

Jan. 14, 1964

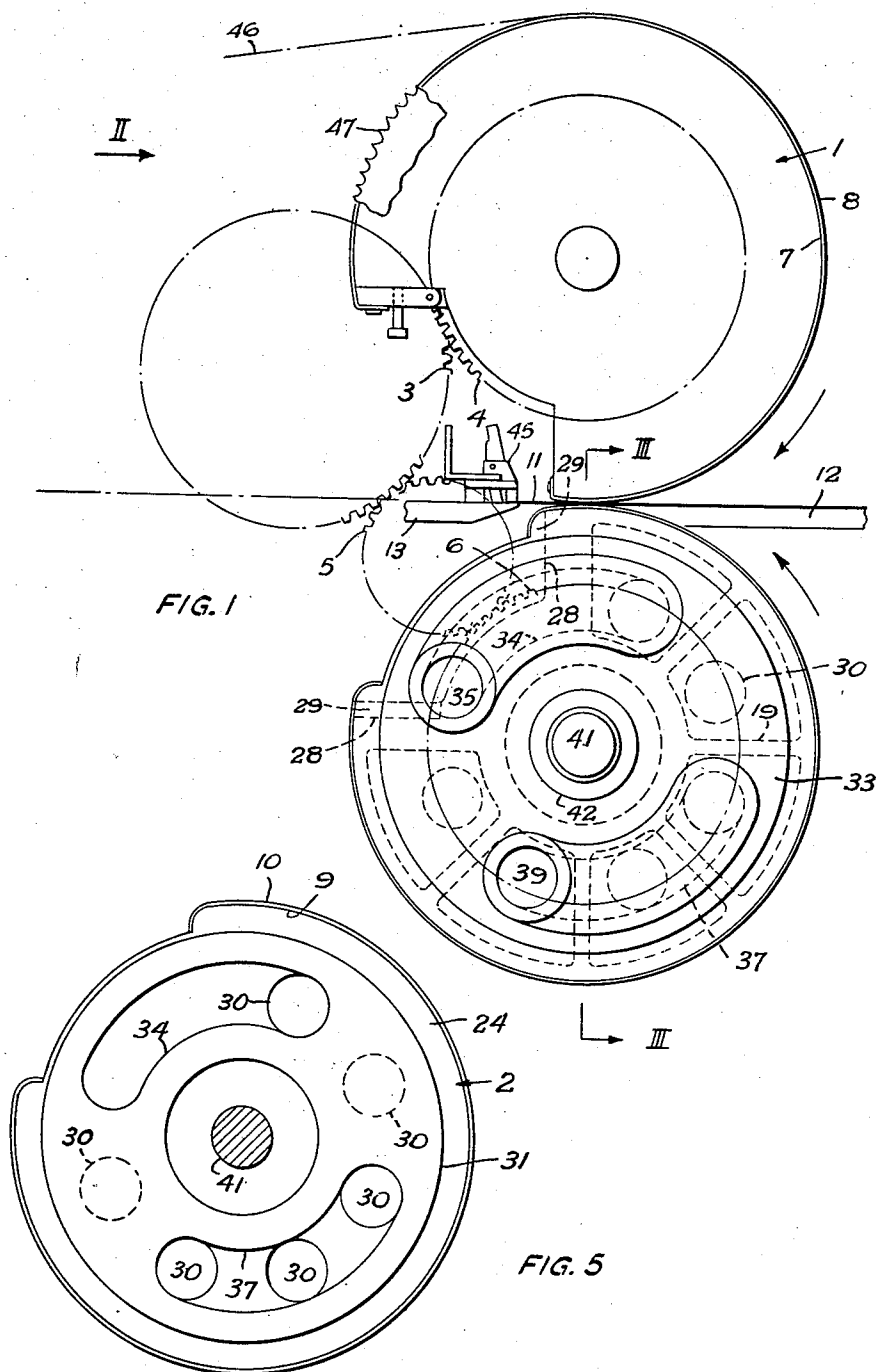
W. F. GOLDING

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APPARATUS FOR SEPARATING WASTE AND WORK IN CUT SHEETS

Filed Jan. 4, 1961

4 Sheets-Sheet 1



