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TRANSFER TURRET WITH SETTABLE VACUUM TIMING AND NECKER MACHINE INCLUDING SAME

Abstract

A transfer turret includes a rotatable starwheel for transferring can bodies between process stations. The starwheel includes pockets, each having a vacuum port and being adapted to receive a can body. The transfer turret also includes a stationary vacuum assembly having: a frame; an infeed and an outfeed baffle fixedly coupled to the frame, each having a leading end and a trailing end; and a transfer zone extending from the trailing end of the infeed baffle to a leading end of the outfeed baffle that is structured to be under vacuum when the transfer turret is in use. When in use: the transfer zone conveys the vacuum to the vacuum ports of the pockets aligned with the transfer zone to retain the can bodies within such pockets, and the infeed and outfeed baffle are each structured to block the vacuum to the vacuum ports of the pockets aligned therewith.

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Background/Summary

FIELD OF THE INVENTION

[0001] The disclosed concept relates generally to apparatuses for manufacturing containers and, more particularly to apparatus for transferring container bodies between stages in a container manufacturing process. The disclosed concept further relates to necker machines utilizing such arrangements.

BACKGROUND OF THE INVENTION

[0002] Metal beverage cans are designed and manufactured to withstand high internal pressure-typically 90-100 psi. Can bodies are commonly formed from a metal blank that is first drawn into a cup. The sides of the cup are ironed to a desired can wall thickness and height and the bottom of the cup is formed into a dome. After the can is filled, a can end is placed onto the open can end and affixed with a seaming process.

[0003] It has been the conventional practice to reduce the diameter at the top of the can in a process referred to as necking. Cans may be necked in a “spin necking” process in which cans are rotated with rollers that reduce the diameter of the neck. Most cans are necked in a “die necking” process in which cans are longitudinally pushed into dies to gently reduce the neck diameter over several stages. For example, reducing the diameter of a can neck from a conventional body diameter of 2 11/16th inches to 2 2/16th inches (that is, from a 211 to a 202 size) often requires multiple stages, often 12.

[0004] Each of the necking stages typically includes a main turret shaft that carries a starwheel for holding the can bodies, a die assembly that includes the tooling for reducing the diameter of the open end of the can, and a pusher ram to push the can into the die tooling. Each necking stage also typically includes a transfer turret assembly that receives can bodies from a previous or upstream stage and delivers the can bodies to a subsequent or downstream stage.

[0005] Conventional transfer turret assemblies typically include a rotating transfer starwheel that includes a plurality of pockets that each retain a received can body under a vacuum force. The vacuum pressure of each pocket abates once the pocket has rotated to a predetermined angular exit position, at which point each can body exits the transfer turret pocket and is received by a complementary starwheel pocket of a downstream station. The vacuum is thus set to abate once the pocket has rotated to an angular position that provides for a transfer time that allows the can body to travel into the complementary pocket of the downstream starwheel as the starwheels rotate at a given rate.

[0006] While the vacuum abatement location may provide for accurate transfers at a given rotational speed, the capability to operate die necking processes at different speeds has become desirable to control the quantity of can bodies produced over a given period of time. Unfortunately, changing the rotational speed of the starwheel can remove the exit and intake pockets from proper operational alignment due to the resulting change(s) in transfer times, which can cause can bodies to be dropped or crushed during operation, and may use the vacuum ineffectively by providing a period during which vacuum force is applied but no can is located in the pocket or a period in which vacuum force is applied too long.

SUMMARY OF THE INVENTION

[0007] Embodiments of the disclosed concept address shortcomings in conventional arrangements by providing robust solutions for adjusting vacuum timing in a transfer turret for different operating speeds. As one aspect of the disclosed concept, a transfer turret for a can necking machine is provided. The transfer turret comprises: a transfer starwheel rotatable about a rotation axis and configured to transfer a plurality of can bodies between a first process station and a second process station, the transfer starwheel including a plurality of peripheral pockets, each pocket including a vacuum port and is adapted to receive a can body; a stationary vacuum assembly comprising: a frame; an infeed baffle fixedly coupled to the frame, the infeed baffle having a leading end and an opposite trailing end; an outfeed baffle fixedly coupled to the frame, the outfeed baffle having a leading end and an opposite trailing end; and a transfer zone that is structured to be under vacuum when the transfer turret is in use, the transfer zone extending a circumferential length from a trailing end of the infeed baffle to a leading end of the outfeed baffle; wherein when the transfer turret is in use: the transfer zone is structured to convey the vacuum to the vacuum ports of the transfer starwheel pockets that are aligned with the transfer zone to thereby retain the can bodies within the transfer starwheel pockets that are aligned with the transfer zone, and the infeed baffle and the outfeed baffle are each structured to block the vacuum to the vacuum ports of the transfer starwheel pockets that are aligned with either of the infeed baffle or the outfeed baffle.

