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(54) **EQUIPMENT FOR FORMING PAPER PACKAGES AND METHODS OF USE**

VORRICHTUNG ZUR HERSTELLUNG VON PAPIERVERPACKUNGEN UND VERWENDUNGSVERFAHREN

ÉQUIPEMENT POUR FORMER DES EMBALLAGES EN PAPIER ET PROCÉDÉS D'UTILISATION

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Description

Field

[0001] Equipment for forming paper packages and methods of use are described herein and, in particular, equipment for folding paper into packages or package precursors.

Background

[0002] Flow wrap packages are often formed by progressively folding a web of packaging film about one or more products, then forming a seal in a longitudinal direction and a pair of transverse seals and singulating the packages in a sequential manner. Equipment for forming flow filmic wrap packages can including a folding shoulder positioned adjacent the entrance to a forming box. The folding shoulder functions to covert a planar web of film into a generally inverted U-shape for further forming in the forming box.

[0003] Packaging materials are shifting from film to paper for some products. However, the differences between film and paper can limit the package configurations that can be made with paper. A particular package configuration made with film may be more difficult to make with paper due to the difference in properties between film and paper. For example, film can readily be used in typical flow wrap forming equipment, but using paper in the same flow wrapping equipment configured for film can result in unwanted creasing, breaking of fibers or other undesirable changes to the paper.

[0004] US-A-2003/0230054 discloses a forming box unit with a pair of forming bars and a pair of side forming plates. The pair of forming bars are located at the infeed end of the forming box unit and are connected to the pair of side forming plates. The packaging material is pulled over the forming bars and then the forming plates.

Summary

[0005] Equipment for folding paper as part of a flow wrap process is described herein, where the equipment includes a folding shoulder configured for folding paper prior to entrance into a forming box or other downstream equipment. The folding shoulder is advantageously configured to reduce stress concentrations in the paper as it flows along the underside of the shoulder, thereby reducing creasing and/or breaking of fibers in the paper.

[0006] In one aspect, a folding shoulder is provided for folding paper upstream of a forming box. The folding shoulder can be configured for use with paper by reducing contact between the folding shoulder and the paper by having one or more rollers positioned at geometry changes in the folding shoulder positioned to contact paper traveling on the underside of the folding shoulder to reduce friction between the folding shoulder and the paper.

[0007] In another aspect, the folding shoulder can optionally include a roller positioned to contact the paper at an upstream end of the folding shoulder.

[0008] In another aspect, a roller can be positioned at an intersection of the folding shoulder and the forming box, and can optionally extend through an opening in the folding shoulder.

[0009] In yet another aspect, lateral ends of a roller are contoured and positioned to contact the paper as the paper travels along the underside of the forming shoulder.

[0010] In another aspect, the forming shoulder includes an entrance portion angled relative to a pair of intermediate wing portions and a pair of downstream wing portions. One or more rollers can be positioned at the intersection of the entrance portion and intermediate wing portions.

[0011] In another aspect, a pair of rollers can be positioned on either side of an entrance of the forming box, the rollers being tapered.

[0012] In another aspect, rollers are positioned in pairs with adjacent pairs configured to form a pre-crease line in the paper. Optionally, each of the pair can include a circumferentially extending, radial projection and the other of the pair includes a corresponding circumferential groove.

[0013] Any of the folding shoulders described herein can be provided in combination with a forming box.

[0014] A method of forming a flow wrap paper package can be performed using the forming shoulders described herein. The method can include contacting the paper at the geometry change using the one or more rollers to reduce stress concentrations in the paper by reducing friction between the folding shoulder and the paper.

[0015] In another aspect, an apparatus for forming a package from a continuous roll of packaging material can include a forming box having an upper piece and a lower piece, the upper piece having a horizontal portion and an upwardly angled portion, the lower piece having a portion extending at least partially inside the horizontal portion of the upper piece and spaced by a gap therefrom such that the packaging material passes under the upper piece of the forming box and through the gap between the upper and lower pieces of the forming box to form a tube-like or inverted U-shape package precursor containing a packaging item.

[0016] In one aspect, the apparatus can include at least one set of cooperating shaped rollers which create a machine-direction embossed folding line in the packaging material.

[0017] In one aspect, the apparatus can include at least one rotating drum, wheel or roller which assists movement of the packaging material over the leading edge of upper piece of the forming box.

[0018] In another aspect, the apparatus can include two or more tensioning wheels, arranged at diverging angles with respect to the direction of the packaging material movement, and which act to keep the packaging

material flat as it passes from the upwardly angled and the horizontal portions of the forming box.

[0019] In another aspect, the upper and lower pieces of the forming box are an assembly of at least two components, wherein the two components are adjustable to accommodate various package widths.

[0020] In another aspect, the apparatus includes rollers at one or more locations where the material undergoes a change of angle or direction, thereby eliminating a friction point which can strain the material, creating undesirable creases in the finished package.

[0021] The apparatus and equipment described herein can be used to form a flow wrap paper package.

Brief Description of the Drawings

[0022]

FIGURE 1 is a perspective view of packaging equipment for forming a flow wrap package using paper, showing a web of paper being fed along the underside of a folding shoulder upstream of a forming box, where the folding shoulder has rollers positioned to contact the web of paper to reduce stress concentrations in the paper;

FIGURE 2 is a perspective view of packaging equipment for forming a flow wrap package using paper, showing a web of paper being fed along the underside of a folding shoulder upstream of a forming box, where the folding shoulder has tapered rollers positioned to contact the web of paper to reduce stress concentrations in the paper;

FIGURE 3 is a perspective view of packaging equipment for forming a flow wrap package using paper, showing a web of paper being fed along the underside of a folding shoulder upstream of a forming box, where the folding shoulder has gradual angle changes to reduce stress concentrations in the paper flowing there against;

FIGURE 4 is a perspective view of packaging equipment for forming a flow wrap package using paper, showing a folding shoulder upstream of a forming box, where the folding shoulder has rollers positioned to contact the web of paper to reduce stress concentrations in the paper at an upstream end portion of the shoulder and changes in surface angles adjacent the forming box entrance;

FIGURE 5 is a perspective view of packaging equipment for forming a flow wrap package using paper, showing a folding shoulder upstream of a forming box, where the folding shoulder has rollers with tapered ends positioned to contact the web of paper to reduce stress concentrations in the paper;

FIGURE 6 is a diagrammatic view of a portion of the rollers of FIGURE 5 showing the tapered end of one of the rollers;

FIGURE 7 is a perspective view of packaging equipment for forming a flow wrap package using paper, showing a folding shoulder upstream of a forming box, where the folding shoulder has pairs of associated rollers for pre-forming creases in the paper;

FIGURE 8 is a diagrammatic view of one of the pairs of associated rollers of FIGURE 7;

FIGURE 9 is a perspective view of packaging equipment for forming a flow wrap package using paper, showing the underside of a folding shoulder upstream of a forming box, where the forming shoulder includes a roller at an upstream end portion of the shoulder;

FIGURE 10 is a perspective view of packaging equipment for forming a flow wrap package using paper, showing a folding shoulder extending into a forming box to reduce stress concentrations in the paper;

FIGURE 11 is a perspective view of packaging equipment for forming a flow wrap using paper, showing an adjustable folding shoulder upstream of an adjustable forming box;

FIGURE 12 is a top plan view of packaging equipment for forming a flow wrap package using paper, showing a folding shoulder upstream of a forming box;.