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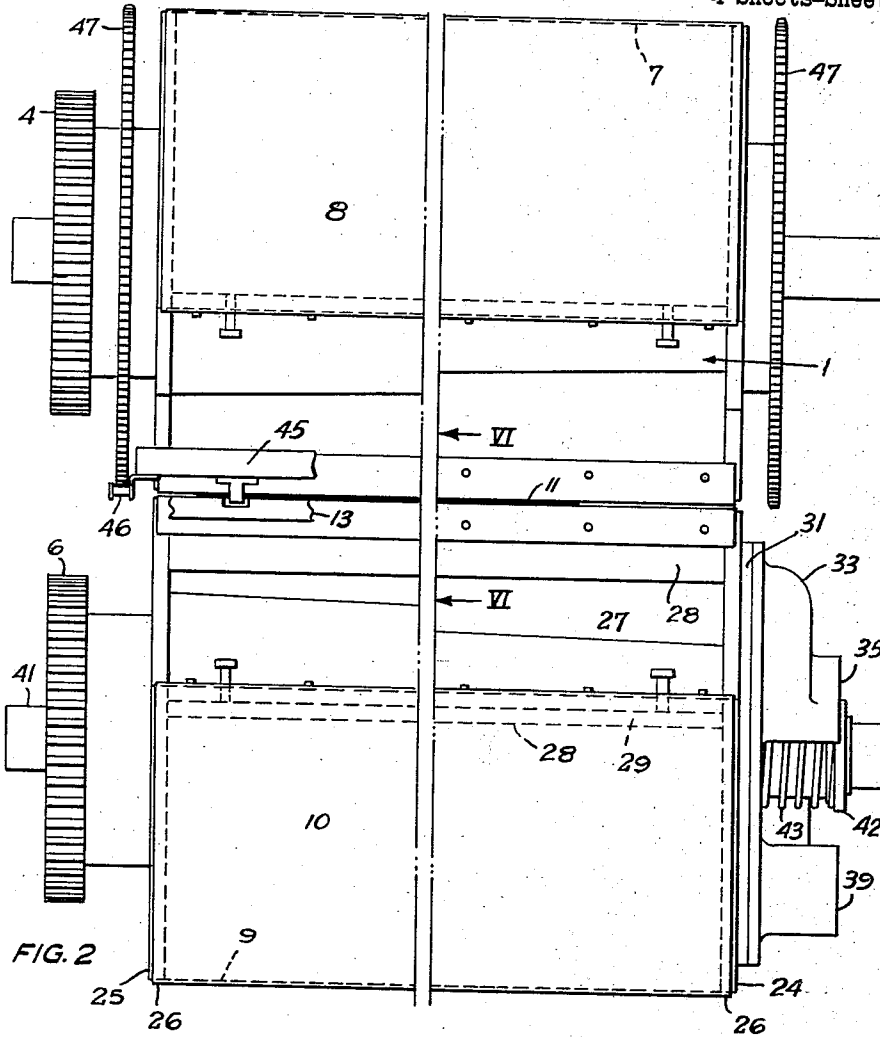
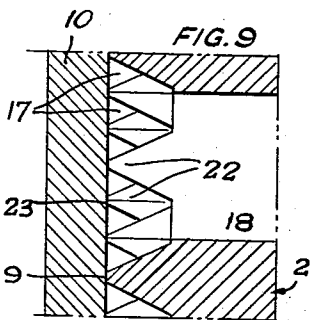
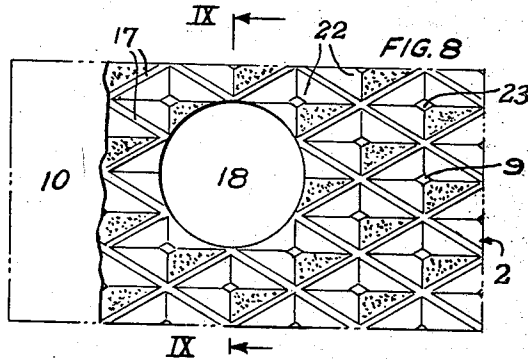
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APPARATUS FOR SEPARATING WASTE AND WORK IN CUT SHEETS

