases the blade lifetime and so reduces the machine stoppage time required to replace blades. A roller 53 of hardened steel or some other suitable material support the web 40 beneath the blade 52. The roller advantageously reduces dragging of the web 40 as it is cut by the blade 52.

[0035] Figure 4 shows the blade 52. The blade 52 is castellated so that the perforations of the cut 24 can be defined. That is, the blade 52 has cutting teeth 54 separated from one another. When the blade 52 engages the web 40, cuts are made by the teeth 54 and the ties 26 are left between the cuts. Rotary blades with different geometry can be used to define ties 26 of different widths, in order to create a perforated cut of the required tear strength. That is, a blade with fewer teeth spaced further from one another will produce wider ties and a perforated cut of greater tear strength, or a blade with wider teeth closer together will produce narrower ties and a perforated cut of lesser tear strength.

[0036] Engagement of the blade 52 with the web 40 is

controlled by a piston 56. The piston 56 of this embodiment is pneumatic, although other suitable methods of operation can be used. The blade 52 is operated by being lowered to engage the web 40, or raised to disengage the web 40. When the blade 52 is engaged with the web 40 the movement of the web 40 causes the blade 52 to be rotated, and so make the cut 24. Rotation of the blade 52 is aided by the roller 53. In an alternative embodiment, rotation of the blade is powered, e.g. by an electric motor.

[0037] The blade 52 is intermittently engaged with the web 40 to define the perforated cut 24, then disengaged by the piston 56 to define the end of the cut 24, so that the unbroken portions 32 are left at either end of the cut 24. A sensor 58 detects the reference mark 48 and an associated control system (not shown) activates the piston 56 to engage or disengage the blade 52 accordingly.

[0038] In this embodiment, the reference mark 48 indicates when the blade 52 is to be operated to disengage from the web 40, i.e. where the perforated cut 24 is to be ended. When the sensor 58 detects the reference mark 48, the control system acts to disengage the blade 52. After a predetermined length of web 40 has passed along the apparatus 44, the control system activates the piston 56 to engage the blade 52 with the web 40, so that the cut 24 is started. When the sensor 58 detects the subsequent reference mark 48, the blade 52 is disengaged, and so on, repeating the process along the length of the web 40. The reference mark 48 is shown in an example location in Figures 1 and 2. In an alternative embodiment the reference mark is located elsewhere on the web, and the sensor is correspondingly located.

[0039] The length of web 40 that passes along the apparatus 44 is measured using a shaft encoder. The encoder rotates as the web 40 moves, and emits a known quantity of electronic pulses as it rotates. The distance rotated by the encoder, and thus the amount of web 40 that has passed beneath the blade 52, can therefore be calculated. The control system engages the blade 52 with the web 40 according to the number of pulses emitted. In an alternative embodiment, the control system engages the blade 52 after a set amount of time has passed, where the web 40 is travelling at a predetermined speed, i.e. so that the length of web that has passed can be calculated.

[0040] In an alternative embodiment, the control system is configured to engage the blade with the web when the reference mark is detected by the sensor, and to disengage the blade from the web after a predetermined length of web has passed.

[0041] In a further alternative embodiment, a second reference mark indicates when the blade is to engage the web.

[0042] The web 40 passes through an adhesive station 60 and the adhesive strip 28 is applied. The release liner 34 is attached to the adhesive strip 28. The web 40 is folded, and passes through a cutting and welding station 62 where an individual bag 10 is severed from the web 40 by a blade. The bag 10 is folded, and a heated blade

is used to simultaneously cut and weld the side edges 16. The top edge 18 is also welded.

[0043] In an alternative embodiment, cutting of the side edges and welding the bag takes place in separate steps.

[0044] In an alternative embodiment, printing takes place on a separate apparatus line. Once printed, the web is rolled and transferred to the apparatus line for the application of adhesive and creation of perforated cuts.

[0045] In a further alternative embodiment, where adhesive application and printing take place in the same line, adhesive is applied before printing takes place.

