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(54) **A MULTI-PLY WEB FORMING APPARATUS**

MEHRLAGEN-BLATTBILDUNGSVORRICHTUNG

MACHINE POUR FORMER UNE BANDE A COUCHES MULTIPLES

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Description

Background of the Invention

Field of the Invention

The present invention relates to a multi-ply web forming apparatus. More specifically, the present invention relates to a multi-ply web forming apparatus for forming a top ply on a base ply.

Information Disclosure Statement

Bel Bond™ top wire formers permit upward removal of water from stock so that the resultant web has more uniform surface characteristics thereon.

More specifically, when stock is ejected from a headbox onto a fourdrinier wire, water is drained downwardly, leaving a fibrous web on the upper surface of the wire. Thereafter, the fibrous web is transferred to a press section for removing more water from the formed web.

The aforementioned downward drainage of water causes uneven surface characteristics on the resultant web. The Bel Bond™ unit is a top wire unit which includes a looped top wire which cooperates with the lower fourdrinier wire to define therebetween a forming section.

Water is removed upwardly from the stock during passage thereof through the forming section such that more even surface characteristics are imparted to the resultant formed web.

However, in the formation of a multi-ply web, a base ply is initially formed on the lower fourdrinier wire, and a secondary headbox is disposed immediately upstream relative to a top wire Bel Bond™ apparatus.

Another arrangement of this type is disclosed in EP-A-0 397 430 which describes a multi-ply web forming apparatus according to the preamble of claim 1.

More specifically, EP-A-0 397 430 discloses a multi-ply web forming apparatus for forming a top ply on a base ply which includes a secondary headbox depositing stock on a base ply for generating the top ply, and a generally horizontally disposed twin wire forming zone comprising an inverted vacuum box with a plurality of dewatering blades disposed above the top wire and dewatering foils disposed on the opposite side of the wires relative to the dewatering blades.

In EP-A-0 397 430, the dewatering foils are placed in correspondence with the blades.

Although the aforementioned arrangement has proved successful in the formation of a multi-ply web, there exists a tendency for the top ply to crush during subsequent pressing thereof.

More particularly, when the stock is ejected from the secondary headbox, there exists a tendency for a fibrous mat to form on the underside of the top wire, such fibrous mat tends to trap lower consistency stock there-

below so that in the subsequent pressing operation, crushing of the web occurs.

The present invention seeks to overcome the aforementioned problem by removing water evenly from the top ply resulting in a more uniform consistency of stock in a "Z" direction.

Therefore, it is a primary objective of the present invention to provide a multi-ply web forming apparatus which overcomes the aforementioned disadvantages of the aforementioned apparatus and to provide a considerable contribution to the art of multi-ply web forming.

Another object of the present invention is the provision of a multi-ply web forming apparatus which inhibits crushing of the resultant web, particularly heavy weight webs.

To achieve this, the multi-ply web forming apparatus of the invention is characterized by the features claimed in the characterizing portion of claim 1.

Basically, in the multi-ply web forming apparatus according to the invention, each foil of the plurality of foils is disposed between adjacent blades of the plurality of dewatering blades such that the blades and foils impart dewatering pressure pulses to the multi-ply web during passage of the web between the blades and foils, thereby maintaining the consistency of the top ply uniform in a "Z" direction so that crushing of the resultant web is inhibited.

A turning bar which defines a curved surface is disposed beneath the lower forming wire and upstream relative to the first end of the forming section for guiding the lower wire, the secondary headbox being disposed closely adjacent to the turning bar.

In a more specific embodiment of the present invention, the turning bar is adjustable such that positioning of the secondary headbox closely adjacent to the lower wire is permitted so that the stock ejected from the secondary headbox is ejected substantially parallel to the lower wire from the turning bar to the dewatering shoe.

The curved surface of the turning bar in one embodiment of the present invention is ceramic.

The curved dewatering shoe also includes a plurality of spaced bars which are spaced in a machine direction. Each bar extends in a cross-machine direction, and the bars include an upstream bar.

The dewatering shoe also includes a vacuum box in fluid communication with the spaces defined between each adjacent bar.

The stock is ejected from the secondary headbox so that such stock impinges on the base ply adjacent to the upstream bar of the plurality of spaced bars.

In one embodiment of the present invention, the dewatering shoe has a radius of curvature within the range 12 to 18 meters.

The vacuum slot means is an auto-slice which includes a lip means for directing the portion of water ejected from the top ply through the top wire. The auto-slice also includes collecting tank means associated with the lip means for collecting the portion of water

therein.

In a more specific embodiment of the present invention, the vacuum slot means includes a plurality of vacuum slots which are spaced relative to each other in a machine direction, each vacuum slot including an adjustable lip. The vacuum slot means also includes a collecting tank disposed above each lip, the arrangement being such that in use of the apparatus, water removed from the top ply through the top wire due to tension of the lower wire and a converging wire wedge defined between the wires is removed through the vacuum slot means so that trapping of lower consistency stock within the top ply by the formation of a fiber mat on the opposite side of the top wire relative to the vacuum slot means is inhibited.

The inverted vacuum box has a greater radius of curvature than the radius of curvature of the dewatering shoe.

Each blade of the plurality of dewatering blades is spaced at a distance relative to an adjacent dewatering blade. The distance is greater than the distance between adjacent bars of the dewatering shoe.

Each foil of the plurality of foils is disposed between adjacent blades of the plurality of dewatering blades such that the blades and foils impart dewatering pressure pulses to the multi-ply web during passage of the web between the blades and foils.

More specifically, the foils cooperate with the blades and are disposed between the blades from an upstream blade along a portion of the machine direction length of the vacuum box.

In another embodiment of the present invention, the foils cooperate with the blades and are disposed between the blades and downstream relative to an upstream blade to a downstream blade of the vacuum box.

Each dewatering foil includes a pair of threaded rods which are disposed parallel and spaced relative to each other and adjacent to one end of the foil.

A further pair of threaded rods are disposed spaced and parallel relative to each other adjacent an opposite end of the foil.

A yoke portion cooperates with the pair of rods such that vertical adjustment of the yoke relative to the rods is permitted.

A further yoke cooperates with the further pair of rods such that vertical adjustment of the further yoke relative to the further rods is permitted.