[0008] One or both of an angular positioning about the rotation axis and/or the circumferential length of the transfer zone may be selectively changeable by: replacing the infeed baffle with a different infeed baffle having a differently positioned trailing end; and/or replacing the outfeed baffle with a different outfeed baffle having a differently positioned leading end. The infeed baffle may include an infeed coupling portion for fixedly coupling the infeed baffle to the frame and which is spaced a first circumferential distance from the trailing end of the infeed baffle by a first circumferential distance; the different infeed baffle may include an infeed coupling portion for fixedly coupling the different infeed baffle to the frame and which is spaced a second circumferential distance, different than the first circumferential distance, from the trailing end of the different infeed baffle; the outfeed baffle may include an outfeed coupling portion for fixedly coupling the outfeed baffle to the frame and which is spaced a first circumferential distance from the leading end of the outfeed baffle by a third circumferential distance; and the different outfeed baffle may include an outfeed coupling portion for fixedly coupling the different outfeed baffle to the frame and which is spaced a fourth circumferential distance, different than the third circumferential distance, from the trailing end of the different outfeed baffle.

[0009] The frame may comprise a transfer turret backer plate to which the infeed manifold and the outfeed manifold are each rigidly coupled. The transfer starwheel may be fixedly coupled to a transfer turret hub; and the transfer turret hub may be fixedly coupled to a transfer turret driveshaft that is structured to be rotated about the rotation axis by a drive arrangement.

[0010] The transfer starwheel may comprise a plurality of segments. The plurality of segments may consist of four segments.

[0011] Each of the infeed baffle and the outfeed baffle may comprise a curved upper surface extending between the leading end and the trailing end. The transfer starwheel may comprise a cylindrical inner surface; and the curved upper surface of each of the infeed baffle and the outfeed baffle may be cooperatively shaped to the cylindrical inner surface.

[0012] The frame may comprise a transfer turret backer plate to which the infeed manifold and the outfeed manifold are each rigidly coupled; the transfer starwheel may be fixedly coupled to a transfer turret hub; the transfer turret hub may be fixedly coupled to a transfer turret driveshaft that is structured to be rotated about the rotation axis by a drive arrangement; each of the infeed baffle and the outfeed baffle may comprise a lower surface extending between the leading end and the trailing end; the transfer zone may be structured to be under vacuum from a stationary manifold volume in communication with the transfer zone; and the stationary manifold volume may be defined: on a first end by the transfer turret backer plate; on an opposite second end by the transfer turret hub; on an inner portion by the transfer turret driveshaft; and on an outer circumference by a cylindrical inner surface of the transfer starwheel and by the leading end, trailing end, and lower surface of each of the infeed baffle and the outfeed baffle.

[0013] As another aspect of the disclosed concept, a necker machine for use in forming can bodies is provided. The necker machine comprises: a plurality of forming stations structured to carry out forming operations on the can bodies; and a transfer assembly structured to move the can bodies