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4 Sheets-Sheet 2



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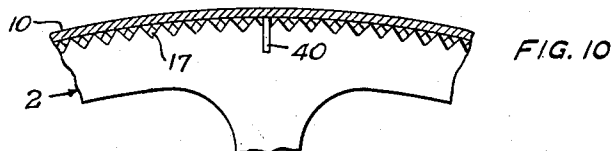
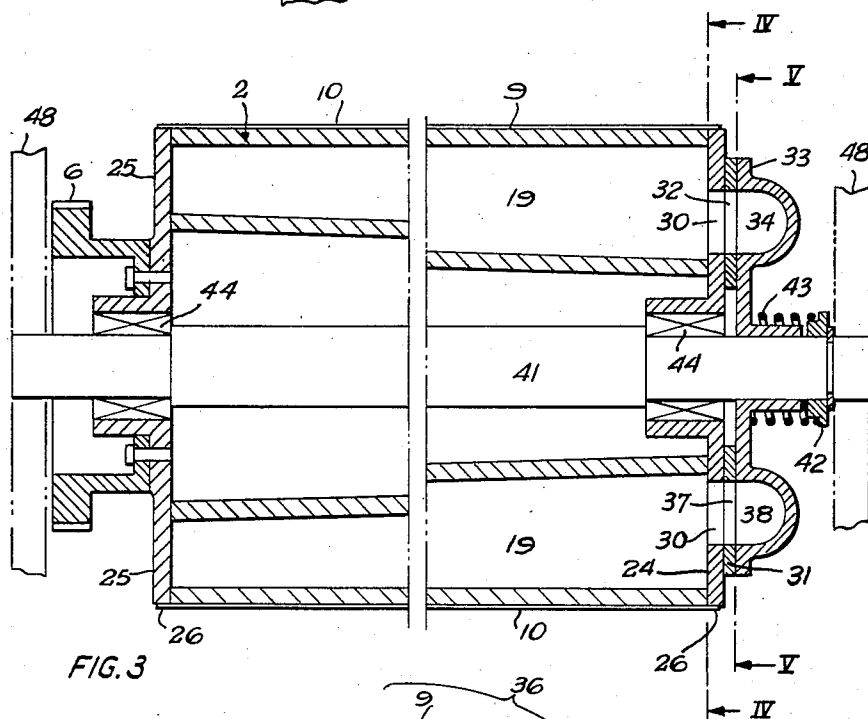
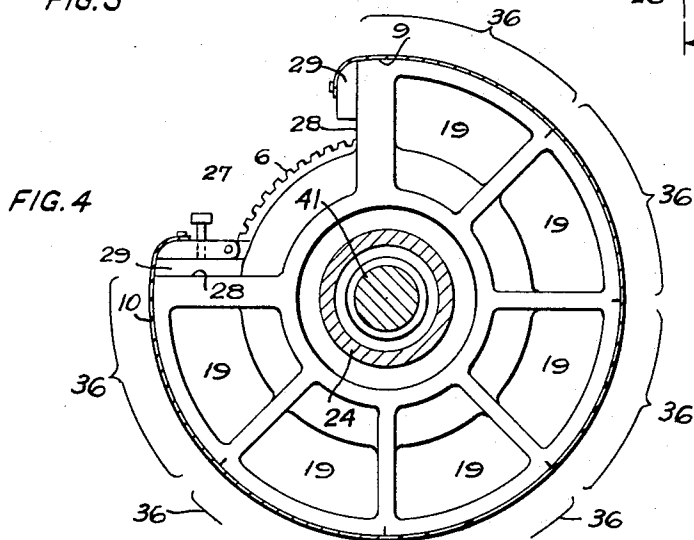
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APPARATUS FOR SEPARATING WASTE AND WORK IN CUT SHEETS

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4 Sheets-Sheet 3



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APPARATUS FOR SEPARATING WASTE AND WORK IN CUT SHEETS

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6 Claims. (Cl. 93—36)

This invention relates to apparatus for separating waste and work in die-cut sheets.