[0046] In an alternative embodiment, the web is supplied already folded, as a tube, or as a double sheet, allowing two adjacent bags to be produced simultaneously. In this embodiment the apparatus includes a roller adjacent the rotary blade, the roller being configured to separate the obverse and reverse walls of the bag so that the blade cuts through only one of the walls. The roller is mounted with an axis substantially parallel to that of the rotary blade. In an alternative embodiment the roller is mounted with an axis substantially perpendicular to that of the rotary blade. In an embodiment where rotation of the blade is powered, a plate is used to separate the obverse and reverse walls of the bag whilst cutting takes place.

[0047] The above-described process produces a bag 10 with a mouth held closed to prevent contamination of the bag before use, and that does not extend across the full width of the bag, allowing a leak resistant seal to be made around the mouth. Advantageously, there is no need for an additional welding step to shorten the cut, and any tampering with the bag will be evident.

Claims

1. A method of producing a bag comprising the steps of:

- a) continuously feeding a web of plastics material along an apparatus from an input end thereof, the web having a reference mark printed thereon;
- b) operating a castellated rotary blade as the reference mark reaches a predetermined point to perform one of disengagement or engagement with the web, in order to define a perforated cut substantially parallel to the direction of feed;
- c) operating the rotary blade after a predetermined length of the web has passed the blade to perform the other of engagement or disengagement of the blade with the web, to define the perforated cut;
- d) cutting and welding the bag from the web, the bag having side edges substantially perpendicular to the direction of feed from the web;

wherein the reference mark is located such that, and the predetermined length is such that, the perforated

cut does not extend to either side edge.

2. The method of claim 1 wherein the perforated cut does not extend to within 7mm of either side edge.
3. The method of claim 1 or claim 2 wherein the perforated cut does not extend to within 12mm of either side edge.
4. The method of any of claims 1 to 3 further comprising the step of e) applying adhesive to the web.
5. The method of any of claims 1 to 4 further comprising the step of f) printing a reference mark on the web.
6. The method of any of claims 1 to 5 further comprising the step of g) applying a tamper evident feature to the web.
7. An apparatus configured to manufacture a series of bags according to the method of any of claims 1 to 6, the apparatus comprising:
 - a drive system for continuously feeding a web of plastics material along the apparatus from an input end thereof;
 - a castellated rotary blade and a means of engagement/disengagement therefor; and
 - a cutting and welding station for cutting and welding a bag from the web.
8. An apparatus according to claim 7 further comprising an adhesive station for applying adhesive to the web.
9. An apparatus according to claim 7 or claim 8 further comprising a printing station for printing a reference mark on the web.
10. A bag of plastics material comprising:
 - obverse and reverse walls with side edges; and
 - a mouth defined by the obverse wall; wherein the mouth comprises a perforated cut extending across the obverse wall substantially perpendicular to the side edges, and wherein the cut does not extend to either side edge.
11. A bag according to claim 10 wherein the perforated cut does not extend to within 7mm of either side edge.
12. A bag according to claim 10 or claim 11 wherein the perforated cut does not extend to within 12mm of either side edge.
13. A bag according to any of claims 10 to 12 further comprising an adhesive strip configured to overlay the mouth on all sides.

14. A bag according to any of claims 10 to 13 further comprising a tamper evident feature, preferably wherein the tamper evident feature is tamper evident ink.

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15. A bag according to any of claims 10 to 14 wherein the bag is of polyethylene.