FIGURE 13 is a cross-sectional view of the packaging equipment of FIGURE 12 taken along line XIII-XIII of FIGURE 12; and

FIGURE 14 is a cross-sectional view of the packaging equipment of FIGURE 12 taken along line XIV-XVI of FIGURE 12 and showing packaging material spaced between inner and outer portions of the forming box.

Detailed Description

[0023] Equipment for folding paper as part of a flow wrap process is described herein and shown in FIGURES 1-14, where the equipment includes a folding shoulder configured for folding paper prior to entrance into a forming box or other downstream equipment. A typical flow wrapped package will include a fin seal and a pair of transverse seals. The folding shoulder is advantageously configured to reduce stress concentrations in the paper as it flows along the underside of the shoulder, thereby reducing creasing and/or breaking of fibers in the paper, or even tearing. As described further herein, stress concentrations are reduced by reducing friction at specific locations where the geometry of the folding shoulder changes, providing for gradual geometry changes, and/or pre-creasing the paper. As used herein, the term "paper" includes paperboard or paper or other similar products made from fibrous materials, including wood fiber, as well as laminates of film, foil, or other barriers with those materials, which will tend to have dead-fold properties.

[0024] Generally, and with reference to FIGURE 1, the equipment for forming a flow wrap package using paper includes an infeed of items 10 to be packaged, such as

food items, an upstream roller 12 for directing a web of paper 14 unwound from a roll of paper toward the underside of a folding shoulder 16. The folding shoulder 16 is positioned upstream of a forming box 18. The folding shoulder 16 includes a leading edge 20 and multiple surfaces that function to fold the paper 14 as it is drawn along the underside thereof before leading into the forming box 18. The folding shoulder 16 can be used to form the paper 14 into a generally inverted U-shape. The forming box 18 can perform additional functions, such as positioning lateral edges of the web of paper 14 to form a fin or lap seal with the paper 14 folded about the items 10 to be packaged. A tube of paper 22 exits the forming box 18 and can be directed to downstream equipment, such as a sealing station for forming transverse seals and singulating the sealed packages from the remainder of the tube of paper 22. Conventional aspects of the equipment, such as the infeed apparatus, e.g., conveyor, for the item 10, have been omitted for clarity.

[0025] The folding shoulder 16 of the embodiment of FIGURE 1 includes a pair of rollers 24, 26 positioned where there is a change in geometry. More specifically, the folding shoulder 16 includes a planar entrance portion 28, a middle pair of lateral wing portions 30, and a downstream pair of lateral wing portions 32. To reduce stress concentrations in the paper 14 caused by the intersection between the planar entrance portion 28 and the middle pair of lateral wing portions 30, each of those intersections has a roller 24/26. Each of the rollers 24, 26 extends through an opening 34, 36 at the intersection. The reduced friction between the rollers 24, 26 and the paper 14 as compared to if there were no rollers at those intersections (instead only the folding shoulder material) advantageously can reduce stress concentrations in the paper 14, thereby leading to benefits such as reduced creasing or other deformations in the paper 14. The rollers 24, 26 can be mounted in any suitable manner, including on axels supported by bearing mounts on the top surface of the folding shoulder 16.

[0026] Like the forming shoulder 16 of FIGURE 1, the forming shoulder 116 of FIGURE 2 is positioned adjacent the entrance of a folding box 118 configured to wrap the paper 14 around the items 10 to be packaged, as described generally above. The forming shoulder 116 of FIGURE 2 differs in that it does not have an upstream planar entrance portion 28, as in the forming shoulder 16 of FIGURE 1. Instead, a pair of tapered or conical rollers 124, 126 are positioned on either side of the entrance of the forming box 118. However, the rollers 124, 126 could instead be positioned in respective openings of the folding shoulder 116. Due to the different diameters along the axial length of the tapered rollers 124, 126, a given point along the roller 124/126 more lateral than another point will be rotating at a different angular velocity. This angular velocity difference can be used to speed up or slow down the paper 14 as may be suitable. The pair of tapered or conical rollers 124, 126 both reduce the stress concentrations as the paper 14 initially contacts the folding shoulder 116 and, due to their shape, the stress concentrations as the paper 14 transitions toward a pair of intermediate lateral wings 130 which then transition to downstream lateral wings 132 of the folding shoulder 116 that are disposed on either side of the forming box 118. The reduced friction between the rollers 124, 126, due to the fact that they rotate, and the paper 14 as compared to if there were no rollers (instead only the folding shoulder material) advantageously can reduce stress concentrations in the paper 14, thereby leading to benefits such as reduced creasing or other deformations in the paper. The rollers 124, 126 can be mounted in any suitable manner, including on axels supported by bearing mounts on the top surface of the folding shoulder.

[0027] Like the forming shoulders 16, 116 of FIGURES 1 and 2, the forming shoulder 216 of FIGURE 3 is configured to be positioned adjacent the entrance of a folding box 218 configured to wrap the paper 14 around the items 10 to be packaged, as described generally above. Additional details of the forming box 218 are shown; specifically, an exit opening of the box. The forming shoulder 216 of FIGURE 3 includes geometry configured to reduce stress concentrations in paper 14 traveling along its underside. The forming shoulder 216 includes an upturned, planar entrance portion 202, followed by a trapezoidal portion 204 extending to the entrance of the forming box 218. A pair of lateral wings 206 extend along the lateral sides of the trapezoidal portion 204 and past the entrance of the forming box 218. Advantageously, the planar entrance portion 202 can provide for adjustment of the approach angle of the packaging material so as to have a reduced change in angle of the material. This can lead to reduced stress on the material.

[0028] Like the previously-discussed embodiments of the folding shoulders 16, 116, 216 of FIGURES 1-3, the folding shoulder 316 of FIGURE 4 is positioned configured to be positioned adjacent the entrance of a folding box 318 configured to wrap the paper 14 around the items to be packaged. The geometry is similar to the folding shoulder 216 of FIGURE 3, including a trapezoidal portion 304 and a pair of lateral wings 306. However, rollers 302, 326, 328, 330 are strategically positioned to contact the paper 14 and reduce stress concentrations in the paper 14 as it passes along transitions in geometry of the forming shoulder 316. More specifically, instead of an upturned planar entrance portion 202, as in the embodiment of FIGURE 3, the folding shoulder 316 of FIGURE 4 includes a roller 302 at the initial contact of the paper 14 and the folding shoulder 316. Also, a roller 328 is positioned in an opening 334 at the intersection of the trapezoidal portion 304 and the forming box 318. Rollers 326, 330 are also positioned in openings 332, 336 in the lateral wings 306 adjacent the roller 328 of the trapezoidal portion 304. The reduced friction between the rollers 302, 326, 328, 330 and the paper 14 as compared to if there were no rollers (instead only the folding shoulder material) advantageously can reduce stress concentrations in the paper 14, thereby leading to benefits such as reduced

creasing or other deformations in the paper 14. The rollers 302, 326, 328, 330 can be mounted in any suitable manner, including on axels supported by bearing mounts on the top surface of the folding shoulder 316.