According to this invention, apparatus for separating a waste portion from a die-cut sheet of cardboard or the like, comprises a pair of counter-rotating upper and lower rolls between which the sheet is passed along a substantially horizontal plane, a jacket of flexible sheet material provided on the lower roll, a chamber provided within the lower roll, a cut-out provided in the jacket in register with said waste portion, air passages connected between the chamber and the periphery of the lower roll in positions to communicate with said cut-out, means provided at the periphery of the upper roll cooperating to push the waste portion from the sheet into said cut-out when the waste portion passes the nip of the rolls, a source of suction connected to said chamber and cooperating to suck the waste portion pushed as aforesaid into engagement with the periphery of the lower roll for the waste portion to adhere to the lower roll and to be carried thereby into a position clear of the plane of the sheet, and means for releasing the suction after a pre-determined amount of travel of the waste portion from the nip of the rolls and prior to the return of the cut-out to said nip.

One form of apparatus according to this invention will now be described with reference to the accompanying drawings wherein:

FIG. 1 is an end view of the apparatus.

FIG. 2 is an elevation as seen in the direction of the arrow II in FIG. 1.

FIG. 3 is a section on the line III—III in FIG. 1.

FIG. 4 is a section on the line IV—IV in FIG. 3.

FIG. 5 is a section on the line V—V in FIG. 3.

FIG. 6 is an enlarged section on the line VI—VI in FIG. 2.

FIG. 7 is a section on the line VII—VII in FIG. 6.

FIG. 8 is an enlarged detail of FIG. 7.

FIG. 9 is a section on the line IX—IX in FIG. 8.

FIG. 10 is an enlarged detail of FIG. 4.

Referring to the drawings, an upper roll 1 and a lower roll 2 are driven counter-rotationally by a gear 3 driving a gear 4 secured to the roll 1 and driving, via an intermediate gear 5, a gear 6 secured to the roll 2. The roll 1 comprises a part-cylindrical periphery 7 around which is wrapped a jacket 8, and the roll 2 comprises a part-cylindrical periphery 9 around which is wrapped a jacket 10. The rolls 1, 2 are positioned for the jackets 8, 10 to engage a sheet 11 fed to the rolls and to forward the sheet 11 by virtue of said counter-rotation. The sheet 11 is fed to the rolls 1, 2 on a table 12 and is delivered from the rolls 1, 2 over a table 13, the tables 12, 13 supporting the sheet in a plane substantially tangential to the rolls.

The sheet is die-cut into carton blanks in a manner well known per se. Between the carton blanks there occur the usual waste portions, one such portion, denoted 14, being shown in FIGS. 6, 7.

A pad 15 (FIG. 6) secured to the jacket 8 and an aperture or cut-out 16 in the jacket 10 are positioned to register with the waste portion 14 during the passage thereof through the nip of the rolls 1, 2, and during this passage the pad 15 separates the waste portion 14 from the sheet 11 by pushing it into the cut-out 16. FIG. 6 shows the leading part of the waste portion 14 as having been

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pushed into the cut-out 16 while the trailing part of the waste portion 14 is still in engagement with the sheet 11.

The pad 15 is made of a resilient material, e.g. rubber, and is dimensioned to place the waste portion 14 into contact with the part of the periphery 9 where exposed by the cut-out 16.

