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(54) ROLL MATERIAL DISPENSER TEAR BAR

(57) A web material dispenser tear bar, a dispenser assembly comprising a tear bar and a method of forming the same. The tear bar includes a cutting edge that is defined by a plurality of teeth that extend along a longitudinal edge of a body of the tear bar. The teeth include a first group of teeth that have a triangular shape defined by linear edges of the respective teeth and a second group of teeth where at least one side of each tooth of the second group of teeth have a curved edge that extends in a radial direction toward an adjacent one of the plurality of teeth. The tear bar is preferably disposed in the housing of a dispenser and oriented to engage a web material to selectively perforate and/or sever a portion of the web material from the roll.

EP 3 918 967 A1

Description

BACKGROUND OF THE INVENTION

[0001] The present invention generally relates to a tear bar for perforating and/or severing a portion of a rolled web material such as a single user portion of a web material, and, more specifically, is directed to an dispenser assembly that incorporates a tear bar, and method for dispensing a perforated portion of a rolled web material through the use of a tear bar in a dispenser assembly.

[0002] Dispensers for dispensing discrete portions of paper or web material from bulk rolls of such materials have been employed for many years and across various industries and for various applications. Such dispensers are widely used in public lavatories to dispense paper toweling for users to dry their hands. Typically, a bulk roll of sheet material is supported within a dispenser cabinet or housing and incrementally rotationally advanced to dispense discrete portions of the bulk material roll. In manually operated devices, manual actuation of a button or lever effectuates operation of a feed mechanism configured to rotationally advance the bulk roll and dispense a tail end of the sheet material beyond the confines of the cabinet or housing for use by the user. The feed mechanism typically includes feed roller that is associated with a drive roller and an idle roller to effectuate the desired sequential incremental advancement of the web material from the bulk roll. The manually actuated lever interacts with the drive roller so that actuation of the lever rotates the drive roller. Rotation of the drive roller acts to unwind material from the material roll.

[0003] Alternative dispensers, which eliminate or limit manual operation of the roll material dispensing systems, are often referred to as "contactless" or "touchless" dispensers. Such dispensers commonly use one or more proximity sensors that detect the presence of a hand of other part of a user relative to the dispenser and include a motorized feed assembly that advances the feed mechanism to effectuate dispensing of the sheet material from the housing.

[0004] Dispensers for rolls of flexible sheet material, whether manually operated, operated in the touchless manner, or a combination thereof, when deployed in restroom, industrial or commercial environments, are often subject to high volumes of repetitive usage. Additionally, many dispensers are configured to receive and dispense various types of web material. For example, in the context of hand towel dispensers, such dispensers may receive rolls of single-ply or multi-ply material. Alternatively, the material may be of variable thickness, absorbency, density, core structure, etc. Accordingly, such dispensers are often not customized to dispense a specific material, but rather are provided with sufficient tolerances as to accommodate various materials. Such wide tolerances may result in some web materials performing at a higher level than others. That is to say, for example, a given dispenser may perforate and sever a multi-ply material with more consistency than a single-ply material. Or alternatively, a given dispenser may generate undesirable hanging material tabs through incomplete cuts or may be prone to material folding and jamming in the feeder assembly when dispensing a given type of webbed material. That is to say, some applications associated with the use of such rolled web material dispensers require suitable tolerances to accommodate multiple material types which may adversely impact performance of the dispenser.

[0005] Poor performance of the dispenser assembly may include but is not limited to jamming in the feed mechanism, incomplete tearing of the material, and/or undesirable overlapping of the web of material, and/or the imparting of undesired tensile forces to the remainder of the roll of web material during dispensing during undesired or incomplete tearing or perforating operations. Such performance issues may require premature replacement of the roll of web material and/or service of the dispenser including unloading and reloading unconsumed rolls of web material in response to undesired jamming of the web material during use thereof. Replacement of spoiled rolls of web material, roll realignment, and jam correction are both a time consuming and wasteful side effect associated with an underperforming rolled web material dispensers.

[0006] In an effort to mitigate the detriments of such events, some dispenser assemblies are configured to receive and dispense only one specific type of web material. By narrowly defining the parameters of the web material accepted in the dispenser, the assembly's tolerances can be narrowly tailored, and performance optimized for dispensing that specific material. However, customers often do not wish to be limited to a single web material option, and desire to have flexibility in selecting the type of material that will be dispensed from the assembly. In such dispensers, it is not feasible to narrow the tolerances as to accommodate only a single web material type. Such considerations and the dispense operation and separation of discrete portions of the roll of web material can be exacerbated in instances where the roll of web material is provided in a non-uniform construction, such as if the web material is provided with reinforcement members that extend the longitudinal length of the rolled material. Although such reinforcements improve the tensile performance of the web material, particularly when gripped by wet hands, the reinforcements can frustrate efforts intended to mitigate jamming of web material during the dispensing operations.

[0007] Accordingly, there is a need for a tear bar, a dispenser assembly including such a tear bar, and a method for severing web material from a roll using a tear bar that allows the web material to be cleanly and repeatedly torn from roll of material, independent of the material type while mitigating instances of jamming of the web material in the feed mechanism, incomplete tearing of the material, undesirable overlapping of the web of material, and mitigation of communication of tensile forces

beyond the perforation and toward remaining portions of the bulk roll of web material.

SUMMARY OF THE INVENTION

[0008] The present invention discloses a web material dispenser assembly that resolves one or more of the shortcomings disclosed above.

[0009] One aspect of the present application discloses a tear bar that is configured to perforate and/or cut a web material in a repeatable manner and in a manner that mitigates side-to-side and/or longitudinal translation of the roll of web material relative to the feed mechanism and the tear bar associated therewith. The tear bar defines a cutting edge that is defined by a plurality of teeth that extend along a longitudinal edge of a body of the tear bar. The teeth are dissimilar along the longitudinal length of the tear bar and include a first group of teeth that each have a generally triangular shape defined by adjacent linear edges and a second group of teeth where at least one side of each tooth of the second group of teeth has a curved edge that extends in a radial direction toward an adjacent one of the plurality of teeth of the tear bar.

[0010] Another aspect of the present application usable or combinable with one or more of the above aspects discloses at least one arcuate channel disposed in the cutting edge, formed by a curved edge of the first one of the second group of teeth, an adjacent curved edge of the second one of the second group of teeth extends outwardly from the body of the tear bar such that tear bar includes at least one an arcuate trough formed between adjacent ones of the second group of teeth.

[0011] Another aspect of the present application usable or combinable with one or more of the aspects disclosed above includes at least one acute channel disposed in the cutting edge and formed by the linear edge of the at least one tooth of the first group that intersects the linear edge of the at least one other tooth at an acute angle.

[0012] Still another aspect of the present application usable or combinable with one or more of the aspects disclosed above includes at least one gap channel disposed in the cutting edge, formed by the linear edge of the first one of the first group of teeth and an adjacent linear edge of the second one of the first group of teeth that are separated by a the rectilinear trough.

[0013] Another aspect of the present application that is usable or combinable with one or more of the above aspects discloses a first and second arcuate channel separated by a plurality of acute channels.

[0014] Still another aspect of the present application that is usable or combinable with one or more of the above aspects discloses a first arcuate channel and a first gap channel separated by a plurality of acute channels.