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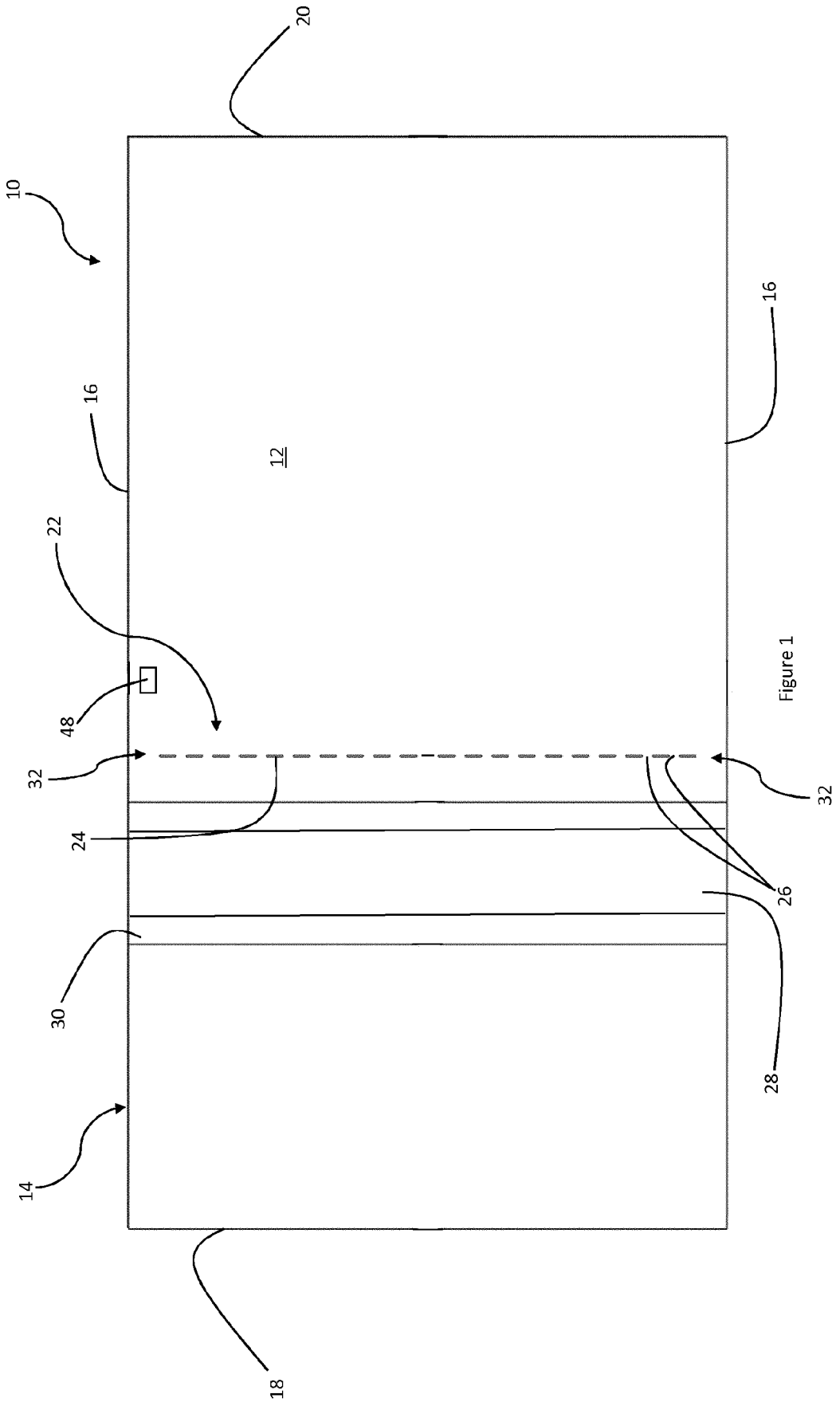