A foil bar having a first and a second end is arranged such that a first end of the foil bar is journaled within the first yoke, and a second end is journaled within the second yoke such that vertical adjustment of the foil bar is permitted. The journals permit rotational adjustment of the foil bar relative to the lower wire. Pneumatic tube means are disposed beneath the foil bar for adjustably loading the foil bar against the lower wire.

Many variations and modifications of the present invention will be readily apparent to those skilled in the art by a consideration of the detailed description contained hereinafter.

Brief Description of the Drawings

Figure 1 is a side-elevational view of a multi-ply web forming apparatus which is not in accordance with the present invention;

Figure 2 is a side-elevational view of a further multi-ply web forming apparatus which is not in accordance with the present invention;

Figure 3 is a side-elevational view of a multi-ply web forming apparatus according to an embodiment of the present invention;

Figure 4 is an enlarged view of the auto-slice shown in Figure 1;

Figure 5 is a side-elevational view of a preferred embodiment of the present invention.

Similar reference characters refer to similar parts throughout the various embodiments of the present invention.

Detailed Description of the Drawings

Figure 1 is a side-elevational view of a multi-ply web forming apparatus, generally designated **10**, for forming a top ply **12** on a base ply **14**.

The former **10** includes a lower looped forming wire **16** for receiving the base ply **14** thereon.

A top looped forming wire **18** cooperates with and is disposed above the lower wire **16** for defining therebetween a generally horizontally disposed forming section **20** having a first and a second end **22** and **24**, respectively.

A turning bar **26** defines a curved surface **28** which is disposed beneath the lower forming wire **16** and upstream relative to the first end **22** of the forming section **20** for guiding the lower wire **16**.

A secondary headbox **30** is disposed closely adjacent to the turning bar **26** such that stock **32** ejected from the secondary headbox **30** towards the first end **22** of the forming section **20** is deposited on the base ply **14**, the stock **32** ejected from the secondary headbox **30** generating the top ply **12**.

A curved dewatering shoe **34** is disposed beneath the lower wire **16** and adjacent to the first end **22** of the forming section **20**. The curved shoe **34** has a center of curvature disposed below the lower wire **16** such that a portion of water, as indicated by the arrow **36**, is ejected through the top wire **18**.

A vacuum slot means, generally designated **38**, is disposed above the top wire **18** and immediately downstream relative to the dewatering shoe **34** for collecting the portion of water **36** upwardly away from the top wire **18**.

An inverted vacuum box, generally designated **40**,

is disposed immediately downstream relative to the vacuum slot **38** and on the opposite side of the top wire **18** relative to the dewatering shoe **34**. The box **40** defines a curved face **42** having a center of curvature disposed above the top wire **18**.

A plurality of dewatering blades **44,45,46,47,48,49,50,51,52,53,54, 55** and **56** are disposed in spaced relationship in a machine direction MD along the curved face **42**. Each blade **44** to **56** extends in a cross-machine direction such that the blades **44** to **56** are disposed between the curved face **42** and the top wire **18** for guiding the top wire therepast.

Figure 2 is a side-elevational view of a further arrangement showing a multi-ply web forming apparatus generally designated **10A**.

The web forming apparatus **10A** is essentially identical to the apparatus shown in Figure 1, except in that the forming apparatus shown in Figure 2 further includes a plurality of dewatering foils **58,59,60** and **61** disposed on an opposite side of the wires **16A** and **18A** relative to the blades **44A** to **56A** such that the consistency of the stock forming the top ply **12A** is increased during passage thereof through the forming section **20A** while maintaining the consistency of the top ply **12A** uniform in a "Z" direction so that crushing of the resultant web is inhibited.

As shown in Figures 1 and 2, the turning bar **26,26A** is adjustable such that positioning of the secondary headbox **30,30A** closely adjacent to the lower wire **16,16A** is permitted so that the stock **32,32A** ejected from the secondary headbox **30,30A** is ejected substantially parallel to the lower wire **16,16A** from the turning bar **26,26A** to the dewatering shoe **34,34A**.

The curved surface **28,28A** of the turning bar **26,26A** is fabricated from ceramic material.

Figure 3 is a side-elevational view of an embodiment of the present invention. Figure 3 shows a multi-ply web forming apparatus, generally designated **10B**, which includes all of the essential features shown in Figure 1. However, the curved dewatering shoe, generally designated **34B**, includes a plurality of spaced bars **62,63,64,65, 66,67,68,69,70,71,72,73,74,75,76** and **77** spaced in a machine direction MD. Each bar, as for example bar **62**, extends in a cross-machine direction, and the spaced bars **62** to **77** include an upstream bar **62**.

More specifically, the dewatering shoe includes a vacuum box **78** which is in fluid communication with spaces defined between adjacent bars, such as between bars **62** and **63**.

The stock **32B** ejected from the secondary headbox **30B** impinges on the base ply **14B** adjacent to the upstream bar **62** of the plurality of spaced bars **62** to **77**.

The dewatering shoe **34B** has a radius of curvature within the range 12 to 18 meters.

Figure 4 is an enlarged view of the vacuum slot means **38** shown in Figure 1. As shown in Figure 4, the vacuum slot means **38** includes an auto-slice **80** which includes lip means **82** shown in Figure 4 for directing the

portion of water **36'** ejected from the top ply **12** through the top wire **18**. The auto-slice **80** also includes collecting tank means **84** associated with the lip means **82** for collecting the portion of water **36'** therein.

As shown in Figure 4, the auto-slice **80** more specifically includes a plurality of slots **86,87,88,89** and **90** which are spaced relative to each other in a machine direction with each slot **86** to **90** including a lip **82, 92, 93,94** and **95**, respectively.

Each slot **86** to **90** includes a collecting tank **84,97,98,99** and **100** disposed above an associated lip **82** and **92** to **95**, respectively. The arrangement is such that in use of the apparatus, water **36'** removed from the top ply **12** through the top wire **18** due to tension of the lower wire **16** and a converging wire wedge **102** defined between the wires **16** and **18** is removed through the vacuum slot means **38** so that trapping of lower consistency stock within the top ply **12** by the formation of a fiber mat on the opposite side of the top wire **18** relative to the vacuum slot means **38** is inhibited.

In each of the arrangements shown in Figures 1-3, the inverted vacuum box **40** has a greater radius of curvature than the radius of curvature of the dewatering shoe **34**.