[0015] Another aspect of the present application that is usable or combinable with one or more of the above aspects discloses a dispenser assembly having a housing defined by a cover that cooperates with a base. A hub assembly is contained by the housing and is configured to support a roll of web material and a feed mechanism that is operable to sequentially dispense the roll of web material. The dispenser includes a tear bar that intermittently interacts with the web material such that, when the tear bar is introduced thereto, the tear bar at least perforates the web material to effectuate separation of discrete dispense portions thereof. The tear bar includes a first set of teeth having linear edges that intersect one another at an apex and a second set of teeth having at least one arcuate edge having a radius of curvature that extends in a lateral direction across the tear bar toward an adjacent tooth and is coincident with an apex of the tooth having the at least one arcuate edge.

[0016] Another aspect of the present application that is usable or combinable with one or more of the above aspects includes a method of dispensing web material from a roll using a tear bar in a dispenser assembly. A further aspect of the present application that is usable or combinable with one or more of the above aspects discloses a method of forming a perforation bar of a rolled web material dispenser. The method of forming the perforation bar includes forming a cutting body that is defined by a thickness and a longitudinal length that extends between a first longitudinal end and a second longitudinal end of the body. The cutting edge is formed by a longitudinal edge of the body and is defined to include a first group of teeth wherein each tooth of the first group of teeth has a triangular shape relative to a direction normal to the thickness of the body and a second group of teeth wherein at least one side of each tooth of the second group of teeth has a curved edge that extends in an outward radial direction in a plane defined by the longitudinal length of the body toward an adjacent one of the plurality of teeth.

[0017] These and other aspects, features, and advantages of the present invention will become apparent from the detailed description, claims, and accompanying drawings.

DESCRIPTION OF THE DRAWINGS

[0018] A clear conception of the advantages and features constituting the present invention, and of the construction and operation of typical mechanisms provided with the present invention, will become more readily apparent by referring to the exemplary, and therefore nonlimiting, embodiments illustrated in the drawings accompanying and forming a part of this specification, wherein like reference numerals designate the same elements in the several views, and in which:

FIG. 1 is a perspective view of a roll material dispenser assembly having a tear bar according to the present invention;

FIG. 2 is a perspective view of the roll dispenser assembly of FIG. 1 with the cover and roll of web ma-

terial removed therefrom and exposing an interior of the base of the housing or enclosure of the dispenser assembly;

FIG. 3 is perspective view of the roll dispenser assembly of FIG. 2 with the cover removed therefrom and the roll of web material installed therein with the tail thereof disposed proximate the feed mechanism thereof;

FIG. 4 is a partial transverse cross-section top perspective view of the dispenser assembly of FIG. 1 viewed from above the rolls of the feed mechanism;

FIG. 5 is a partial transverse cross-section top perspective view of the dispenser assembly of FIG. 1 viewed from within the driver roll of the feed mechanism;

FIG. 6A is a top plan view of one embodiment of the tear bar as installed within the dispenser assembly of FIG. 1; and

FIG. 6B is detailed top plan view of a portion of the cutting edge of the tear bar of FIG 6A.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0019] In describing the preferred embodiments of the invention which are illustrated in the drawings, specific terminology will be resorted to for the sake of clarity. However, it is not intended that the invention be limited to the specific terms so selected and it is to be understood that each specific term includes all technical equivalents which operate in a similar manner to accomplish a similar purpose. The various features and advantageous details of the subject matter disclosed herein are explained more fully with reference to the non-limiting embodiments described in detail in the following description.

[0020] Illustrative embodiments of a dispenser assembly 10 in accordance with various aspects of the present invention are shown in FIG. 1 through FIG. 6B. Initially, FIG. 1 shows a dispenser assembly 10 that includes an internally disposed rolled web material tear bar 12 (FIG. 5), according to one embodiment of the present invention, and as explained further below with respect to FIGS. 4 through 6B.

[0021] Referring to FIGS. 1-3, material dispenser 10 includes a cabinet, housing or enclosure 14 that is shaped to receive a replaceable bulk roll of sheet or web material 16. Enclosure 14 is defined by a base, back, or back wall 17, a first sidewall 18, a second opposing sidewall 20, a floor 22, and a front cover 24 that cooperate with one another to define an interior cavity 26 of enclosure 14. Enclosure 14 may be formed of plastic or other suitable material. The back wall 17, sidewalls 18, 20, and floor 22 collectively form a rear portion or base of enclosure 14. Preferably, sidewalls 18, 20, floor 22, and back wall 17 are provided in a unitary single body construction. Cover 24 movably cooperates with the rear or base portion of enclosure 14 to selectively expose cavity 26 associated with receiving discrete sequential rolls of web material 16 associated therewith. As disclosed above, it is appreciated that the rearward portion of enclosure 14 or that portion that is generally rearward of cover 24 may be formed as a single or multiple piece assembly formed by injection, blow, or roto molding. Alternatively, the various walls or panels that define enclosure 14 may be separately manufactured parts that are connected by methodologies such as welds, moldings, fasteners, solder, overlapping snap fit connections, or the like.

[0022] Referring to FIGS. 2 and 3, material dispenser 10 includes a feed assembly or feed mechanism 28 that is contained within enclosure 14. Although shown as an assembly that cooperates with enclosure 14, it is appreciated that in other embodiments, the feed mechanism 28 can be provided in the form of a cassette that can be assembled prior to being associated with enclosure 14. Regardless of the specific configuration, feed mechanism 28 includes one or more rollers such as a drive roller 30 and an idle roller 32 that are positioned relative to one another to effectuate the dispensing of web material 16 beyond the confines of enclosure 14 and to a user. The drive roller 30 and the idle roller 32 form a pressure nip 34 through which the web material is drawn prior to being dispensed beyond the confines or perimeter edge of enclosure 14. The drive roller 30 and the idle roller 32 extend transversely with respect to and are supported from the sidewalls 18, 20 of enclosure 14 such that the same are rendered rotatable about respective parallel axes. It will be appreciated that these axes are also generally parallel to the rotational axis of the roll of sheet or web material supported therein.

[0023] Still referring to FIGS. 2 and 3, the roll of sheet or web material 16 is configured to be retained within the cavity 26 of the enclosure 14, above the feed mechanism 28. For example, a first retaining arm 36 may extend outwardly from the back wall 17 adjacent the first side wall 22 and an opposing second roll retaining arm 38 may extend from the back wall 17 adjacent the second side wall 24. The first and second retaining arms 36, 38 may be received and retained within first and second receiving slots 40, 42 adjacent the first and second side walls 18, 20, respectively. A hub 44 extends inwardly from an outwardly extending end of the first and second arms 36, 38, and when used in combination are configured to rotatably receive the opposing longitudinal ends or sides of the roll of sheet or web material 16.

[0024] In this configuration it will be appreciated that the roll of sheet or web material 16 is rotatably suspended above the feed mechanism 28, to spin about an axis that extends transversely with respect to the sidewalls 18, 20 of enclosure 14 and generally parallel to the rotational axis of the drive roller 30 and the idle roller 32. From this rotatably mounted position, an end of the web material extends downwardly for cooperation with the pressure nip 34 and is advanced out of the enclosure 14 though a downwardly directed opening in the enclosure 14 upon activation and rotation of the drive roller 34. In one embodiment of the present invention, where the dispenser

is a contactless system, the drive roller 34 is advanced by user interaction with a touchless operator such as a proximity sensor or the like to effectuation operation of the feed mechanism.