Figure 1

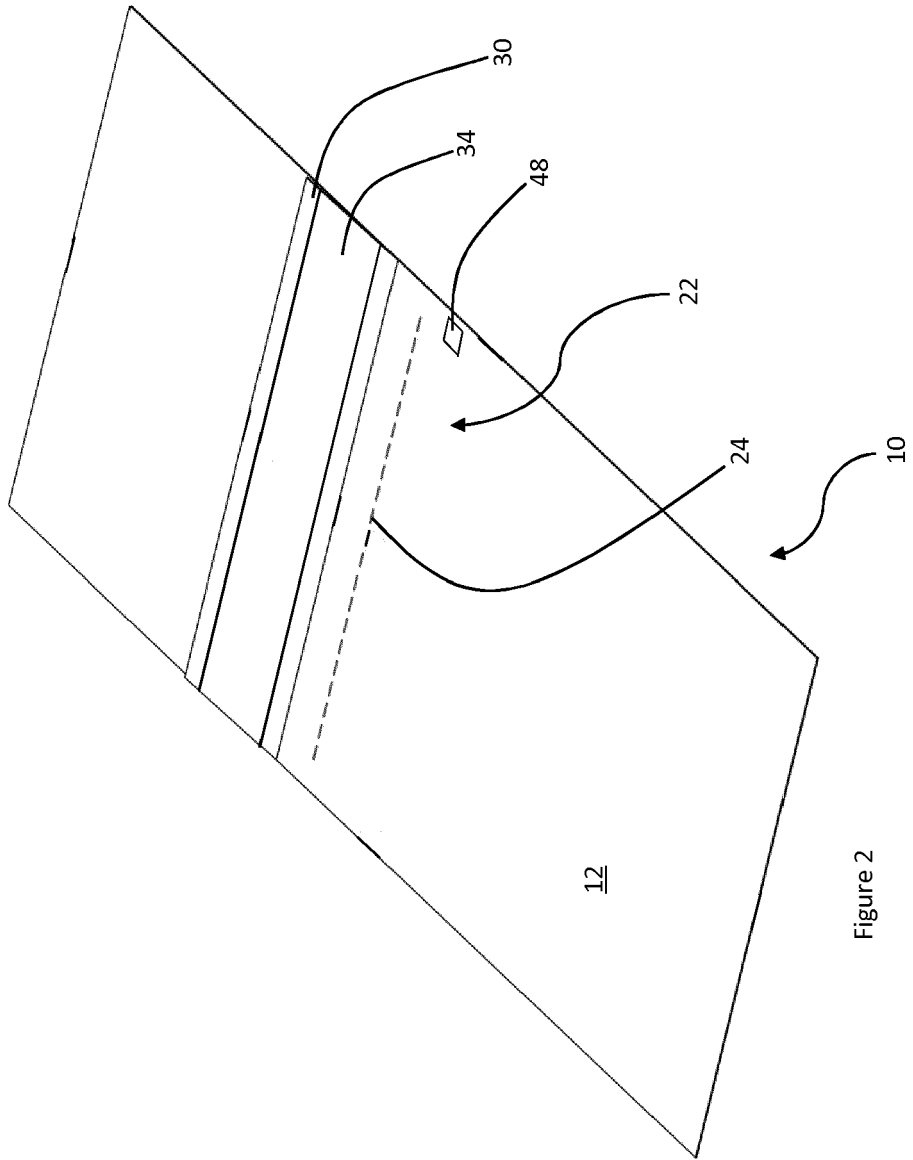
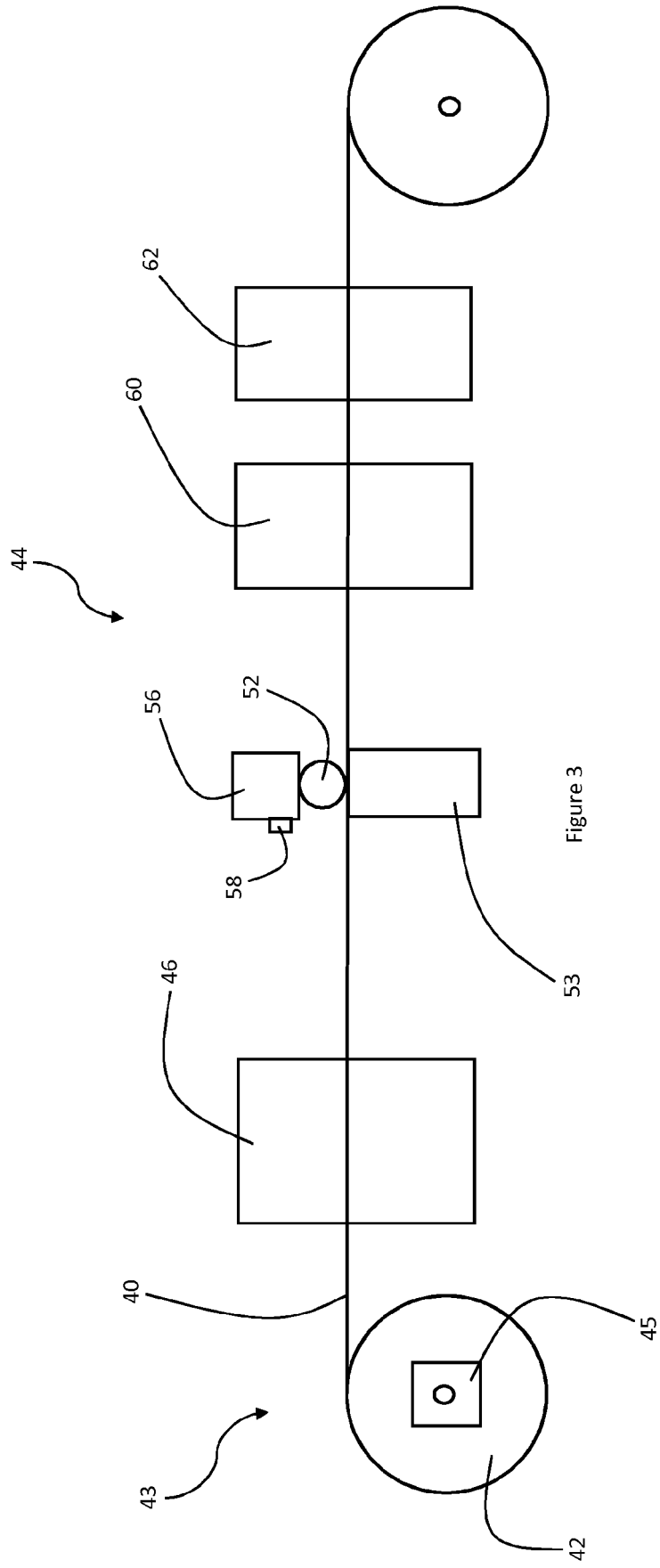