Suction means are provided to ensure that the waste portion 14 is retained in the cut-out 16 until the waste portion 14 has reached a position well clear of the plane of the sheet 11. Said suction means comprise chambers 19 in the interior of the roll 2 and air passages defined by grooves 17 in the whole of the periphery 9 of the roll 2 and by holes or ducts 18 connecting the grooves 17 to the chambers 19. As will be explained later hereinbelow the chambers 19 are evacuated and the resulting suction in the holes 18 is distributed by the grooves 17 over the periphery 9. Referring to FIGS. 6 to 9, the grooves 17 are produced by cutting V-grooves extending helically around the periphery 9. Grooves 17 cut parallel to the line 20 (FIG. 7) and other grooves 17 cut parallel to the line 21 form a criss-cross pattern and define between them pyramidal projections 22 (FIGS. 8, 9), slightly flattened apices 23 of which support the jacket 10. It will be seen that the grooves 17 and the inside of the jacket 10 define spaces through which the suction is distributed substantially over the whole of the periphery 9. When the waste portion 14 is being pushed by the pad 15 into the cut-out 16, the suction in the grooves 17 operates to adhere the waste portion 14 to the periphery 9 whereby the waste portion 14 is carried away from the plane of the sheet 11 as the roll 2 rotates. In view of the distribution of suction by the grooves 17, the cut-out, 16, may be of any shape or position determined by the arrangement of the carton blanks in the sheet 11, and for different jobs, i.e. different arrangements of carton blanks, it is merely necessary to employ differently cut out jackets 10.

The roll 9 is provided at its respective ends with end plates 24, 25 dimensioned to seat the adjacent edge portions 26 of the jacket 10 (FIGS. 2, 3, 7) thereby to provide a seal against the escape of suction at the longitudinal ends of the periphery 9. Further, for the purpose, inter alia, of providing space for a means for fastening the jacket 10 to the roll 2, the latter is provided with a recess 27 defined by radial walls 28 each of which has screwed thereto a sealing plate 29 over which the jacket 10 is strained whereby escape of suction is prevented at the circumferential ends of the periphery 9.

Referring particularly to FIGS. 3 to 5, the chambers 19 are arranged in angular sequence around the axis of the roll 2 and extend the full length thereof. At the ends of the roll 2 the chambers 19 are closed by said end plates 24, 25. The end plate 24 is provided at each chamber 19 with a port 30 and defines a valve member engaged by a stationary valve seat or ring 31 provided with an arcuate port 32 with which the apertures 30 register sequentially as the roll 2 rotates. At the face remote from the plate 24, the ring 31 is secured to a seat support member 33 provided with a cavity 34 open to the port 32 and itself connected through a port 35 (FIGS. 1, 2) to a source of suction or suction pump (not shown). The holes 18 are positioned for each chamber 19 to supply suction to a distinct part 36 (FIG. 4) of the periphery 9 radially adjacent thereto. The arcuate port 32 is so positioned that, as the leading end of any one part 36 reaches the nip of the rolls 1, 2, the corresponding port 30 has just reached a position of registration with the port 32 and stays in registration therewith until the trailing end of the part 36 is well past the nip of the rolls 1, 2.

The valve seat 31 also comprises an arcuate port 37 spaced about 180 degrees from the port 31 and positioned for sequential register with the ports 30 as the roll 2 rotates. The port 37 is open to a cavity 38 in the mem-

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ber 31, and the cavity 38 is connected through a port 39 to a source of air pressure, say, the pressure side of said suction pump. When the port 30 of any one chamber 19 registers with the port 37, the suction in that chamber is turned into pressure and any waste portion 16 is blown from the periphery 9. The port 37 is positioned for this pressure phase of any one chamber 19 to be completed well before the corresponding peripheral part 36 reaches the nip of the rolls 1, 2 again.

To avoid loss of suction from one to another of the parts 36 through the grooves 17, and further, to prevent the pressure in any one pressurized chamber from discharging through the grooves 17 into a part 36 subject to suction, the ports 36 are separated by sealing strips 40 (FIG. 10) extending the full length of the periphery 9.

If the sheet 11 is relatively narrow, the jacket 10 need of course only extend over a corresponding part of the length of the periphery 9 and, in that case, the remainder of the periphery is covered by blank strips of suitable material which may be adhesive material.