[0025] In an alternative embodiment of the present invention, where the drive roller 30 is advanced by manual activation an actuator 46, such as a wheel or lever, the actuator 44 may be manually engaged by the user to advance the material from roll 16 through the rollers 30, 32 and therefrom toward the dispense opening defined by enclosure 14.

[0026] Still referring to FIGS. 2 and 3, a plurality of mounting holes or apertures 48 are located in the back wall 16 of the enclosure 14. The apertures 48 are configured to receive mounting hardware, such as a threaded fastener or peg, therein such that the material dispenser 10 may be affixed to a wall 16. When the dispenser is mounted and the roll of webbed material 16 has been loaded into the cavity 26, with an end of the web material 16 extending downwardly within the pressure nip 34, the enclosure 14 is closed such that the cover 24 movably cooperates with the rear or base portion of enclosure 14 as shown in FIG. 1. Preferably, dispenser assembly 10 includes a lock mechanism 50 that is configured to provide only selective access to cavity 26 of enclosure 14 for service and/or reloading operations.

[0027] Lock mechanism preferably includes a resilient barb 52 that extends outwardly from the rear wall 16 of the base portion of the enclosure 14 near the top of the dispenser 10. When closed, the resilient barb 52 deflects about and engages a corresponding fixed barb (not shown) disposed at the interior surface of a top portion 54 of the cover 24. Such a configuration allows the overlapping barbs to maintain a friction fit closure between the cover 24 and base portion of the enclosure 14 when enclosure 14 is closed. A keyhole 56 is positioned in the top 54 of the cover 24, at a location that overlies the resilient barb 52 when the dispenser assembly 10 is in the closed configuration. Inserting a corresponding elongated key 58 through the keyhole 56 allows the key 58 to downwardly deflect the resilient barb 52 and release the cover 24 from its engagement with the rear portion of the enclosure 14 to allow opening of dispenser assembly 10.

[0028] Turning now to FIGS. 4 through 6B, and initially FIGS. 4 and 5, the feed mechanism 28 of the dispenser assembly 10 is shown from above in further detail where a portion of tear bar 12 is visible proximate pressure nip 34 at a location generally between the drive roller 30 and the idle roller 32. In one embodiment, the drive roller 30 is generally cylindrical having a first end 60 rotatably mounted to a first portion of a spring loaded advancement linkage 62 adjacent the first side 18 of the rear portion of the housing 14, and an opposing second end 64 rotatably mounted to a second portion of the spring loaded advancement linkage 62 adjacent the second side 20 of the rear portion of the housing 14. The cylinder of the driver roller 30 may be bifurcated about its longitudinal axis to form respective first and second generally corresponding semicircular cylindrical segments 66, 68.

[0029] As shown in FIG. 4, the first cylindrical segment 66 is positioned above the second cylindrical segment 68, such that the second cylindrical segment 68 is obscured from view. The tear bar 12 is partially disposed within the drive roller 30 and between the first and second cylindrical segments 66, 68. That is to say, the tear bar 12 is disposed between the two respective cylindrical segments and is preferably moveable in an outward radial direction relative thereto during rotation of drive roller 30. Tear bar 12 is formed by a body that defines a cutting edge 70 that periodically extends outwardly or protrudes from the outer surface 72 of the driver roll 30 and into engagement with the webbed material passing thereof. When introduced to web material 16, cutting edge 70 perforates the web material to define a tear line associated with a desired amount thereof. The first and second segments 66, 68 of the driver roll 30 may be formed by injection, blow, or roto molding and are connected by fasteners 74 that extend between the first and second segments 66, 68 below the outer surface 72 of the driver roll 30. In this configuration, the tear bar 12 is securely moveably retained within the driver roll 30. Alternatively, the first and second segments 66, 68 of the driver roll 30 may be affixed to one another by welds, moldings, fasteners, solder, overlapping snap fit connections, or the like.

[0030] Referring now to FIG. 5, which illustrates a cross section through the first segment 66 of the driver roll 30, such that the tear bar 12 is shown overlying the interior of the second segment 68. As described above, the tear bar 12 provides a cutting edge 70 that periodically extends outwardly from the outer surface 72 of the driver roll, towards the idle roller 32. The cutting edge 70 comprises a generally planer array of teeth 76 wherein the plane of teeth 76 are generally defined by the thickness of tear bar 12. Cutting edge 70 is defined by plurality of adjacent teeth 76 that define discrete channels 78 therebetween as will be described in further detail below. As disclosed further below, the plurality of teeth 76 defined by cutting edge 70 are dissimilar relative to the longitudinal length of cutting edge 70. The cutting edge 70 extends outwardly along a longitudinal edge of the planar body 80 of the tear bar 12.

[0031] Still referring to Fig. 5, the body 80 is disposed within or supported by a housing or carrier 82, which may be affixed about the body 80 and extend rearwardly therefrom via welds, moldings, fasteners, solder, overlapping snap fit connections, or the like. A rear edge 84 of the carrier 82 and a corresponding rear edge 86 of the body of the tear bar 12 may include one or more indexing structures, such as a notch 88, which mates with a one or more corresponding bosses 90 extending inwardly from a respective one or both of the first and/or second segments 66, 68 of the driver roll 30. Engagement of the notches 88 and their corresponding bosses 90 provides for proper orientation and positioning of the tear blade

12 within the driver roll 30, when the two opposing segments 66, 68 are fastened together to form the assembled driver roll 30.

[0032] During operation, rotation of the drive roll 30 advances the end of the roll of web material 16 through the feed mechanism 28 and through the pressure nip 34 where it then extends downwardly through the opening in the floor 22 of the encasement 14. Rotation of the drive roll 30 intermittently introduces the cutting edge of the tear bar 12 into contact with the roll of web material 16 once a desired length of web material 16 has been expelled through the opening. In one embodiment of the present invention the length of web material 16 is preferably between 8 inches and 16 inches; however, it should be understood that the present invention is not so limited and that other lengths of web material between instances of interaction of cutting edge 70 therewith are envisioned and considered within the scope of the present invention.

[0033] Upon completion of a desired degree of driver roller 30 rotation, the tear bar 12 engages the web material 16 to cut, i.e. perforate, the web material 16 at the various longitudinal locations that overly the array of teeth 76 as the web material passes thereover. Preferably, teeth 76 perforate rather than fully sever the web materials and perforate the web material in a manner wherein force applied to an exposed tail of the web material by the user of the web of material 16 sufficiently completes the separation of the predetermined length of the web material 16 from the roll, and initiates presentation of a subsequent length of web material from dispenser assembly 10 and passage through the feed mechanism 28 such that the same is presented for subsequent user initiated tearing in the manner described above.