Each blade, for example **44B**, of the plurality of dewatering blades **44B** to **56B** is spaced at a distance **D** relative to an adjacent dewatering blade **45A**, as shown in Figure 2. The distance **D** is greater than the distance **d** between adjacent bars **62** and **63** of the dewatering shoe **34B** shown in Figure 3.

In the embodiment shown in Figure 3, each foil of the plurality of foils **58B,59B,60B** and **61B** is disposed between adjacent blades of the plurality of dewatering blades **44B** to **56B** such that the blades **44B** to **56B** and foils **58B** to **61B** impart dewatering pressure pulses to the multi-ply web during passage of the web between the blades and foils.

Figure 5 is a side-elevational view of a preferred embodiment of the present invention which is very similar to the embodiment shown in Figure 3. However, the foils **58C,59C,60** and **61C** cooperate with the blades **44C,45C,46C** and **47C** and are disposed opposite to the blades **44C** to **47C** from an upstream blade **44C** along a portion of the machine directional length of the vacuum box **40C**.

As shown in the embodiment of Figure 3, the foils **58B** to **61B** cooperate with the blades **44B** to **56B** and are disposed opposite to the blades **44B** to **56B** and downstream relative to an upstream blade **44B** to a downstream blade **56B** of the vacuum box **40B**.

In the arrangement shown in Figure 2, the foils **59** to **61** are disposed upstream relative to the dewatering shoe **34A** and opposite to the auto-slice **80**.

In operation of the apparatus according to the present invention, in each of the embodiments shown in Figures 3 and 5, and as more clearly shown in Figure 4, the stock forming the top ply **12** impinges on the top wire **18** in the vicinity of the leading lip **82** of the slot **86**.

The lips **82** and **92** to **95** are adjusted such that as the top wire **18** extends around lips **82** and **92** to **95**, the radius of curvature of the top wire **18** around the auto-slice **80** is approximately 15 meters.

Additionally, water present on the inside of the Bel Bond™ wire **18** due to the tension of the base wire **16** and the converging wire wedge **102** is removed.

No vacuum is applied within the collecting tanks **84** and **97** to **100**.

The objective of the present invention is to increase the consistency of the in-coming stock in a uniform manner throughout the slurry, rather than forming a fiber mat on the outside of the Bel Bond™ wire **18** with a lower consistency beneath trapped by the base ply **14**. The present invention eliminates crushing, which occurs at heavy weights in existing designs.

Also, the auto-slice unit **80** and the lead-in roll ahead of the auto-slice are both fully adjustable for optimum performance.

The present invention also includes an arrangement similar to that shown in Figure 5, but with the auto-slice removed so that a vacuum slot only is provided within the loop of the top wire for removing water upwardly.

Additionally, the radius of curvature of the upstream portion of the curved surface of the inverted vacuum box, that is the portion having opposing foils, has a radius of curvature of approximately 15 meters, while the remainder of the curved surface of the inverted vacuum box has a radius of 5 meters.

Also, in another embodiment of the present invention, that portion of the inverted box adjacent to the opposing foils is flat, while the remainder of the curved surface is curved.

The various embodiments of the present invention enable even dewatering of the top ply in a multi-ply former so that the consistency of the stock forming the top ply is increased during passage thereof through the forming section while maintaining the consistency of the top ply uniform in a "Z" direction so that crushing of the resultant web is inhibited.

Claims

1. A multi-ply web forming apparatus for forming a top ply on a base ply, said former comprising:

a looped lower forming wire (16) for receiving the base ply (14) thereon;

a top looped forming wire (18) cooperating with and disposed above said lower wire for defining therebetween a generally horizontally disposed forming section (20) having a first and a second end (22, 24);

a secondary headbox (30, 30B) disposed above said lower wire (16) such that stock (32) ejected from said secondary headbox (30, 30B)

towards said first end of said forming section (20) is deposited on the base ply (14), said stock ejected from said secondary headbox (30, 30B) generating the top ply (12);

a curved dewatering shoe (34, 34B) disposed beneath said lower wire (16) and adjacent to said first end (22) of said forming section (20), said curved shoe (34, 34B) having a center of curvature disposed below said lower wire (16) such that a portion of water from the top ply is ejected through said top wire (18);

a vacuum slot means (38) disposed above said top wire (18) and immediately downstream relative to said dewatering shoe (34) for collecting said portion of water (36) upwardly away from said top wire (18);

an inverted vacuum box (40) disposed immediately downstream relative to said vacuum slot means (38) and on the opposite side of said top wire (18) relative to said dewatering shoe (34, 34B), said box (40) defining a curved face (42) having a center of curvature disposed above said top wire (18);

a plurality of dewatering blades (44B-56B, 44C-56C) disposed in spaced relationship in a machine direction along said curved face (42), each blade (44B-56B, 44C-56C) extending in a cross-machine direction such that said blades are disposed between said curved face (42) and said top wire (18) for guiding said top wire therepast; and

a plurality of dewatering foils (58B-61B, 58C-61C), said foils being disposed on an opposite side of said wires (16, 18) relative to said blades (44B-56B, 44C-56C) such that the consistency of the stock forming the top ply is increased during passage thereof through said forming section,

characterized in further comprising a turning bar (26) defining a curved surface (28), which is disposed beneath said lower forming wire (16) and upstream relative to said first end (22) of said forming section (20) for guiding said lower wire (16), said secondary headbox (30, 30B) being disposed closely adjacent to said turning bar (26, 26A), and

in that each foil of said plurality of foils (58B-61B, 58C-61C) is disposed between adjacent blades of said plurality of dewatering blades (44B-56B, 44C-56C) such that said blades and foils impart dewatering pressure pulses to the multi-ply web during passage of the web between said blades and foils, thereby maintaining the consistency of the top ply uniform in a "Z" direction so that crushing of the resultant web is inhibited.

2. A multi-ply web forming apparatus according to claim 1 characterised in that the turning bar (26) is

adjustable such that positioning of said secondary headbox closely adjacent to said lower wire is permitted so that the stock ejected from said secondary headbox is ejected substantially parallel to said lower wire from said turning bar to said dewatering shoe.