[0029] Turning now to the embodiment of a folding shoulder 416 depicted in the FIGURES 5 and 6, a roller 428 having multiple segments (which may optionally be able to rotate independently) is positioned adjacent the intersection of a trapezoidal portion 404 of the folding shoulder 416 and the forming box 418 and extending through an opening 434 to contact paper 14 traveling along the underside of the folding shoulder 416. As with the embodiments of FIGURES 3 and 4, the trapezoidal portion 404 is flanked by a pair of lateral wings 406. The roller 428 can advantageously reduce stress concentrations in the paper 14 moving along the underside of the folding shoulder 416 by reducing friction between the roller 428 and the paper 14, as compared to between a rollerless shoulder and the paper. In addition to being at the intersection of the trapezoidal portion 404 and entrance of the forming box 418, the roller 428 has ends 436 that extend into a portion of the opening 434 that extends through the lateral wings 406. The ends 436 of the rollers 434 are tapered or chamfered, as shown in FIGURE 6, although other shapes, such as rounded, can be suitable. The ends 436 of the rollers 434 are positioned to contact the paper 14 as it moves along the underside of the folding shoulder 416. By contacting the paper 14 with rollers 434, reduced friction between the forming shoulder 416 and the paper 14 can result.

[0030] The forming shoulder 616 of FIGURES 7 and 8 includes multiple pairs of rollers 608, 610, 612, 614 position to contact both sides of the paper 14 as it travels along the underside of the shoulder 616. The shoulder 616 includes a trapezoidal portion 604 and lateral wings 606. The upper of the pair of rollers extends through a respective opening 628, 630, 632, 634. The pairs of rollers 608, 610, 612, 614 are configured to pre-crease the paper 14. In particular, one of the rollers 620 includes a circumferentially extending, radial projection 624 that mates with a corresponding grove 626 in the other of the rollers 622, as shown in detail in Figure 8. The creases formed by the rollers 620, 622 can reduce stress concentrations in the paper 14 by pre-creasing the paper 14 in specific areas. As the paper 14 is folded, it will beneficially have a propensity to fold along those pre-creased lines, thereby reducing stress concentrations in the paper 14. A first and second pair of the rollers 612, 614 are spaced to form creases that will define the top of the package between the creases. A third pair of rollers 608 are laterally spaced from the first pair of rollers 612 so as to form creases that will define a first side of the package. Similarly, a fourth pair of rollers 610 are latterly spaced from the second pair of rollers 614 so as to form creases that will define a second side of the package.

[0031] A folding shoulder 716 having a roller 712 at its entrance is depicted in FIGURES 9 and 10. The forming box 718 includes an outer portion 720, shown in FIGURE 9, and an inner portion 722, shown in FIGURE 10. During use, the inner portion 722 is disposed within the outer portion 720. Advantageously, the entrance of the forming box 718 has an upwardly-inclined entrance ramp 726, supported by a pair of sidewalls 728, 730 that reduces the angular transition experienced by the paper 14 during formation, thereby leading to reduced stress in the paper 14. A gap 724 can provide space for conveying equipment to drop below the forming box 718 aft the item 10 is at least partially supported by the paper. More specifically, as the paper 14 contacts the exterior of the inner portion 722, the initial contact on the top of the inner portion 722 is at an angle that is less than it would be if there were no such upwardly-inclined entrance. A similar folding shoulder is shown in FIGURES 12-14, thus the same references are used for like or similar components. The roller of the embodiment of FIGURES 9 and 10 is omitted, but could be added. As shown in FIGURE 14, the inner portion is disposed within the outer portion of the forming box.

[0032] Any of the folding shoulders and forming boxes discussed herein can be adapted to be adjustable in width and/or height. For example, as shown in FIGURE 11, the folding shoulder 816 can be split into a first part 820 and second part 822. Fingers of the first part 820 can interleave with fingers of the second part 822. Any manner of selectively fixing the spacing between the first and second parts 820, 822 can be used. The attached forming box 818 includes a first part and a second part with an adjustable gap therebetween. The height of the forming box 818 can also be adjusted, such as by moving a top part 824 and a bottom part 826 away from each other. Any manner of selectively fixing the spacing between the top and bottom parts 824, 826 can be used.

[0033] Although rollers are discussed herein as being useful for reducing stress concentrations in the paper, other structures can be used. For example, protrusions can be used at the geometry intersections of the folding shoulder and/or forming box. The protrusions can reduce the contact points between the paper and the shoulder or box at those intersections or elsewhere. Low-friction materials can also be added. Dipples and/or corregations can also be added to places of contact with the forming shoulders. Moreover, the features described herein with respect to the specific embodiments are interchangeable as may be suitable.

Claims

1. A folding shoulder (16, 116, 316, 416, 616, 816) for folding paper (14) upstream of a forming box (18, 118, 318, 418, 618, 818), **characterised in that** the folding shoulder being configured for use with paper by reducing contact between the folding shoulder and the paper by having one or more rollers (24, 26, 124, 126, 326, 328, 330, 428, 608, 610, 612, 614) positioned at geometry changes in the folding shoul-

der positioned to contact paper traveling on the underside of the folding shoulder to reduce friction between the folding shoulder and the paper.

2. The folding shoulder (116, 316) of claim 1, wherein a roller (124, 126, 302) is positioned to contact the paper (14) at an upstream end of the folding shoulder.

3. The folding shoulder (316, 416) of any one of claims 1-2, wherein a roller (328, 428) is positioned at an intersection of the folding shoulder (316, 416) and the forming box (318, 418), the roller (328, 428) extending through an opening (334, 434) in the folding shoulder (316, 416).

4. The folding shoulder (416) of any one of claims 1-3, wherein lateral ends (436) of a roller (428) are contoured and positioned to contact the paper (14) as the paper (14) travels along the underside of the forming shoulder (416).

5. The folding shoulder (16) of claims 1-4, wherein the forming shoulder includes an entrance portion (28) angled relative to a pair of intermediate wing portions (30) and a pair of downstream wing portions (32), wherein a roller (24, 26) is positioned at the intersection of the entrance portion and intermediate wing portions.

6. The folding shoulder (116) of claim 1, wherein a pair of rollers (124, 126) are positioned on either side of an entrance of the forming box (118), the rollers being tapered.

7. The folding shoulder (616) of claim 1, wherein rollers (608, 610, 612, 614) are positioned in pairs with adjacent pairs configured to form a pre-crease line in the paper (14).

8. The folding shoulder (616) of claim 7, wherein each of the pair includes a circumferentially extending, radial projection (624) and the other of the pair includes a corresponding circumferential groove (626).

9. The folding shoulder (16, 116, 316, 416, 616, 816) of any of the foregoing claims, in combination with a forming box (18, 118, 318, 418, 618, 818).

10. A method of forming a flow wrap paper package using the forming shoulder (16, 116, 316, 416, 616, 816) of any one of the foregoing claims, the method comprising contacting the paper (14) at the geometry change using the one or more rollers to reduce stress concentrations in the paper by reducing friction between the folding shoulder and the paper.

Patentansprüche

1. Falzschulter (16, 116, 316, 416, 616, 816) zum Falten von Papier (14) stromaufwärtig eines Formkastens (18, 118, 318, 418, 618, 818),
dadurch gekennzeichnet, dass die Falzschulter für die Verwendung mit Papier konfiguriert ist, indem der Kontakt zwischen der Falzschulter und dem Papier dadurch verringert wird, dass eine oder mehrere Rollen (24, 26, 124, 126, 326, 328, 330, 428, 608, 610, 612, 614) an Geometrieänderungen in der Falzschulter angeordnet sind, um mit Papier in Kontakt zu kommen, das auf der Unterseite der Falzschulter läuft, um die Reibung zwischen der Falzschulter und dem Papier zu verringern.

2. Falzschulter (116, 316) nach Anspruch 1, wobei eine Rolle (124, 126, 302) so angeordnet ist, dass sie das Papier (14) an einem stromaufwärtigen Ende der Falzschulter berührt.