[0034] Cutting edge 70 is constructed to mitigate jamming of the web of material 16 in the feed mechanism 28, incomplete tearing, and/or undesirable overlapping of the web of material 16 during each dispense event. Referring to FIGS. 6A and 6B, tear bar 12 is shown removed from dispenser assembly 10. More specifically, FIGS. 6A and 6B illustrates an embodiment of the tear bar 12 that is well suited for use in a dispenser assembly 10 that is configured to dispense a roll of web material 16 having a width of approximately 8.0 inches and materials of varied construction such as materials having a uniform construction and materials that may have longitudinal reinforcement fibers contained therein. It is appreciated that alternative embodiments of the present invention, including a dispenser assembly 10 that is configured to dispense a roll of web material 16 having a width of approximately 10.0 inches, and/or alternative widths of web material are considered within the scope of the present invention. That is, it is appreciated that the longitudinal length of tear bar 12 can be configured to accommodate use of a tear bar having a cutting edge 70 as defined by the appending claims in dispenser assemblies configured to dispense web materials having various longitudinal widths.

[0035] Referring initially to FIG. 6A, tear bar 12 is preferably defined by elongate body 80, preferably formed of metal such as stainless steel, that extends between the cutting edge 70 and a rear edge 86 associated therewith. Body 80 preferably includes one or more indexing notch(es) 88 that are located about the length of the rear edge 86 of body 80. A plurality of apertures 92 extend through the generally elongate body 80 and are preferably dispersed between a respective first longitudinal end or side 94 and opposing second longitudinal end or side 96 thereof. One or more of apertures 92 accommodate tear bar 12 being molded or otherwise fastened to carrier or housing 82.

[0036] As indicated above, the cutting edge 70 of the tear bar 12 comprises a generally planer array of teeth 76 where adjacent teeth 76 define discrete channels 78 therebetween. As disclosed above, plurality of teeth 76 are not uniform along the entire longitudinal length of body 80 but are rather oriented in discrete groups of differently shaped teeth. Tear bar 12 includes a distinct configuration of channels 78 as defined by the discrete spaced between adjacent teeth 76, and which extend outwardly from the body 80 to a distance of approximately 0.25 inches.

[0037] First, the cutting edge 70 provides acute channels 98, which as used herein are defined by adjacent teeth 76 having linear cutting edges 100 that are oriented towards one another as they extend outwardly in the perforating or cutting direction from the longitudinal axis of the body 80 of the tear bar 12. In a preferred embodiment, the adjacent teeth 76 which form the acute channels 98 define a relative angle of between 65° and 45°, and more preferably between 60° and 50° relative to one another. Second, the cutting edge 70 provides arcuate channels 102, which as used herein are defined by adjacent teeth 76 having curvilinear or non-linear cutting edges 104 which intersect at an arcuate trough 106 at the base of the arcuate channel 102 opposite the tips of the outwardly extending teeth 76. In a preferred embodiment the adjacent teeth 76 which form the arcuate channels 102 define a relative angle of between 100° and 80°, and more preferably between 95° and 85° relative to one another. Third, the cutting edge 70 provides gapped channels 108, which as used herein are defined by adjacent teeth 76 having generally linear cutting edges 110 that are both oriented at a linear angle relative to one another and also spaced apart from one another by a trench 112 disposed at the base of the gapped channel 108. In a preferred embodiment, the adjacent teeth 76 which form the gapped channels 108 define a relative angle of between 100° and 80°, and more preferably between 95° and 85° relative to one another, and are spaced apart from one another by a trench 112 having a linear distance of approximately preferably between 0.05 and 0.25 inches, and more preferably between 0.10 and 0.20 inches. The trench 112 located at the base of the gapped channels 108 similarly has a depth of approximately preferably between 0.05 and 0.25 inches, and more preferably between 0.10 and

0.20 inches, such that trench 112 is generally rectilinear. In this configuration the rectilinear trench 112 of the gapped channel 108 is further distinguishable from the arcuate trough 106 of the arcuate channels 102.

[0038] In combination, the orientation of the teeth 76 as to define the acute channels 98, arcuate channels 102, and gapped channels 108 work in combination to avoid the web of material 16 from jamming in the feed mechanism 28, incomplete tearing, and/or undesirable overlapping of the web of material 16 during use of the dispenser assembly 10. Moreover, in one embodiment of the present invention the cutting edge 70 of the tear bar 12 formed of the various channels 98, 102 and 108 is arraigned in a somewhat repeating pattern along the longitudinal length of cutting edge 70. For example, a plurality of acute channels 98 may repeat in succession followed by either an arcuate channel 102 or a gapped channel 108, and then repeat. As shown in a portion of tear blade 12 shown in FIG. 6A, adjacent the first end 94, a series of three successive acute channels 98 are followed by either an arcuate channel 102 or a gapped channel 108. More specifically, the pattern of channel orientation mirrors on either side of the tear bar 12 as shown in FIG. 6A. Specifically, working from the outer edge 94, 96 towards the midline, each side of the tear bar 12 provides the following sequence of channels: one arcuate channel 102, three acute channels 98, one arcuate channel 102, three acute channels 98, one gapped channel 108, three acute channels 98, one arcuate channel 102, followed by a final series of three acute channels 98. The center of the cutting edge 70, about which both sides are preferably mirror images of one another, may include a large central trench 114, as illustrated in FIG. 6A. Alternatively, it is considered well within the scope of the present invention that the number of acute channels 98 that repeat in a series may be more or less than three, particularly as is needed to provide for a cutting edge 70 of a desired length as required by the width of the roll of web material 16 intended to be perforated and/or cut from the dispenser assembly 10 during each successive tearing event. Furthermore, it is considered within the scope of the present invention that the angles of the cutting edges of the teeth 76 which form the various channels 98, 102, 108 may vary within the discrete ranges provided above, such that not all channels 98, 102, 108 of a given type need be identical within the tear bar 12.

[0039] Further, it is appreciated that the cutting edge 70 may be implemented in a variety of configurations, using certain features or aspects of the embodiments described herein and others known in the art. Thus, although the invention has been shown and described in what is perceived to be the most practical and preferred embodiments, it is to be understood that the invention is not intended to be limited to the specific features and embodiments set forth above. Rather, it is recognized that modifications may be made by one of skill in the art of the invention without departing from the spirit or intent of the invention and, therefore, the invention is to be taken as including all reasonable equivalents to the subject matter of the claims.

[0040] Therefore, one aspect of the present application discloses a tear bar for use in a web material dispenser wherein the tear bar includes a body that extends in a longitudinal direction between a first end and a second end of the body. The tear bar defines a cutting edge that is defined by a plurality of teeth that extend along a longitudinal edge of the body. The plurality of teeth include a first group of teeth that have a triangular shape relative to a direction normal to a plane of the body and a second group of teeth wherein at least one side of each tooth of the second group of teeth has a curved edge that extends in an outward radial direction toward an adjacent one of the plurality of teeth.

[0041] Another aspect of the present application discloses a web material dispenser having a housing that is defined by a cover that movably cooperates with a base. A hub assembly is disposed in the housing and is oriented to support a roll of a web material. A drive mechanism is supported by the housing and is oriented to advance the roll of the web material. A tear bar is disposed in the housing and oriented to engage the web material to selectively perforate a portion of the web material from the roll. A portion of an edge of the tear bar defines a first set of teeth wherein each tooth of the first set of teeth has linear edges that intersect one another at an apex of the discrete tooth. Another portion of the edge of the tear bar defines a second set of teeth wherein each tooth of the second set of teeth have at least one arcuate edge having a radius of curvature that extends across an axis that extends in a lateral direction across the tear bar and is coincident with an apex of the tooth having the at least one arcuate edge.