3. A multi-ply web forming apparatus according to claim 1 or 2 characterised in that the curved surface of the turning bar (26) is ceramic. 5
4. A multi-ply web forming apparatus according to claim 1, 2 or 3 characterised in that the curved dewatering shoe (34, 34B) further includes a plurality of spaced bars (62-77) spaced in a machine direction (MB), each bar extending in a cross-machine direction, the spaced bars including an upstream bar (62). 10
5. A multi-ply web forming apparatus according to claim 4 characterised in that the dewatering shoe (34, 34B) further includes a vacuum box (78) in fluid communication with spaces defined between each adjacent bar. 15
6. A multi-ply web forming apparatus according to claim 4 characterised in that stock ejected from the secondary headbox (30, 30B) impinges on the base ply (14) adjacent to the upstream bar (62). 20
7. A multi-ply web forming apparatus according to claim 1, characterised in that the dewatering shoe (34, 34B) has a radius of curvature within the range 12 to 18 metres. 25
8. A multi-ply web forming apparatus according to claim 1, characterised in that the inverted vacuum box (40) has a greater radius of curvature than the radius of curvature of the dewatering shoe. 30
9. A multi-ply web forming apparatus according to claim 4 characterised in that each dewatering blade is spaced at a distance relative to an adjacent dewatering blade which is greater than the distance between adjacent bars of the dewatering shoe. 35
10. A multi-ply web forming apparatus according to claim 1, characterised in that the foils (58C-61C) cooperate with the blades (44C-47C) and are disposed between the blades from an upstream blade (44C) along a portion of the machine direction length of said vacuum box (40C). 40
11. A multi-ply web forming apparatus according to claim 1, characterised in that the foils (58B-61B) cooperate with the blades (44B-56B) and are disposed between the blades and downstream relative to an upstream blade (44B) to a downstream blade 45

(56B) of the vacuum box.

Patentansprüche

1. Vorrichtung zur Bildung einer mehrschichtigen Papierbahn, um eine Oberschicht auf einer Grundschicht zu bilden, wobei die Bildungsvorrichtung umfasst:

ein unteres geschlautes Langsieb (16) für die Bildung, um die Grundschicht (14) darauf aufzunehmen;

ein oberes geschlautes Langsieb (18) für die Bildung, das mit dem unteren Langsieb zusammen arbeitet und über diesem angeordnet ist, um dazwischen eine im allgemeinen horizontal angeordnete Bildungszone (20) zu definieren, die ein erstes und ein zweites Ende (22, 24) hat;

einen sekundären Stoffauflaufkasten (30, 30B), der über dem unteren Langsieb (16) angeordnet ist, so dass Papierzeug (32), das aus dem sekundären Stoffauflaufkasten (30, 30B) gegen das erste Ende der Bildungspartie (20) hin ausgeworfen wird, auf der Grundschicht (14) abgelegt wird, wobei das aus dem sekundären Stoffauflaufkasten (30, 30B) ausgeworfene Papierzeug die Oberschicht (12) erzeugt;

einen gekrümmten Entwässerungsschuh (34, 34B), der unterhalb des unteren Langsiebes (16) und in der Nähe des ersten Endes (22) der Bildungspartie (20) angeordnet ist, wobei der gekrümmte Schuh (34, 34B) ein Krümmungszentrum hat, das unterhalb des unteren Langsiebes (16) angeordnet ist, so dass ein Wasseranteil aus der Oberschicht durch das obere Langsieb (18) hindurch herausgeschleudert wird;

eine Saugschlitzeinrichtung (38), die oberhalb des oberen Langsiebes (18) und unmittelbar stromabwärts bezüglich des Entwässerungsschuhs (34) angeordnet ist, um den Wasseranteil (36) nach oben vom oberen Langsieb (18) weg zu sammeln;

einen umgekehrten Saugkasten (40), der unmittelbar stromabwärts bezüglich der Saugschlitzeinrichtung (38) und auf der gegenüberliegenden Seite des oberen Langsiebes (18) bezüglich des Entwässerungsschuhs (34, 34B) angeordnet ist, wobei der Kasten (40) eine gekrümmte Seite (42) definiert, die ein Krümmungszentrum hat, das über dem oberen

Langsieb (18) angeordnet ist;

eine Vielzahl von Entwässerungslamellen (44B - 56B, 44C-56C), die mit Zwischenräumen versehen in Maschinenrichtung entlang der gekrümmten Seite (42) angeordnet sind, wobei sich jede Lamelle (44B - 56B, 44C - 56C) quer zur Maschinenrichtung erstreckt, so dass die Lamellen zwischen der gekrümmten Seite (42) und dem oberen Langsieb (18) angeordnet sind, um das obere Langsieb daran vorbei zu führen; und

eine Vielzahl von Entwässerungsfolien (58B - 61B, 58C - 61C), wobei die Folien auf einer bezüglich der Lamellen (44B - 56B, 44C-56C) gegenüberliegenden Seite der Langsiebe (16, 18) angeordnet sind, so dass die Konsistenz des Papierzeugs, das die Oberschicht bildet, während dem Durchgang desselben durch die Bildungspartie hindurch erhöht wird;

dadurch gekennzeichnet, dass sie weiter eine Wendestange (26) umfasst, die eine gekrümmte Oberfläche (28) definiert, welche unterhalb des unteren Langsieves (16) für die Bildung und stromaufwärts des ersten Endes (22) der Bildungspartie (20) angeordnet ist, um das untere Langsieb (16) zu führen, wobei der sekundäre Stoffauflaufkasten (30, 30B) sehr nahe bei der Wendestange (26, 26A) angeordnet ist, und

dadurch, dass jede Folie aus der Vielzahl von Folien (58B-61B, 58C - 61C) zwischen benachbarten Lamellen aus der Vielzahl von Entwässerungslamellen (44B - 56B, 44C - 56C) angeordnet ist, so dass die Lamellen und die Folien während dem Durchgang der Papierbahn zwischen den Lamellen und Folien hindurch Druckpulse für die Entwässerung auf die mehrschichtige Papierbahn übertragen, wodurch die Konsistenz der Oberschicht in einer "Z" Richtung gleichförmig beibehalten wird, so dass ein Zerquetschen der resultierenden Papierbahn gehemmt wird.

2. Vorrichtung zur Bildung einer mehrschichtigen Papierbahn nach Anspruch 1, dadurch gekennzeichnet, dass die Wendestange (26) einstellbar ist, damit das Positionieren des sekundären Stoffauflaufkastens sehr nahe beim unteren Langsieb ermöglicht wird, so dass das Papierzeug, das aus dem sekundären Stoffauflaufkasten ausgeworfen wird, im wesentlichen parallel zum unteren Langsieb von der Wendestange zum Entwässerungsschuh ausgeworfen wird.
3. Vorrichtung zur Bildung einer mehrschichtigen Papierbahn nach Anspruch 1 oder 2, dadurch gekennzeichnet, dass die gekrümmte Oberfläche der Wen-

destange (26) aus Keramik besteht.