3. Falzschulter (316, 416) nach einem der Ansprüche 1 bis 2, wobei eine Rolle (328, 428) an einem Schnittpunkt der Falzschulter (316, 416) und des Formkastens (318, 418) positioniert ist, wobei die Rolle (328, 428) durch eine Öffnung (334, 434) in der Falzschulter (316, 416) verläuft.

4. Falzschulter (416) nach einem der Ansprüche 1 bis 3, wobei seitliche Enden (436) einer Rolle (428) so konturiert und angeordnet sind, dass sie das Papier (14) berühren, während das Papier (14) an der Unterseite der Formschulter (416) entlangläuft.

5. Falzschulter (16) nach den Ansprüchen 1 bis 4, wobei die Formschulter einen Eingangsabschnitt (28) einschließt, der relativ zu einem Paar von Zwischenflügelabschnitten (30) und einem Paar von stromabwärtigen Flügelabschnitten (32) abgewinkelt ist, wobei eine Rolle (24, 26) an der Schnittstelle des Eingangsabschnitts und der Zwischenflügelabschnitte positioniert ist.

6. Falzschulter (116) nach Anspruch 1, wobei ein Paar Rollen (124, 126) auf beiden Seiten eines Eingangs des Formkastens (118) angeordnet ist, wobei die Rollen konisch verlaufen.

7. Falzschulter (616) nach Anspruch 1, wobei die Rollen (608, 610, 612, 614) paarweise angeordnet sind, wobei benachbarte Paare so konfiguriert sind, dass sie eine Vorfalzlinie im Papier (14) bilden.

8. Falzschulter (616) nach Anspruch 7, wobei jedes Element des Paars einen sich in Umfangsrichtung erstreckenden radialen Vorsprung (624) einschließt und das andere Element des Paars eine entsprechende Umfangsnut (626) einschließt.

9. Falzschulter (16, 116, 316, 416, 616, 816) nach einem der vorstehenden Ansprüche, in Kombination mit einem Formkasten (18, 118, 318, 418, 618, 818).

10. Verfahren zum Formen einer Flow-Wrap-Papierverpackung unter Verwendung der Formschulter (16, 116, 316, 416, 616, 816) nach einem der vorstehenden Ansprüche, wobei das Verfahren das Kontaktieren des Papiers (14) an der Geometrieänderung unter Verwendung der einen oder mehreren Rollen umfasst, um Spannungskonzentrationen im Papier durch Verringern der Reibung zwischen der Falzschulter und dem Papier zu verringern.

Revendications

1. Épaule de pliage (16, 116, 316, 416, 616, 816) pour le pliage du papier (14) en amont d'une boîte de formage (18, 118, 318, 418, 618, 818), **caractérisée en ce que** l'épaule de pliage est conçue pour être utilisée avec le papier en réduisant le contact entre l'épaule de pliage et le papier par la présence d'un ou plusieurs rouleaux (24, 26, 124, 126, 326, 328, 330, 428, 608, 610, 612, 614) positionnés à des changements de géométrie dans l'épaulement de pliage pour entrer en contact avec le papier se déplaçant sur la face inférieure de l'épaulement de pliage afin de réduire la friction entre l'épaulement de pliage et le papier.

2. Épaule de pliage (116, 316) selon la revendication 1, dans laquelle un rouleau (124, 126, 302) est positionné pour entrer en contact avec le papier (14) à une extrémité amont de l'épaule de pliage.

3. Épaulement de pliage (316, 416) selon l'une quelconque des revendications 1 à 2, dans lequel un rouleau (328, 428) est positionné à une intersection de l'épaulement de pliage (316, 416) et de la boîte de formage (318, 418), le rouleau (328, 428) s'étendant à travers une ouverture (334, 434) dans l'épaulement de pliage (316, 416).

4. Épaulement de pliage (416) selon l'une quelconque des revendications 1 à 3, dans lequel les extrémités latérales (436) d'un rouleau (428) sont profilées et positionnées de manière à entrer en contact avec le papier (14) lorsque le papier (14) se déplace le long de la face inférieure de l'épaulement de formage (416).

5. Épaulement de pliage (16) selon l'une quelconque des revendications 1 à 4, dans lequel l'épaulement de formage comporte une partie d'entrée (28) inclinée par rapport à une paire de parties d'ailes intermédiaires (30) et une paire de parties d'ailes en aval (32), dans lequel un rouleau (24, 26) est positionné à l'intersection de la partie d'entrée et des parties d'ailes intermédiaires.

6. Épaulement de pliage (116) selon la revendication 1, dans lequel une paire de rouleaux (124, 126) est positionnée de part et d'autre d'une entrée de la boîte de formage (118), les rouleaux étant effilés.

7. Épaulement de pliage (616) selon la revendication 1, dans lequel les rouleaux (608, 610, 612, 614) sont positionnés par paires, les paires adjacentes étant conçues pour former une ligne de pré-frisage dans le papier (14).

8. Épaulement de pliage (616) selon la revendication 7, dans lequel chacune des paires comporte une projection radiale (624) s'étendant sur la circonférence et l'autre paire comporte une rainure circonférentielle correspondante (626).

9. Épaule de pliage (16, 116, 316, 416, 616, 816) selon l'une quelconque des revendications précédentes, en combinaison avec une boîte de formage (18, 118, 318, 418, 618, 818).

10. Procédé de formage d'un emballage tubulaire en papier à l'aide de l'épaulement de formage (16, 116, 316, 416, 616, 816) selon l'une quelconque des revendications précédentes, le procédé consistant à mettre en contact le papier (14) au niveau du changement de géométrie à l'aide d'un ou plusieurs rouleaux afin de réduire les concentrations de contraintes dans le papier en réduisant la friction entre l'épaulement de pliage et le papier.

FIG. 1

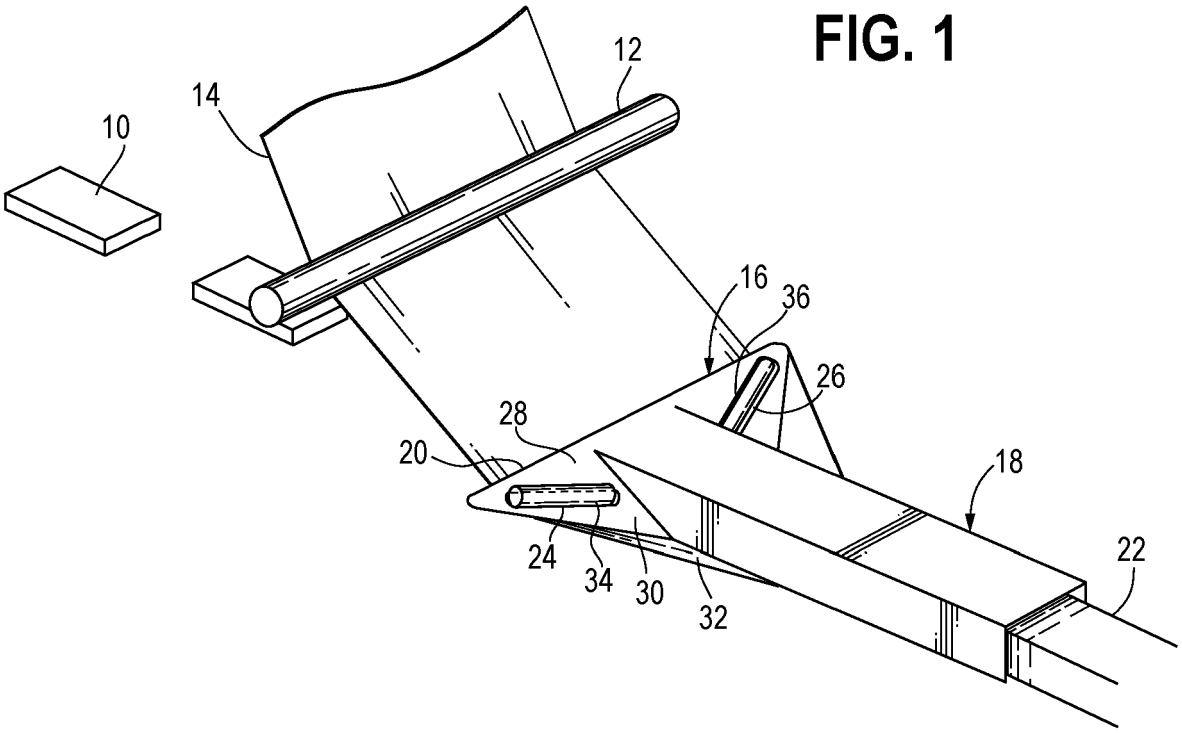
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FIG. 2