[0042] A further aspect of the present invention discloses a method of forming a perforation bar of a rolled web material dispenser. The method includes forming a cutting body that is defined by a thickness and a longitudinal length that extends between a first longitudinal end and a second longitudinal end of the body. A cutting edge is defined by a longitudinal edge of the body and includes a first group of teeth that have a triangular shape relative to a direction normal to the thickness of the body and a second group of teeth wherein at least one side of each tooth of the second group of teeth has a curved edge that extends in an outward radial direction in a plane defined by the longitudinal length of the body toward an adjacent one of the plurality of teeth.

[0043] These are other aspects, advantages, features, and equivalents thereof, are encompassed by the appending claims.

Claims

1. A tear bar for use in a web material dispenser, the tear bar comprising:

a body that extends in a longitudinal direction between a first end and a second end of the body; and
a cutting edge that is defined by a plurality of teeth that extend along a longitudinal edge of the body, the plurality of teeth comprising:

a first group of teeth that have a triangular shape relative to a direction normal to a plane of the body; and
a second group of teeth wherein at least one side of each tooth of the second group of teeth has a curved edge that extends in an outward radial direction toward an adjacent one of the plurality of teeth.

2. A web material dispenser comprising:

a housing defined by a cover that movably co-operates with a base;
a hub assembly disposed in the housing and oriented to support a roll of a web material;
a drive mechanism supported the housing and oriented to advance the roll of the web material;
a tear bar disposed in the housing and oriented to engage the web material to selectively perforate a portion of the web material from the roll;
a first group of teeth defined by a portion of an edge of the tear bar, each tooth of the first group of teeth having linear edges that intersect one another at an apex; and
a second group of teeth defined by another portion of the edge of the tear bar, each tooth of the second group of teeth having at least one curved edge having a radius of curvature that extends across an axis that extends in a lateral direction across the tear bar and is coincident with an apex of the tooth having the at least one curved edge.

3. The tear bar of claim 1 or the web material dispenser of claim 2 wherein each tooth of the second group of teeth are adjacent to at least one other tooth of the second group of teeth such that the curved edge of a first one of the second group of teeth faces a curved edge of a second one of the second group of teeth.

4. The tear bar or the web material dispenser of claim 3 wherein, the curved edge of the first one of the second group of teeth and the curved edge of the second one of the second group of teeth are separated by an arcuate trough therebetween.

5. The tear bar or the web material dispenser of claim 4, wherein the curved edge of the first one of the second group of teeth, the curved edge of the second one of the second group of teeth and the arcuate trough defines a first arcuate channel.

6. The tear bar of claim 1 or any one of claims 3 to 5 wherein at least one tooth of the first group of teeth has a linear edge that is adjacent to a linear edge of at least one other tooth of the first group of teeth, and wherein optionally or preferably the linear edge of the at least one tooth of the first group of teeth intersects the linear edge of the at least one other tooth at an acute angle to define an acute channel; or the web material dispenser of any one of claims 2 to 5wherein the linear edge of at least one tooth of the first set of teeth is adjacent to and intersects at an acute angle the linear edge of at least one other tooth of the first set of teeth to define an acute channel.

7. The tear bar or the web material dispenser of claim 6 wherein the acute angle is less than 65°.

8. The tear bar or the web material dispenser of claim 6 or claim 7 further comprising a plurality of acute channels disposed between the first arcuate channel and a second arcuate channel.

9. The tear bar of any one of claims 6 to 8 wherein the linear edge of the at least one tooth of the first group and the linear edge of the at least one other tooth at an acute angle are separated by a rectilinear trough; or
the web material dispenser of any one of claims 6 to 8 wherein the linear edge of at least one tooth of the first set of teeth and an adjacent linear edge of a second one of the first set of teeth extends outwardly from the tear bar and are separated by a rectilinear trough.

10. The tear bar of claim 9 wherein the linear edge of the first one of the first group of teeth, the linear edge of the second one of the first group of teeth and the rectilinear trough defines a first gap channel; or
the web material dispenser of claim 9 wherein the linear edge of the at least tooth of the first group of teeth, the adjacent linear edge of the second one of the first group of teeth and the rectilinear trough defines a first gap channel.

11. The tear bar or the web material dispenser of claim 10 further comprising a plurality of acute channels disposed between the first arcuate channel and the first gap channel.

12. A web material dispenser comprising:

a housing defined by a cover that movably co-operates with a base;
a hub assembly disposed in the housing and oriented to support a roll of a web material;
a drive mechanism supported the housing and

oriented to advance the roll of the web material; and

the tear bar of claim 1 or any one of claims 3 to 11, the tear bar being disposed in the housing and oriented to engage the web material to selectively perforate a portion of the web material from the roll.

13. The web material dispenser of claim 2 wherein each tooth of the second set of teeth further comprises a linear edge that is opposite the respective at least one arcuate edge.

14. A method of forming a perforation bar of a rolled web material dispenser, the method comprising:

forming a cutting body defined by a thickness and a longitudinal length that extends between a first longitudinal end and a second longitudinal end of the body; and

forming a cutting edge with a longitudinal edge of the body and defining the cutting edge to include a first group of teeth that have a triangular shape relative to a direction normal to the thickness of the body and a second group of teeth wherein at least one side of each tooth of the second group of teeth has a curved edge that extends in an outward radial direction in a plane defined by the longitudinal length of the body toward an adjacent one of the plurality of teeth.

15. The method of claim 14 further comprising orienting an apex of each tooth of the first group of teeth to be collinear with an apex of each tooth of the second group of teeth.