4. Vorrichtung zur Bildung einer mehrschichtigen Papierbahn nach Anspruch 1, 2 oder 3, dadurch gekennzeichnet, dass der gekrümmte Entwässerungsschuh (34, 34B) weiter eine Vielzahl von mit Zwischenräumen angeordneten Stangen (62 - 77) umfasst, die mit Zwischenräumen in Maschinenrichtung (MD) angeordnet sind, wobei sich jede Stange quer zur Maschinenrichtung erstreckt und die mit Zwischenräumen angeordneten Stangen eine stromaufwärts gelegene Stange (62) umfassen.
5. Vorrichtung zur Bildung einer mehrschichtigen Papierbahn nach Anspruch 4, dadurch gekennzeichnet, dass der Entwässerungsschuh (34, 34B) weiter einen Saugkasten (78) umfasst, der in fluidleitender Verbindung mit den Zwischenräumen steht, die zwischen je zwei benachbarten Stangen definiert werden.
6. Vorrichtung zur Bildung einer mehrschichtigen Papierbahn nach Anspruch 4, dadurch gekennzeichnet, dass Papierzeug, das aus dem sekundären Stoffauflaufkasten (30, 30B) ausgeworfen wird, in der Nähe der stromaufwärts gelegenen Stange (62) auf die Grundschrift (14) prallt.
7. Vorrichtung zur Bildung einer mehrschichtigen Papierbahn nach Anspruch 1, dadurch gekennzeichnet, dass der Entwässerungsschuh (34, 34B) einen Krümmungsradius im Bereich von 12 bis 18 Metern hat.
8. Vorrichtung zur Bildung einer mehrschichtigen Papierbahn nach Anspruch 1, dadurch gekennzeichnet, dass der umgekehrte Saugkasten (40) einen grösseren Krümmungsradius hat als der Krümmungsradius des Entwässerungsschuhs.
9. Vorrichtung zur Bildung einer mehrschichtigen Papierbahn nach Anspruch 4, dadurch gekennzeichnet, dass jede Entwässerungslamelle in einer Distanz bezüglich einer benachbarten Entwässerungslamelle angeordnet ist, die grösser ist als die Distanz zwischen benachbarten Stangen des Entwässerungsschuhs.
10. Vorrichtung zur Bildung einer mehrschichtigen Papierbahn nach Anspruch 1, dadurch gekennzeichnet, dass die Folien (58C - 61C) mit den Lamellen (44C - 47C) zusammen arbeiten und von einer stromaufwärts gelegenen Lamelle (44C) an entlang eines Teils der Länge des Saugkastens (40C) in Maschinenrichtung zwischen den Lamellen angeordnet sind.
11. Vorrichtung zur Bildung einer mehrschichtigen Pa-

pierbahn nach Anspruch 1, dadurch gekennzeichnet, dass die Folien (58B - 61B) mit den Lamellen (44B - 56B) zusammen arbeiten und zwischen den Lamellen stromabwärts bezüglich einer stromaufwärts gelegenen Lamelle (44B) und einer stromabwärts gelegenen Lamelle (56B) des Saugkastens angeordnet sind.

Revendications

1. Un appareil de formage d'une bande à couches multiples pour former une couche supérieure sur une couche de base, ladite section de formage comprenant:

une toile de formage inférieure en forme de boucle (16) pour recevoir sur elle la couche de base (14);

une toile de formage supérieure en forme de boucle (18) coopérant avec et disposée au-dessus de ladite toile inférieure pour définir entre elles une section de formage disposée généralement horizontalement (20) ayant une première et une seconde extrémités (22, 24);

une caisse de tête secondaire (30, 30B) disposée au-dessus de ladite toile inférieure (16) de sorte que la pâte (32) éjectée à partir de ladite caisse de tête secondaire (30, 30B) en direction de ladite première extrémité de ladite section de formage (20) est déposée sur la couche de base (14), ladite pâte éjectée à partir de ladite caisse de tête secondaire (30, 30B) produisant la couche supérieure (12);

un sabot d'essorage courbe (34, 34B) disposé sous ladite toile inférieure (16) et adjacent à ladite première extrémité (22) de ladite section de formage (20), ledit sabot courbe (34, 34B) ayant un centre de courbure disposé sous ladite toile inférieure (16), de sorte qu'une portion d'eau provenant de la couche supérieure est éjectée à travers ladite toile supérieure (18);

un moyen de fente à vide (38) disposé au-dessus de ladite toile supérieure (18) et immédiatement en aval par rapport audit sabot d'essorage (34) pour collecter ladite portion d'eau (36) vers le haut à l'écart de ladite toile supérieure (18);

une caisse à vide renversée (40) disposée immédiatement en aval par rapport audit moyen de fente à vide (38) et sur le côté opposé de ladite toile supérieure (18) par rapport audit sabot d'essorage (34, 34B), ladite caisse (40) définissant une face courbe (42) ayant un centre de courbure disposé au-dessus de ladite toile supérieure (18);

une pluralité de lames essorantes (44B-56B, 44C-56C) disposées dans une relation espa-

cée, dans une direction de la machine, le long de ladite face courbe (42), chaque lame (44B-56B, 44C-56C) s'étendant dans une direction transversale à la machine, de sorte que lesdites lames sont disposées entre ladite face courbe (42) et ladite toile supérieure (18), pour guider ladite toile supérieure au-delà; et

une pluralité de feuilles essorantes (58B-61B, 58C-61C), lesdites feuilles étant disposées sur un côté opposé desdites toiles (16, 18) par rapport auxdites lames (44B-56B, 44C-56C), de sorte que la résistance mécanique de la pâte formant la couche supérieure est accrue durant le passage de celle-ci à travers ladite section de formage,

caractérisé en ce qu'il comprend en outre une barre de déviation (26) définissant une surface courbe (28), qui est disposée sous ladite toile de formage inférieure (16) et en amont par rapport à ladite première extrémité (22) de ladite section de formage (20) pour guider ladite toile inférieure (16), ladite caisse de tête secondaire (30, 30B) étant disposée étroitement adjacente à ladite barre de déviation (26, 26A), et

en ce que chaque feuille de ladite pluralité de feuilles (58B-61B, 58C-61C) est disposée entre des lames adjacentes de ladite pluralité de lames essorantes (44B-56B, 44C-56C) de sorte que lesdites lames et feuilles transmettent des impulsions de pression essorantes à la bande à couches multiples durant le passage de la bande entre lesdites lames et feuilles, maintenant de ce fait la résistance mécanique de la couche supérieure uniforme dans une direction en "Z", de sorte qu'un froissement de la bande résultante est empêché.