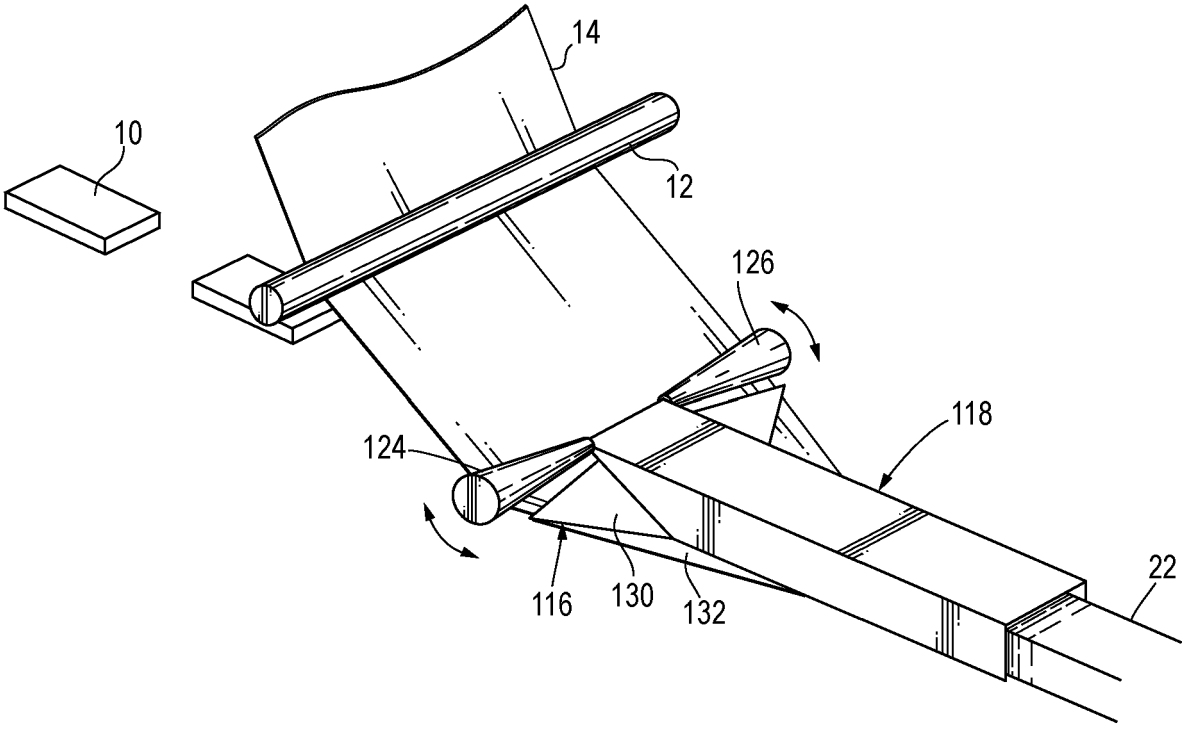
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FIG. 3

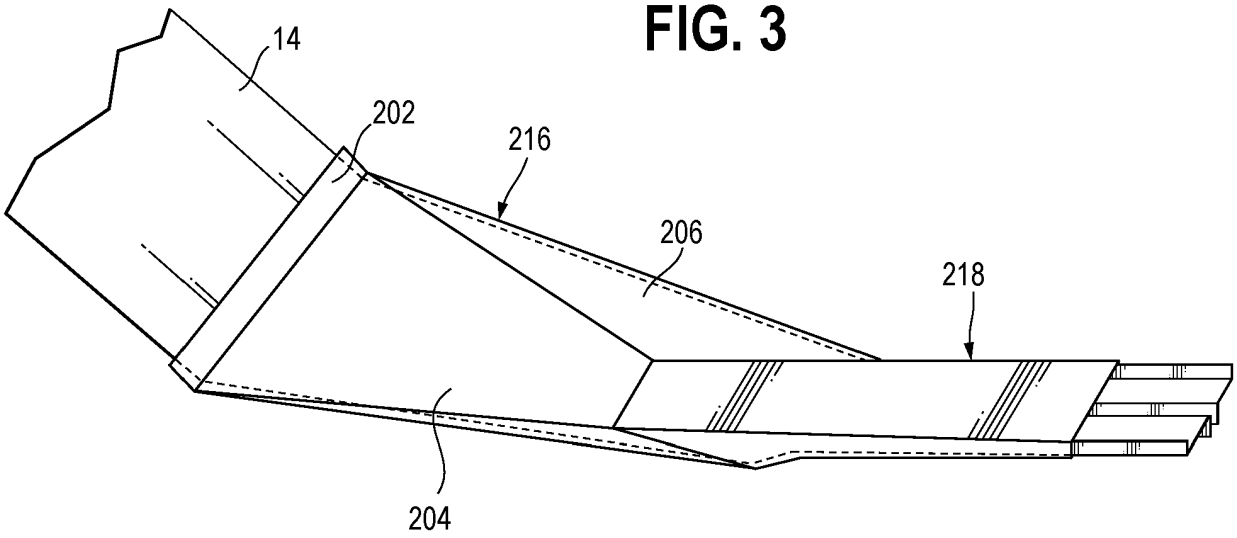
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FIG. 4

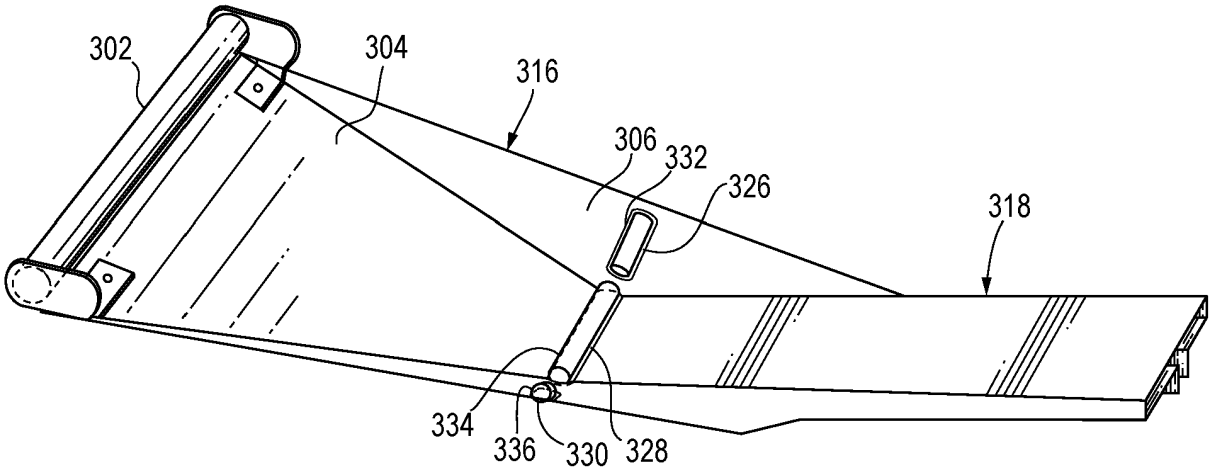
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FIG. 5