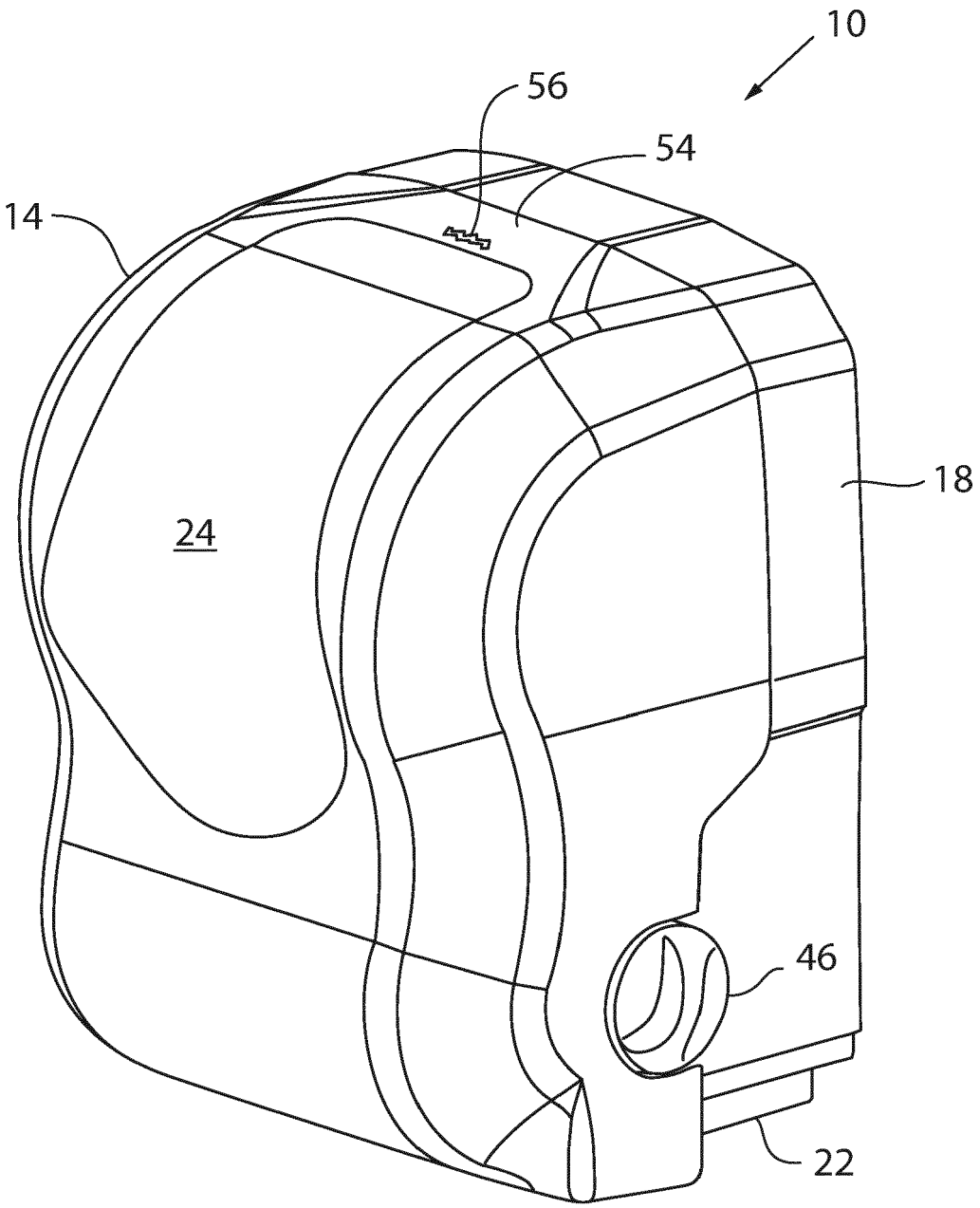

FIG. 1

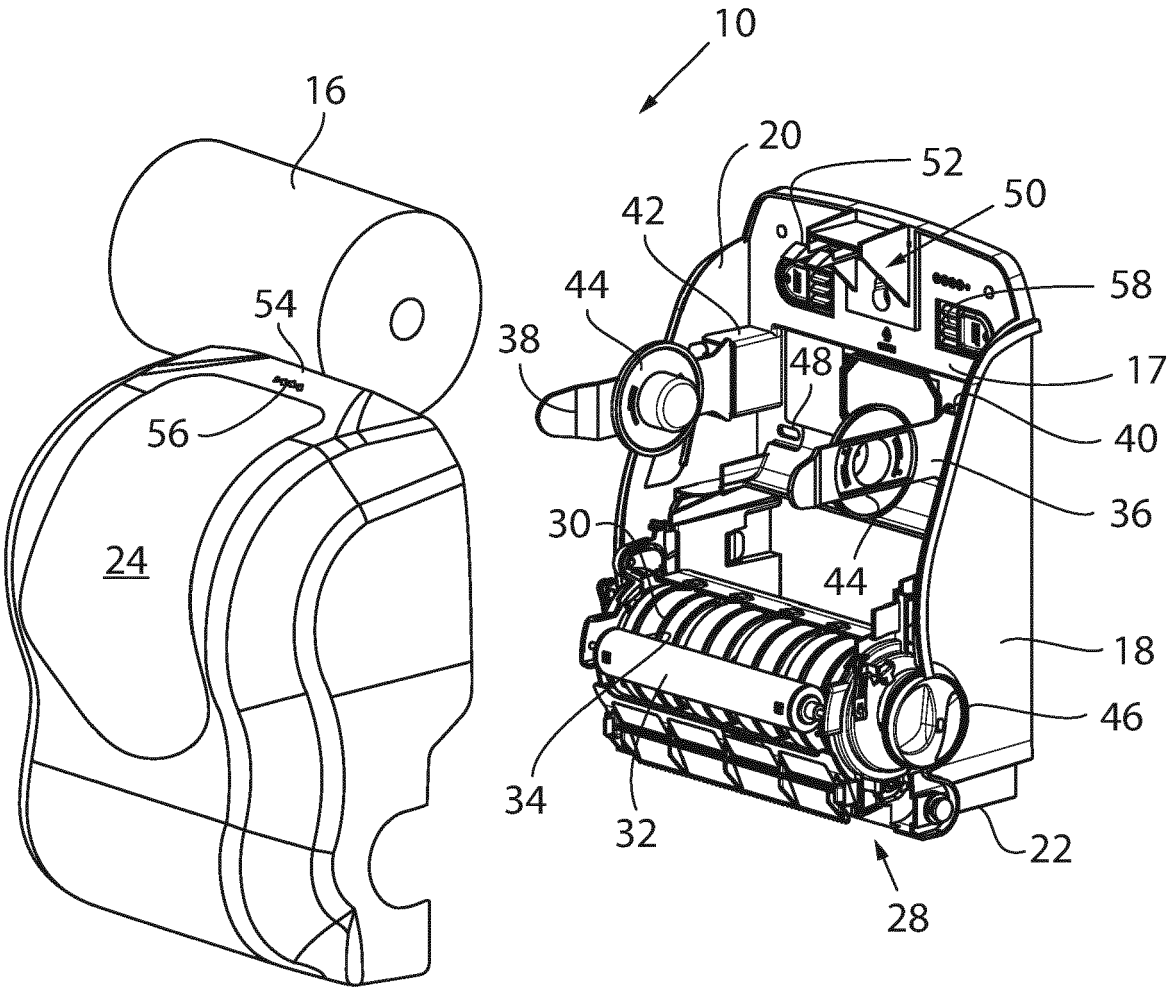

FIG. 2