2. Un appareil de formage d'une bande à couches multiples conformément à la revendication 1, caractérisé en ce que la barre de déviation (26) est ajustable de sorte que le placement de ladite caisse de tête secondaire étroitement adjacente à ladite toile inférieure est permis, de sorte que la pâte éjectée à partir de ladite caisse de tête secondaire est éjectée essentiellement parallèle à ladite toile inférieure à partir de ladite barre de déviation jusqu'audit sabot d'essorage.
3. Un appareil de formage d'une bande à couches multiples conformément à la revendication 1 ou 2, caractérisé en ce que la surface courbe de la barre de déviation (26) est en céramique.
4. Un appareil de formage d'une bande à couches multiples conformément à la revendication 1, 2 ou 3, caractérisé en ce que le sabot d'essorage courbe (34, 34B) comprend en outre une pluralité de barres espacées (62-77), espacées dans une direction de

la machine (MB), chaque barre s'étendant dans une direction transversale à la machine, les barres espacées comprenant une barre en amont (62).

5. Un appareil de formage d'une bande à couches multiples conformément à la revendication 4, caractérisé en ce que le sabot d'essorage (34, 34B) comprend en outre une caisse à vide (78) en communication de fluide avec les espaces définis entre chaque barre adjacente. 5
10
6. Un appareil de formage d'une bande à couches multiples conformément à la revendication 4, caractérisé en ce que la pâte éjectée à partir de la caisse de tête secondaire (30, 30B) heurte la couche de base (14) près de la barre en amont (62). 15
7. Un appareil de formage d'une bande à couches multiples conformément à la revendication 1, caractérisé en ce que le sabot d'essorage (34, 34B) a un rayon de courbure dans la gamme de 12 à 18 mètres. 20
8. Un appareil de formage d'une bande à couches multiples conformément à la revendication 1, caractérisé en ce que la caisse à vide renversée (40) a un rayon de courbure supérieure au rayon de courbure du sabot d'essorage. 25
9. Un appareil de formage d'une bande à couches multiples conformément à la revendication 4, caractérisé en ce que chaque lame essorante est espacée d'une distance par rapport à une lame essorante adjacente qui est supérieure à la distance entre des barres adjacentes du sabot d'essorage. 30
35
10. Un appareil de formage d'une bande à couches multiples conformément à la revendication 1, caractérisé en ce que les feuilles (58C-61C) coopèrent avec les lames (44C-47C) et sont disposées entre les lames à partir d'une lame en amont (44C) le long d'une portion de la longueur, dans une direction de la machine, de ladite caisse à vide (40C). 40
11. Un appareil de formage d'une bande à couches multiples conformément à la revendication 1, caractérisé en ce que les feuilles (58B-61B) coopèrent avec les lames (44B-56B) et sont disposées entre les lames et en aval par rapport à une lame en amont (44B) jusqu'à une lame en aval (56B) de la caisse à vide. 45
50