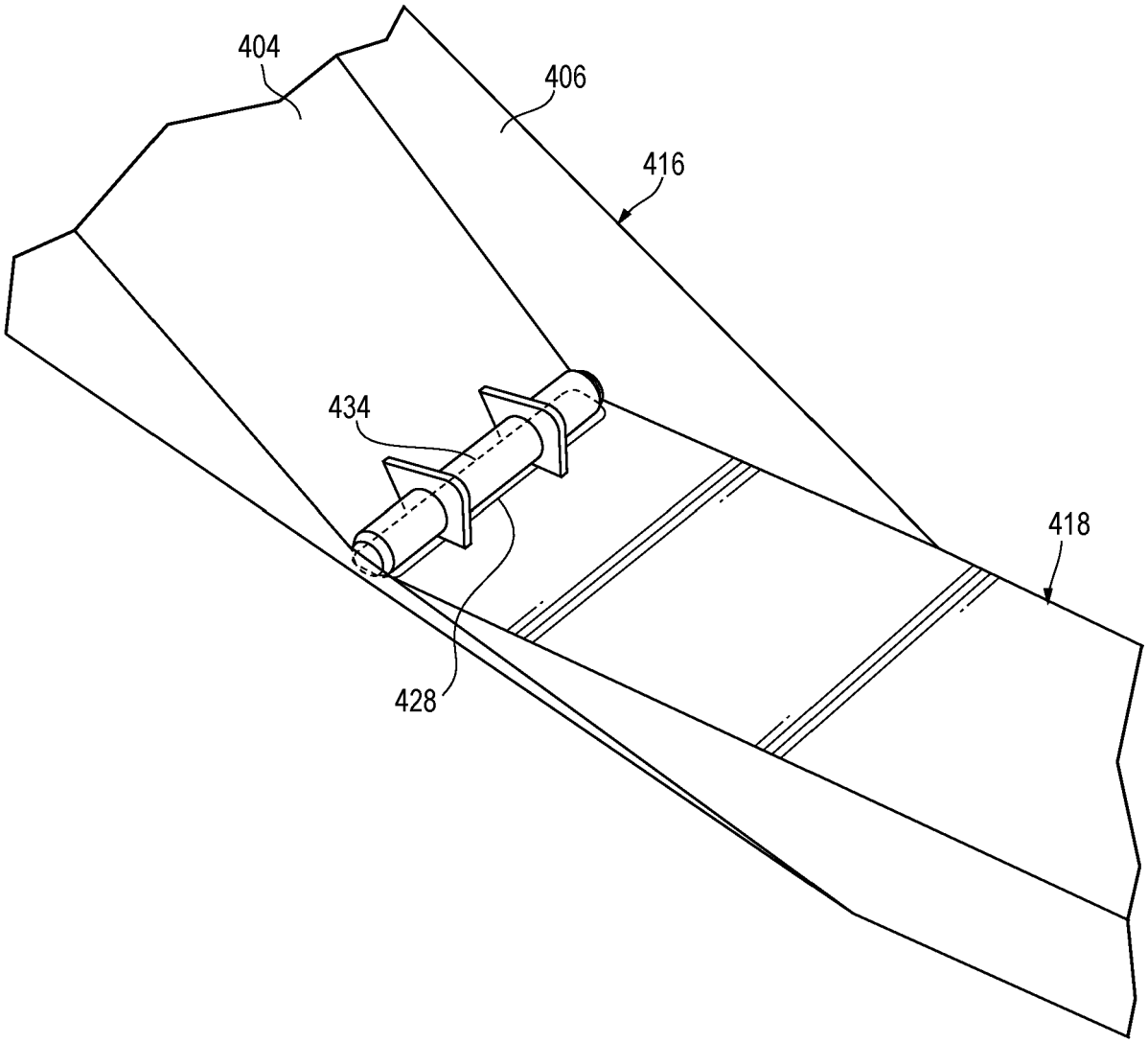

FIG. 6

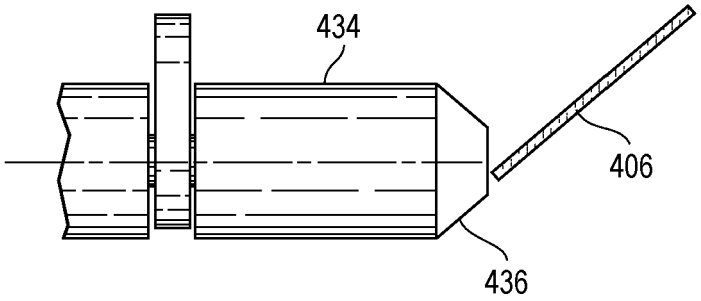

FIG. 7

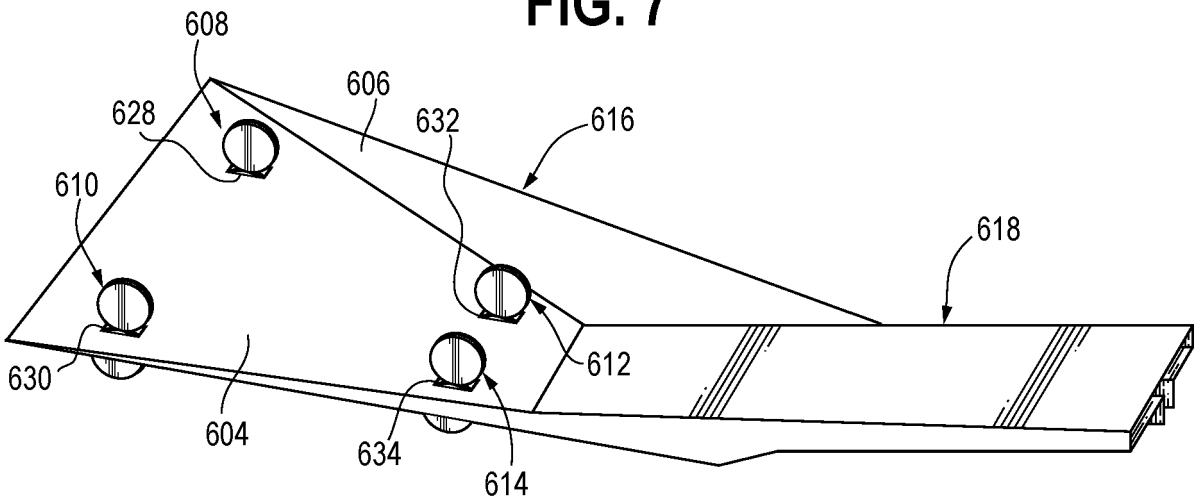
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FIG. 8