between adjacent processing stations, the transfer assembly comprising a plurality of transfer turrets, each transfer turret comprises: a transfer starwheel rotatable about a rotation axis and configured to transfer a plurality of can bodies between a first process station and a second process station, the transfer starwheel including a plurality of peripheral pockets, each pocket including a vacuum port and adapted to receive a can body; a stationary vacuum assembly comprising: a frame; an infeed baffle fixedly coupled to the frame, the infeed baffle having a leading end and an opposite trailing end; an outfeed baffle fixedly coupled to the frame, the outfeed baffle having a leading end and an opposite trailing end; and a transfer zone that is structured to be under vacuum when the transfer turret is in use, the transfer zone extending a circumferential length from a trailing end of the infeed baffle to a leading end of the outfeed baffle; wherein when the transfer turret is in use: the transfer zone is structured to convey the vacuum to the vacuum ports of the transfer starwheel pockets that are aligned with the transfer zone to thereby retain the can bodies within the transfer starwheel pockets that are aligned with the transfer zone, and the infeed baffle and the outfeed baffle are each structured to block the vacuum to the vacuum ports of the transfer starwheel pockets that are aligned with either of the infeed baffle or the outfeed baffle.
[0014] As yet a further aspect of the disclosed concept, a method of adjusting vacuum timing in a transfer turret such as described above is provided. The method comprises: uncoupling at least one of the infeed baffle and/or the outfeed baffle from the frame; and replacing the at least one of the infeed baffle or the outfeed baffle with a different infeed baffle having a differently positioned trailing end; and/or replacing the at least one of the infeed baffle or the outfeed baffle with a different outfeed baffle having a differently positioned leading end. Uncoupling the at least one of the infeed baffle and/or the outfeed baffle from the frame may comprise uncoupling both of the infeed baffle and the outfeed baffle from the frame; and replacing the at least one of the infeed baffle and/or the outfeed baffle may comprise replacing both the infeed baffle with the different infeed baffle having the differently positioned trailing end and replacing the outfeed baffle with the different outfeed baffle having the differently positioned leading end.
[0015] These and other objects, features, and characteristics of the disclosed concept, as well as the methods of operation and functions of the related elements of structure and the combination of parts and economies of manufacture, will become more apparent upon consideration of the following description and the appended claims with reference to the accompanying drawings, all of which form a part of this specification, wherein like reference numerals designate corresponding parts in the various figures. It is to be expressly understood, however, that the drawings are provided for the purpose of illustration and description only and are not intended as a definition of the limits of the disclosed concept.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
[0016] A full understanding of the invention can be gained from the following description of the preferred embodiments when read in conjunction with the accompanying drawings in which:
[0017] FIG. **1** is a perspective view of a necker machine having a number of transfer turrets in accordance with an example embodiment of the disclosed concept;
[0018] FIG. **2** is another perspective view of the necker machine of FIG. **1**;
[0019] FIG. **3** is a front elevation view of the necker machine of FIGS. **1** and **2**;
[0020] FIG. **4** is a schematic cross-sectional view of a can body;
[0021] FIG. **5** is a perspective view of a transfer turret in accordance with an example embodiment of the disclosed concept;
[0022] FIG. **6** is a partially exploded perspective view of the transfer turret of FIG. **5** shown with a rotatable transfer starwheel thereof exploded therefrom;

[0023] FIG. **7** is a perspective view of the transfer turret of FIG. **5** shown with the rotatable transfer starwheel and a rotatable transfer turret hub removed;
[0024] FIG. **8** is a perspective view of the transfer turret of FIG. **5** shown with the rotatable transfer starwheel, the transfer turret hub, along with infeed and outfeed baffles removed;
[0025] FIG. **9** is a sectional view of the transfer turret of FIG. **5** taken along the line indicated in FIG. **5** shown with can bodies positioned in peripheral pockets of the rotatable transfer starwheel aligned with a transfer zone of a stationary vacuum assembly of the transfer turret;
[0026] FIG. **10**A is an example array of differently sized infeed baffles for changing the infeed vacuum timing of the transfer turret of FIG. **5** in accordance with an example embodiment of the disclosed concept; and
[0027] FIG. **10**B is an example array of differently sized outfeed baffles for changing the outfeed vacuum timing of the transfer turret of FIG. **5** in accordance with an example embodiment of the disclosed concept.