55

FIG. 1

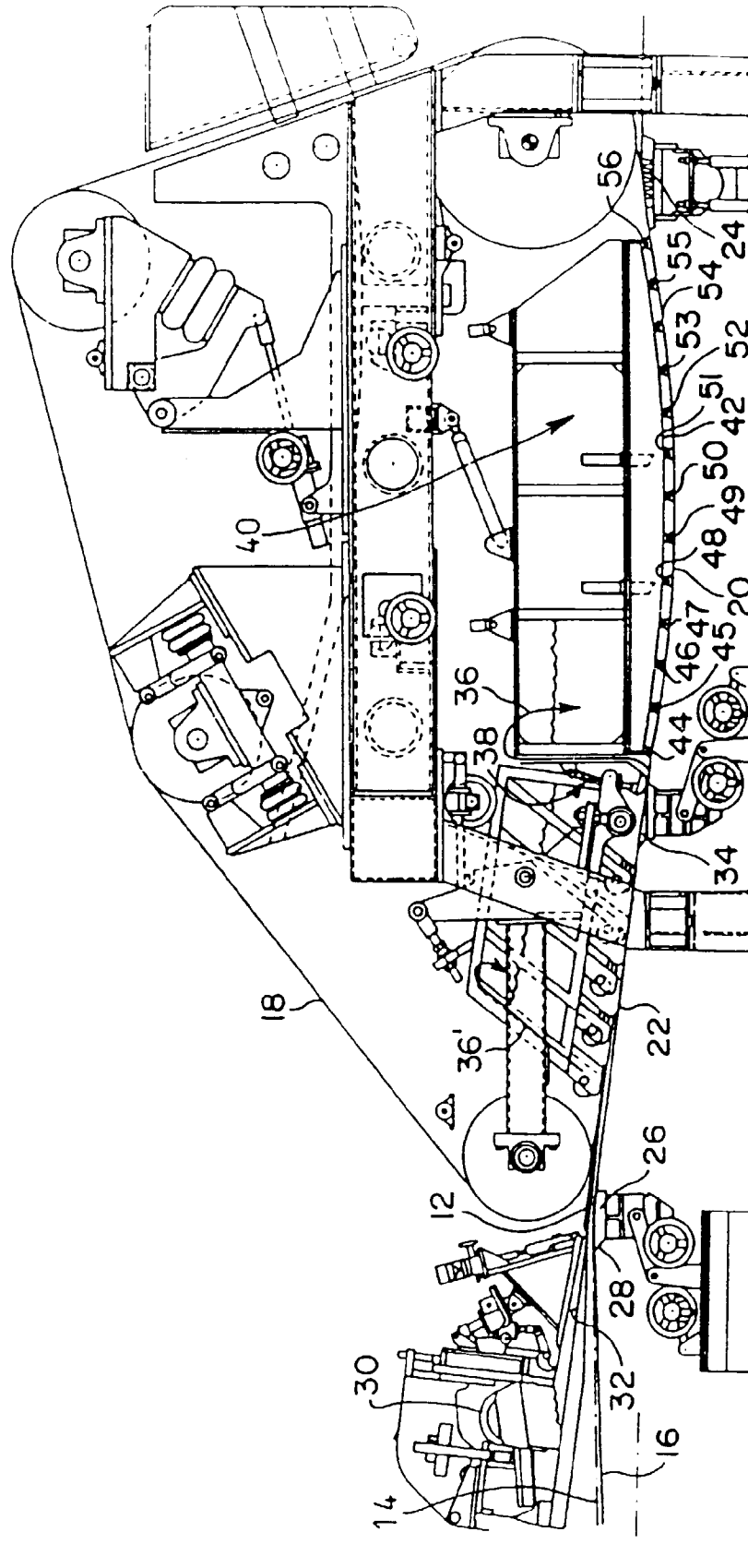


FIG. 2

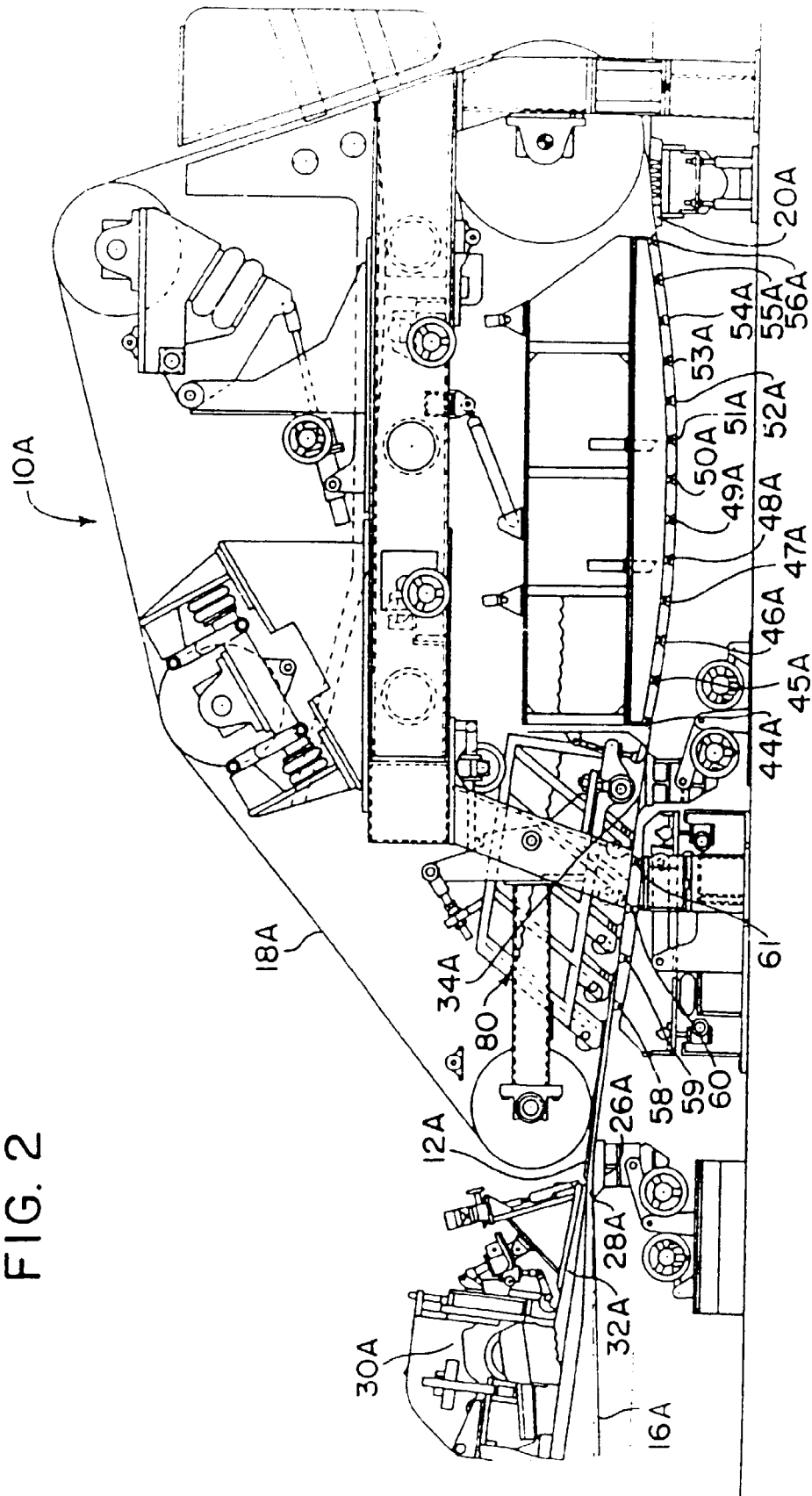