The member 33 is supported for axial sliding motion only on a stationary shaft 41 to which is secured a ring 42, and a compression spring 43 (FIG. 2, 3) situated between the ring 42 and the member 33 urges the latter against the plate 24 to ensure good sealing contact thereof with the seat 31. The shaft 41 is supported on side frames 43 and the roll 2 is supported for rotation on the shaft 40 by bearings 44 (FIG. 3).

The jacket 10 is made of material combining flexibility with substantial resistance to stretching, e.g. flexible compressed asbestos sheeting. The cutouts in the jacket 10 are made at markings produced by using as a template one of the sheets of carton blanks from which the waste portions have been removed manually.

The jacket 8 of the upper roll 1 comprises a thin metal sheet and the pads 15 are glued thereto. As stated before the pads 15 are made of a resilient material, and they are readily cut from appropriate sheets of such material and are positioned on the jacket 8 using one of the sheets of carton blanks as a template.

The jackets 8, 10 are preferably prepared away from the rolls 1, 2, and the prepared jackets are easily attached to the latter and strained into engagement therewith by means known per se.

Reverting to the passage of the sheet 11 through the nip of the rolls 1, 2, at said nip the sheet 11 is received by a gripper 45 (FIG. 6) connected to a pair of endless chains 46 supported on sprockets 47 secured to the roll 1. The gripper 45 operates to transfer the sheet 11 from the rolls 1, 2 to a delivery pile (not shown).

What I claim and desire to secure by Letters Patent is:

1. Apparatus for separating a waste portion from a die-cut sheet comprising a pair of counter-rotating upper and lower rolls between which the sheet is passed along a substantially horizontal plane, a jacket of flexible sheet material provided on the lower roll, a chamber provided within the lower roll, a cut-out provided in the jacket in register with said waste portion, air passages connected between the chamber and the periphery of the lower roll in positions to communicate with said cut-out, means provided at the periphery of the upper roll cooperating to push the waste portion from the sheet into said cut-out

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when the waste portion passes the nip of the rolls, a source of suction connected to said chamber and cooperating to suck the waste portion pushed as aforesaid into engagement with the periphery of the lower roll for the waste portion to adhere to the lower roll and to be carried thereby into a position clear of the plane of the sheet, and means for releasing the suction after a pre-determined amount of travel of the waste portion from the nip of the rolls and prior to the return of the cut-out to said nip.

2. Apparatus according to claim 1, said air passages comprising grooves provided in the periphery of the lower roll and ducts connected between said grooves and said chamber, the grooves and the inside of the jacket defining spaces through which the suction from the ducts is distributed over the periphery of the lower roll.

3. Apparatus according to claim 2, said grooves being dimensioned to define between them tapered projections whose apices function to support the jacket on the roll.

4. Apparatus according to claim 3, wherein the grooves are arranged on a criss-cross pattern and are related for said projections to be substantially of pyramidal shape.

5. Apparatus according to claim 1, comprising a plurality of chambers such as the chamber aforesaid, said air passages being positioned to connect the chambers respectively to distinct circumferential parts of the periphery of said lower roll, and means for applying said source of suction to said chambers sequentially during the period when the corresponding sequential parts of said periphery pass through the nip of the rolls.

6. Apparatus for separating a waste portion from a die-cut sheet comprising a pair of counter-rotating upper and lower rolls between which the sheet is passed along a substantially horizontal plane, a jacket of flexible material provided on the lower roll, a plurality of chambers provided in the lower roll, air passages connected between the respective chambers and distinct circumferentially sequential parts of the periphery of the lower roll, a source of suction, valve means operating to connect the chambers sequentially to said source in such a way that any one chamber is evacuated when the peripheral part connected thereto by said air passages passes the nip of the roll and is cut off again before this peripheral part again approaches said nip, a cut-out provided in the jacket in register with said waste portion, the air passages of at least one of the chambers communicating with said cut-out, means provided at the periphery of the upper roll cooperating to push the waste portion from the sheet into said cut-out when the waste portion passes the nip of the rolls, and said suction cooperating to adhere the waste portion pushed as aforesaid into engagement with the periphery of the lower roll for the waste portion to be carried by the lower roll into a position clear of the plane of the sheet.

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