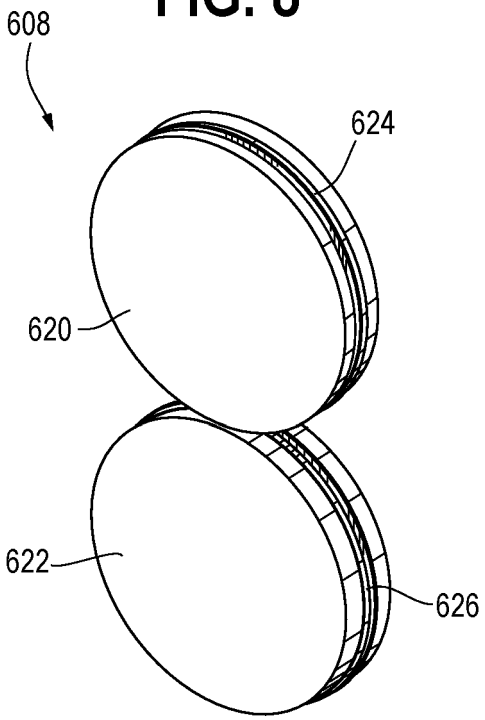
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FIG. 9

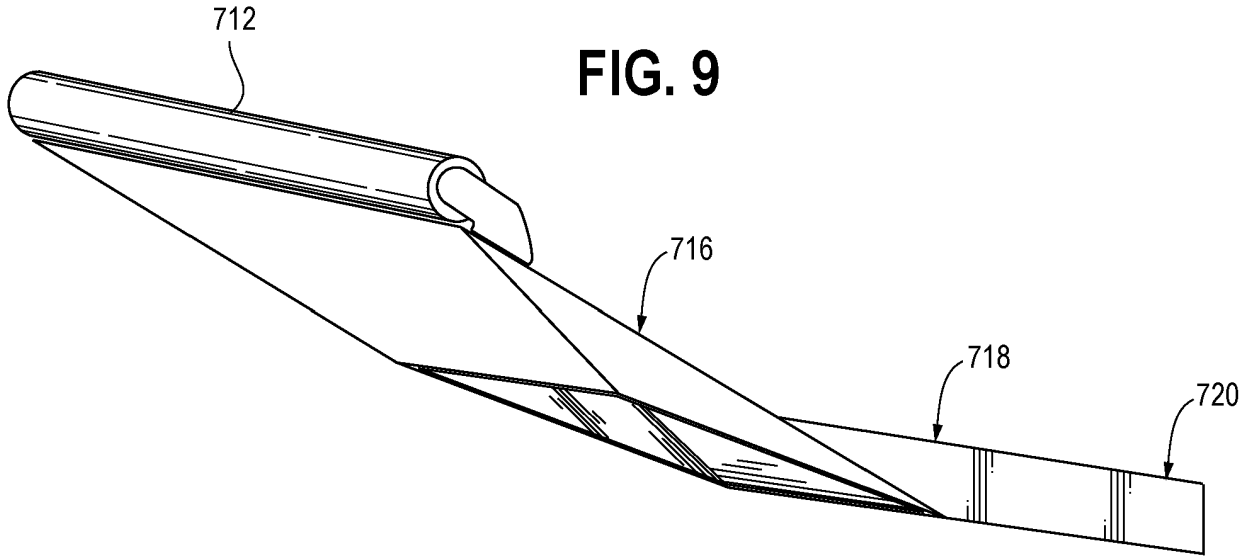


FIG. 10

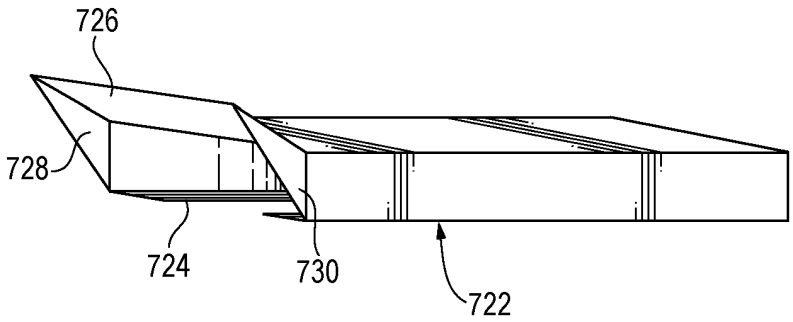


FIG. 11

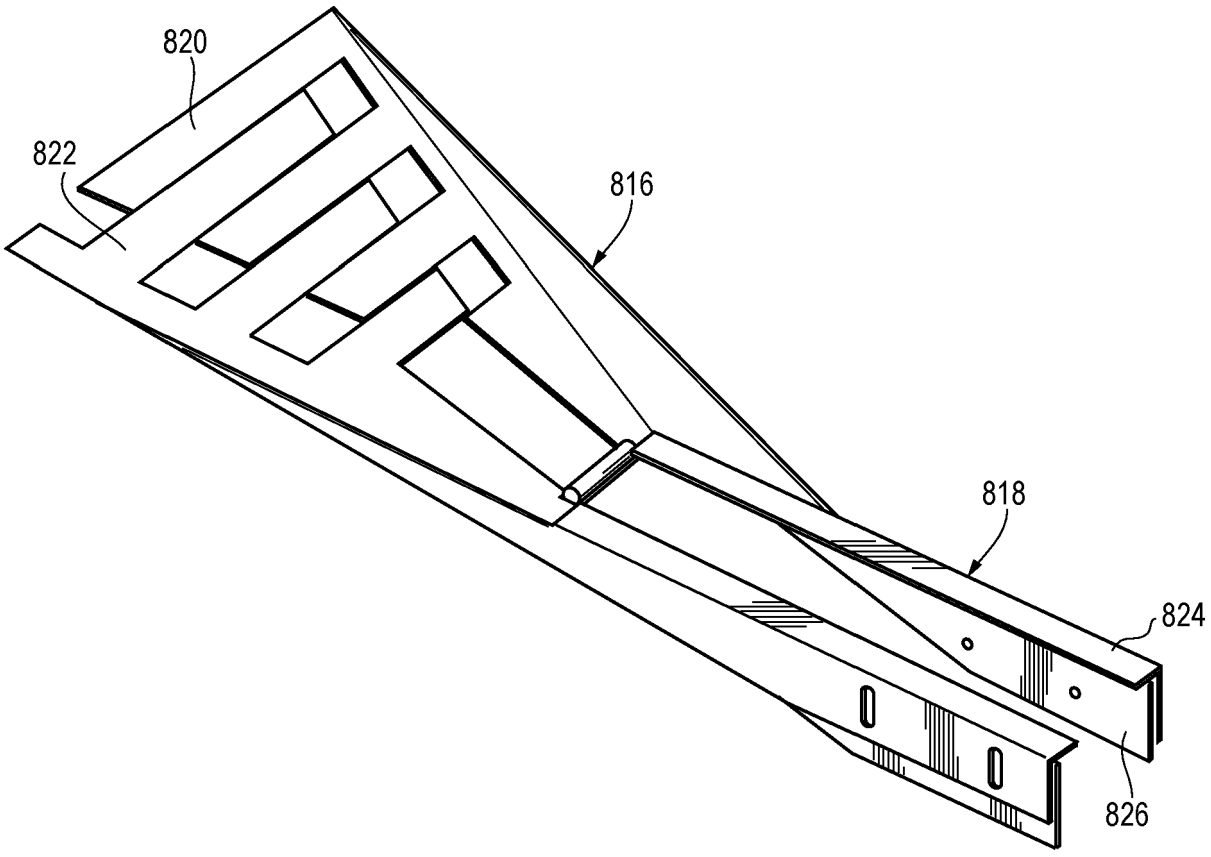


FIG. 12