FIG. 3

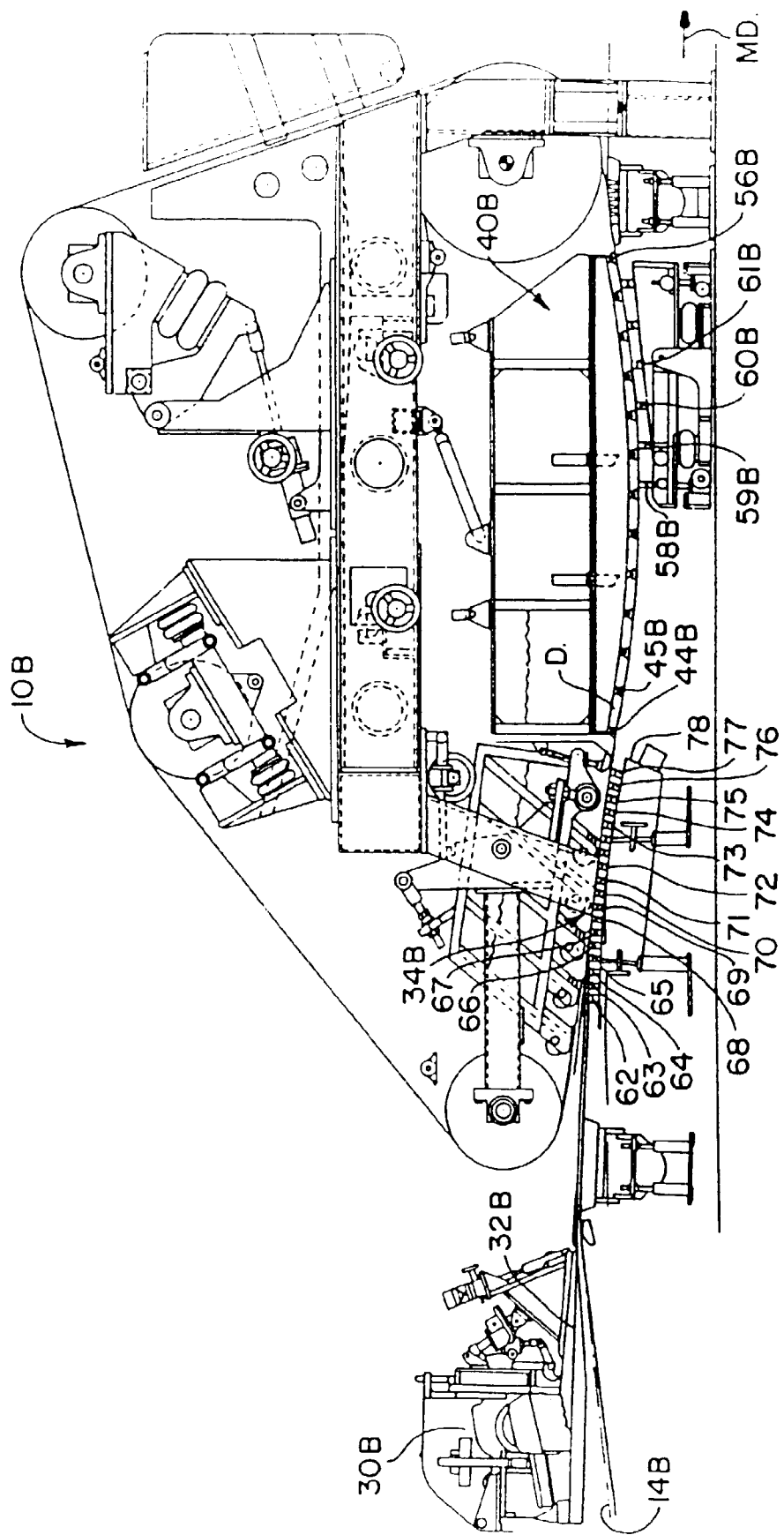


FIG. 4

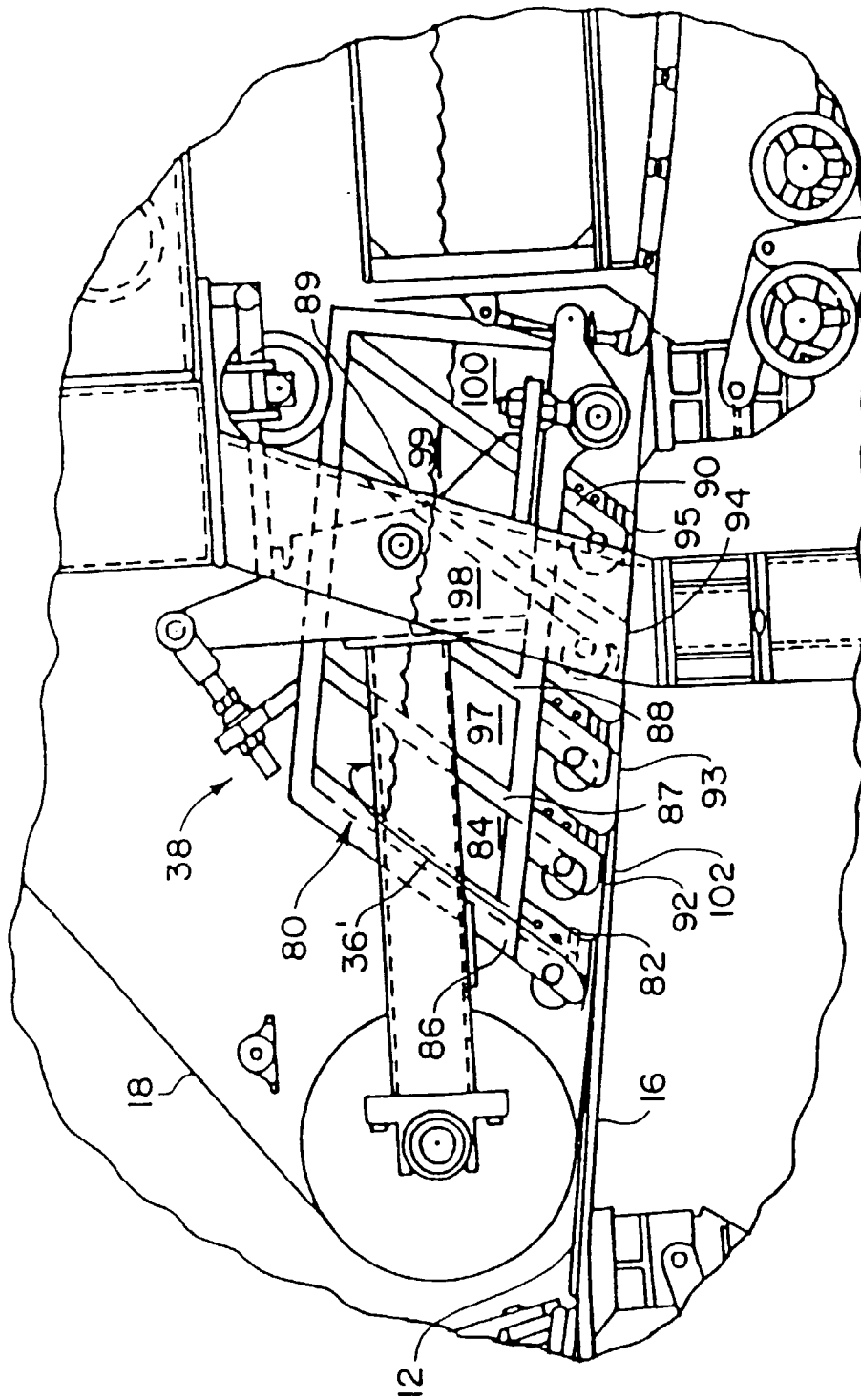


FIG. 5