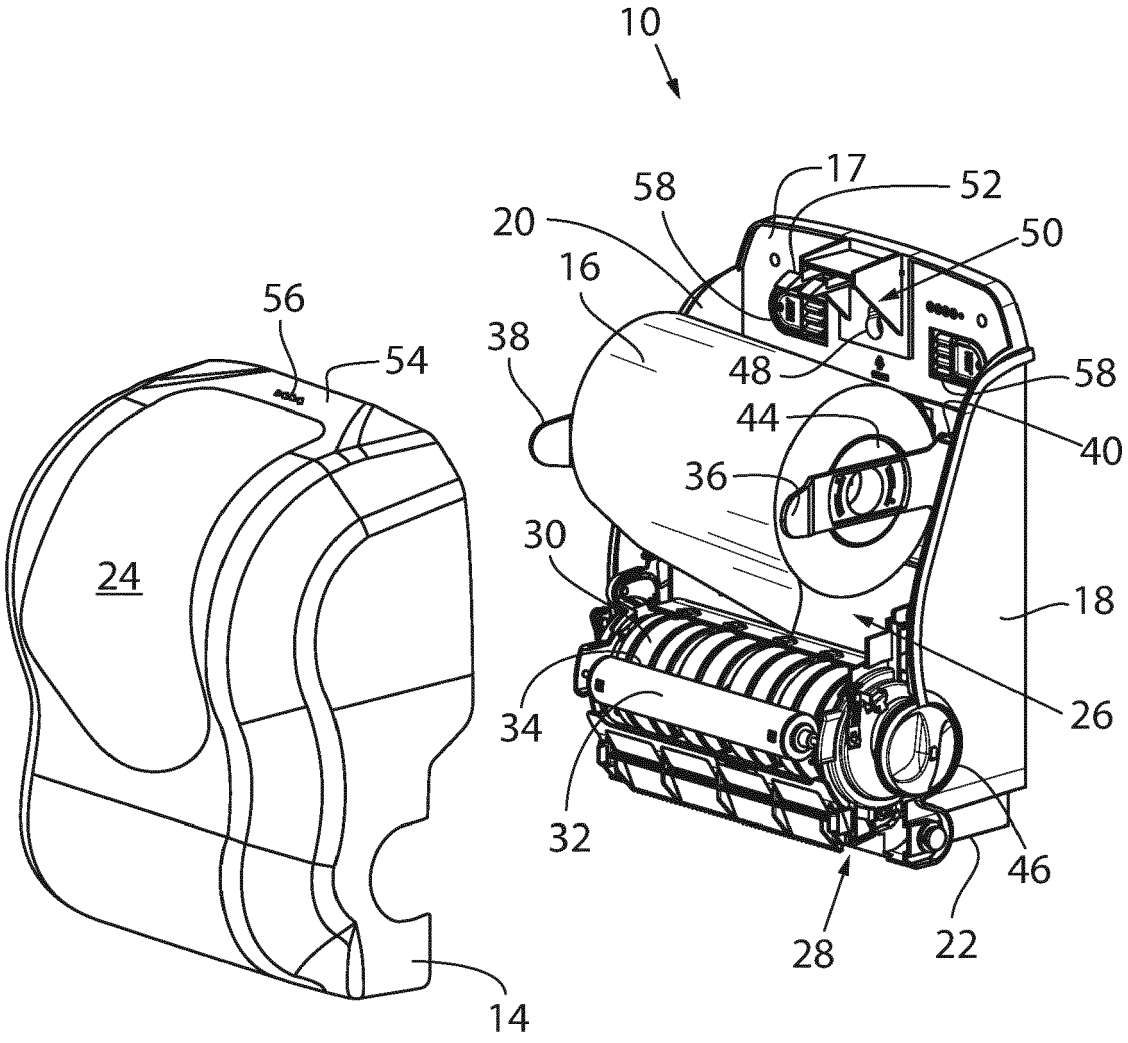
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FIG. 3