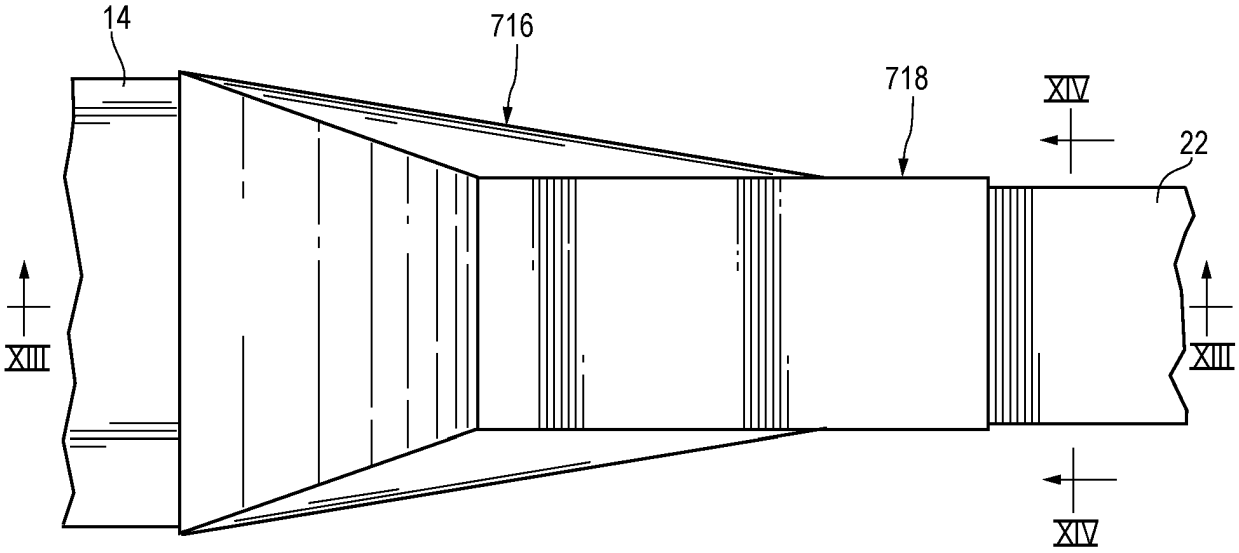


FIG. 13

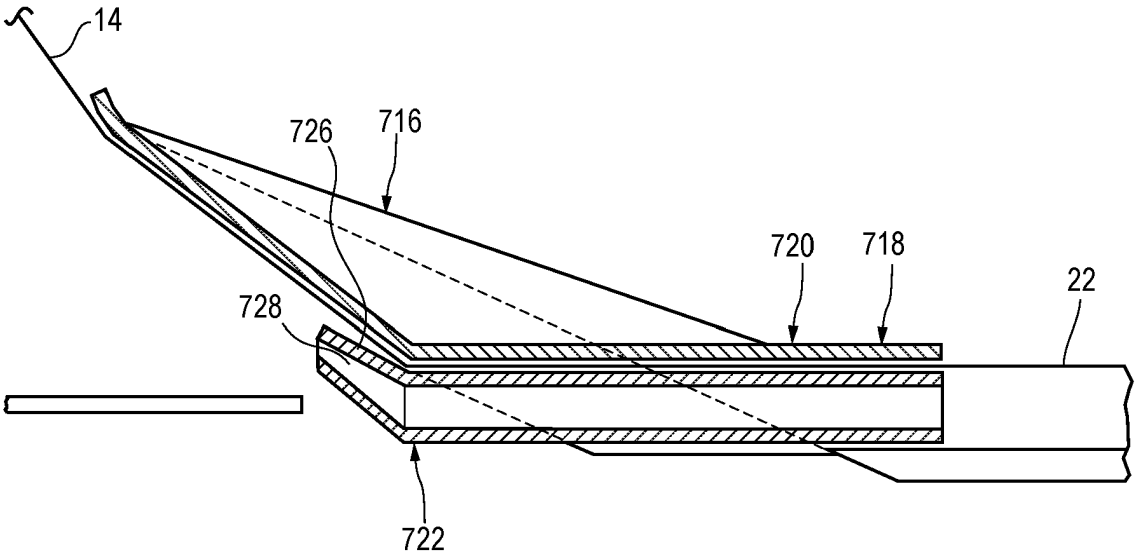
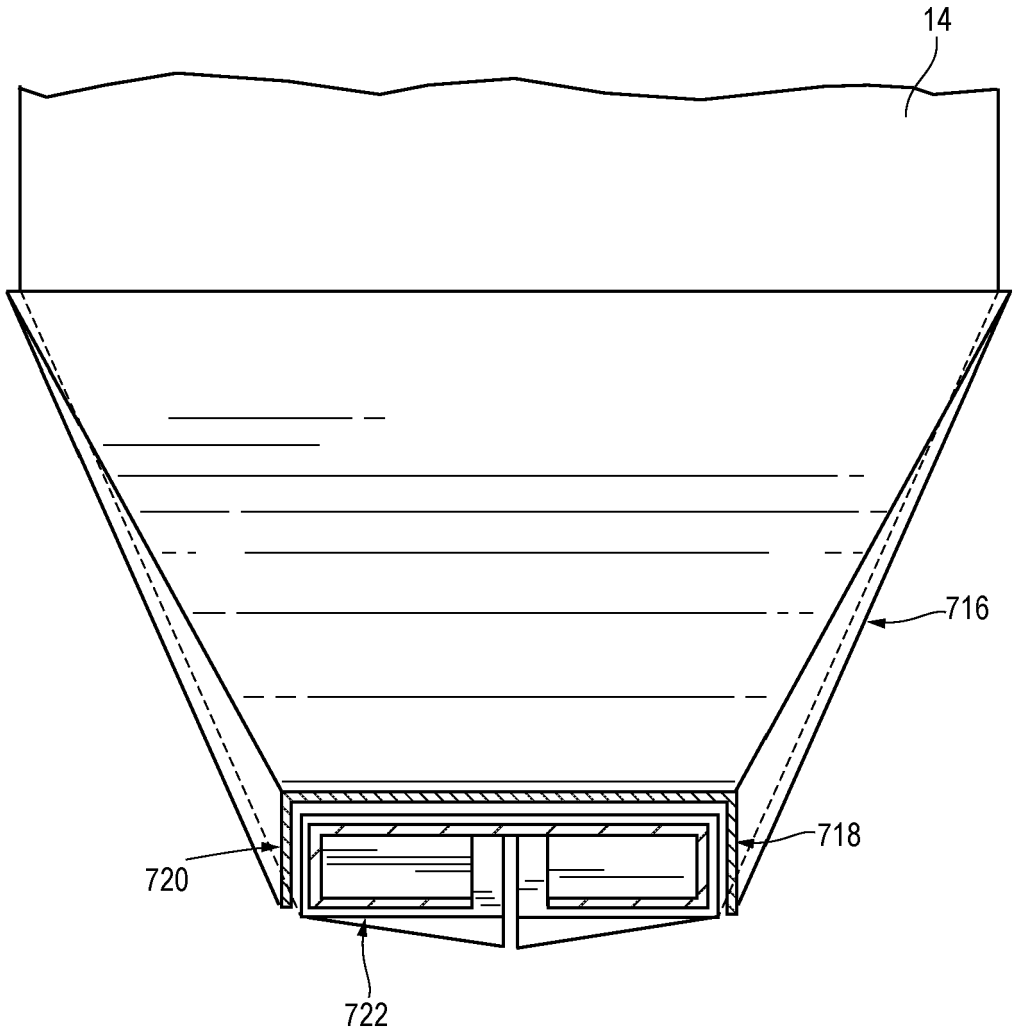


FIG. 14



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Patent documents cited in the description

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