Figure 2



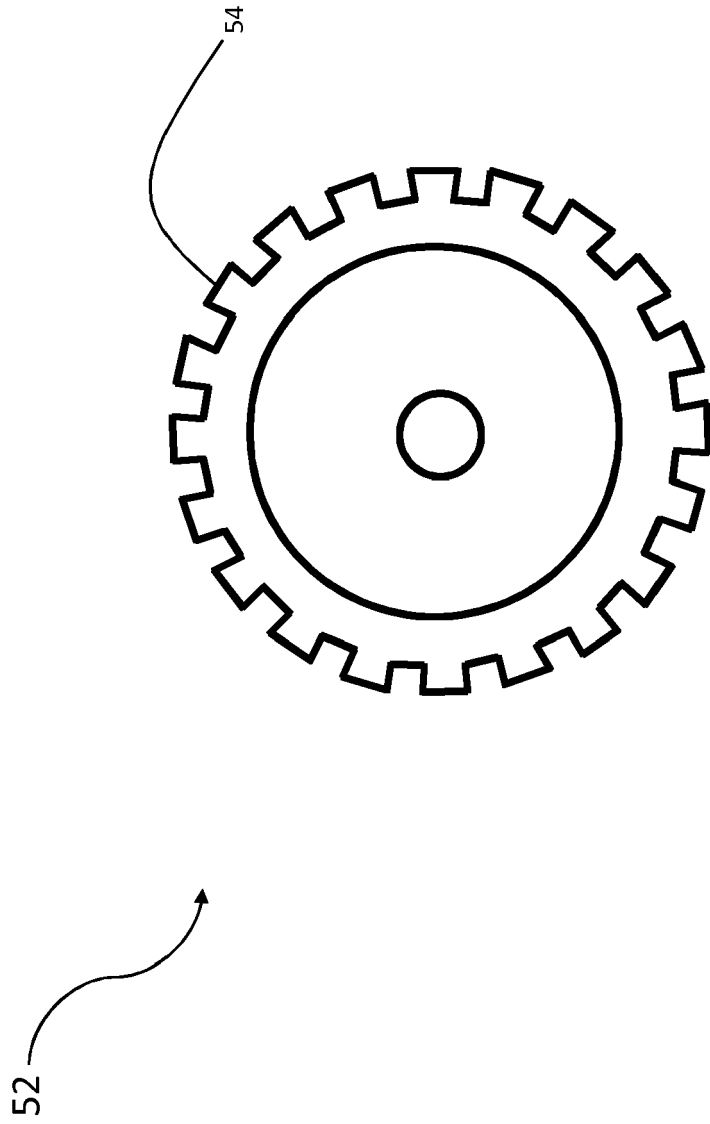


Figure 4



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Application Number
EP 18 15 5790

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Place of search Munich		Date of completion of the search 11 July 2018	Examiner Johne, Olaf
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			

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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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