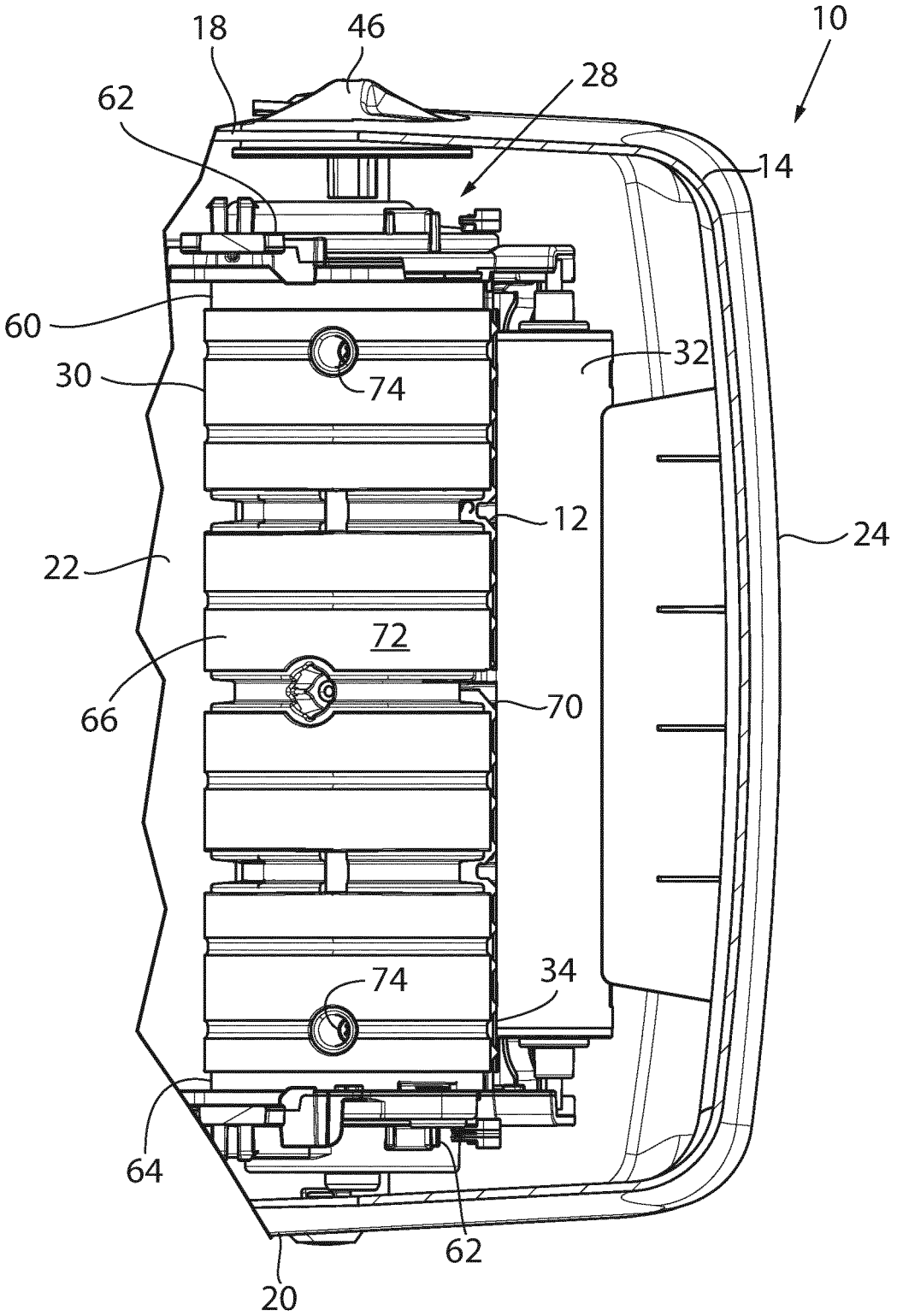

FIG. 4

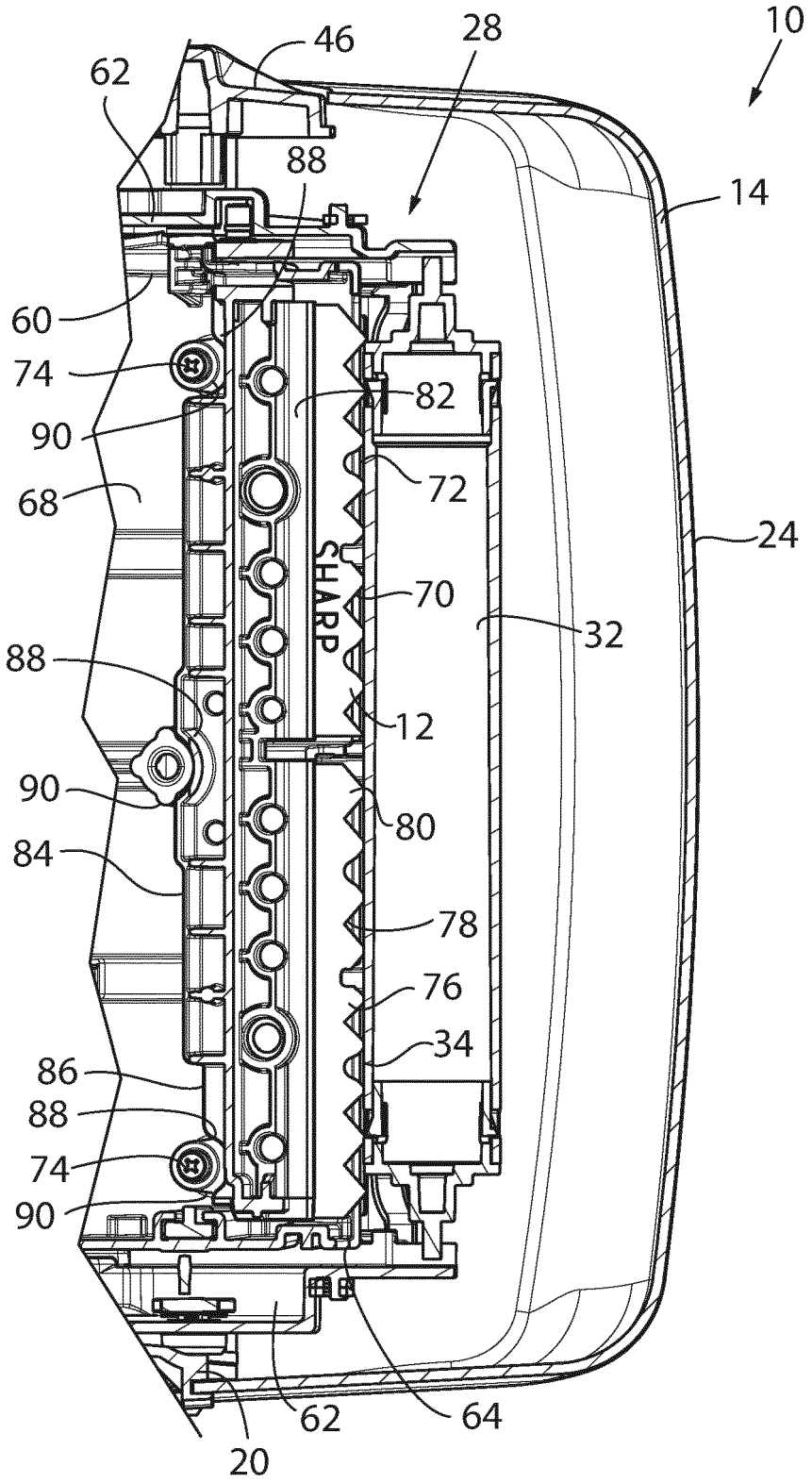
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FIG. 5

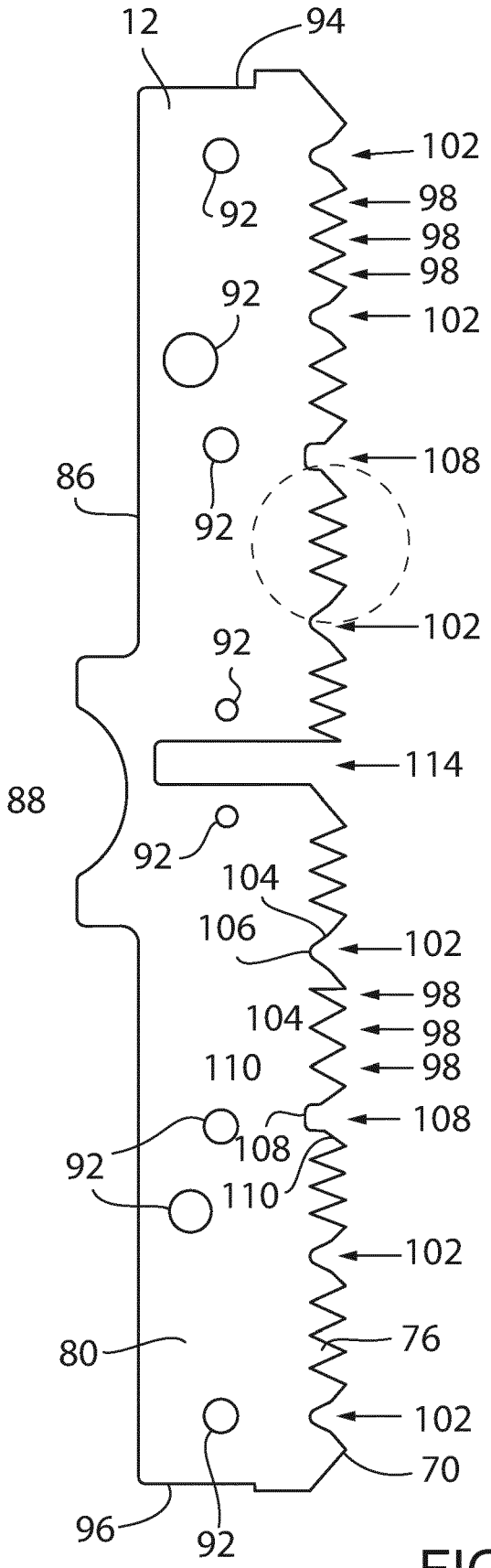
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FIG. 6A

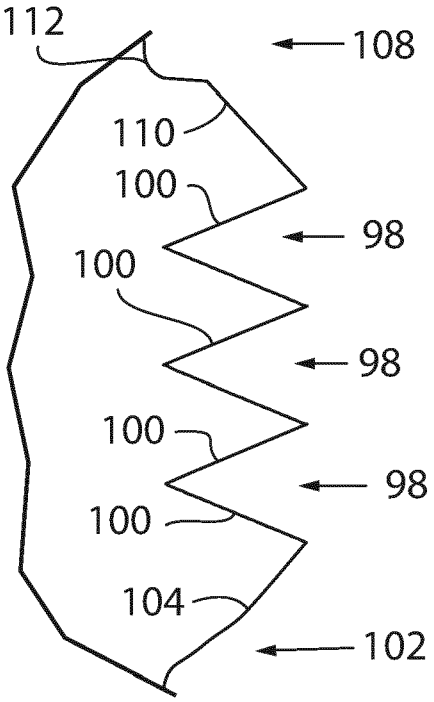
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FIG. 6B

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EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	15 September 2021	Demeester, Jan

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