DETAILED DESCRIPTION OF THE INVENTION

[0028] The specific elements illustrated in the drawings and described herein are simply exemplary embodiments of the disclosed concept. Accordingly, specific dimensions, orientations and other physical characteristics related to the embodiments disclosed herein are not to be considered limiting on the scope of the disclosed concept.
[0029] Directional phrases used herein, such as, for example, clockwise, counterclockwise, left, right, top, bottom, upwards, downwards and derivatives thereof, relate to the orientation of the elements shown in the drawings and are not limiting upon the claims unless expressly recited therein.
[0030] As used herein, the singular form of “a,” “an,” and “the” include plural references unless the context clearly dictates otherwise.
[0031] As used herein, “structured to [verb]” means that the identified element or assembly has a structure that is shaped, sized, disposed, coupled and/or configured to perform the identified verb. For example, a member that is “structured to move” is movably coupled to another element and includes elements that cause the member to move or the member is otherwise configured to move in response to other elements or assemblies. As such, as used herein, “structured to [verb]” recites structure and not function. Further, as used herein, “structured to [verb]” means that the identified element or assembly is intended to, and is designed to, perform the identified verb. Thus, an element that is merely capable of performing the identified verb but which is not intended to, and is not designed to, perform the identified verb is not “structured to [verb].”
[0032] As employed herein, the term “can” refers to any known or suitable container, which is structured to contain a substance (e.g., without limitation, liquid; food; any other suitable substance), and expressly includes, but is not limited to, beverage cans, such as beer and soda cans, as well as cans used for food.
[0033] As used herein, “coupled” means a link between two or more elements, whether direct or indirect, so long as a link occurs. An object resting on another object held in place only by gravity is not “coupled” to the lower object unless the upper object is otherwise maintained substantially in place. That is, for example, a book on a table is not coupled thereto, but a book glued to a table is coupled thereto.
[0034] As used herein, “operatively coupled” means that a number of elements or assemblies, each of which is movable between a first position and a second position, or a first configuration and a second configuration, are coupled so that as the first element moves from one position/configuration to the other, the second element moves between positions/configurations as well. It is noted that a first element may be “operatively coupled” to another without the opposite being true.
[0035] As used herein, “directly coupled” means that two elements are coupled in direct contact with each other.

[0036] As used herein, “fixedly coupled” or “fixed” means that two components are coupled so as to move as one while maintaining a constant orientation relative to each other. The fixed components may, or may not, be directly coupled.
[0037] As used herein, the word “unitary” means a component is created as a single piece or unit. That is, a component that includes pieces that are created separately and then coupled together as a unit is not a “unitary” component or body.
[0038] As used herein, “associated” means that the identified components are related to each other, contact each other, and/or interact with each other. For example, an automobile has four tires and four hubs, each hub is “associated” with a specific tire.
[0039] As used herein, “engage,” when used in reference to gears or other components having teeth, means that the teeth of the gears interface with each other and the rotation of one gear causes the other gear to rotate as well.
[0040] As employed herein, the term “number” shall mean one or an integer greater than one (i.e., a plurality).
[0041] As shown in FIGS. **1-3**, a necker machine **10** is structured to reduce the diameter of a portion of a can body **1**. Necker machine **10** is of similar construction and operates in a similar manner as necker machines described in U.S. Pat. Nos. 11,370,015 and 11,565,303 commonly assigned to the same assignee as the present application except for the transfer turrets **40** described herein and components related thereto. Accordingly, only a general overview of major components of necker machine **10** and the general operation thereof is provided herein.
[0042] As used herein, to “neck” means to reduce the diameter/radius of a portion of a can body **1**. That is a can body **1**, such as shown (for example, without limitation) in FIG. **4**, includes a base **2** with an upwardly depending sidewall **3**. The base **2** and sidewall **3** define a generally enclosed space **4**. In the embodiment discussed below, the can body **1** is a generally circular and/or an elongated cylinder. It is understood that this is only one exemplary shape and that the can body **1** can have other shapes. The can body **1** has a longitudinal axis **5**. The sidewall **3** has a first end **6** and a second end **7**. The base **2** is at the second end **7** and the first end **6** is open. The first end **6** initially has substantially the same radius/diameter as the sidewall **3**, however following forming operations in the necker machine **10**, the radius/diameter of the first end **6** is smaller than the other portions of the radius/diameter at the sidewall **3**.
[0043] The necker machine **10** includes an infeed assembly **11**, a plurality of processing/forming stations **20**, a transfer assembly **30**, and a drive assembly (not numbered). Hereinafter, processing/forming stations **20** are identified by the term “processing stations **20**” and refer to generic processing stations **20**. As is known, the processing stations **20** are disposed adjacent to each other and in series. That is, the can bodies **1** being processed by the necker machine **10** each move from an upstream location through a series of processing stations **20** in the same sequence. The can bodies **1** follow a path, hereinafter, the “work path **9**” (FIG. **3**). That is, the necker machine **10** defines the work path **9** wherein can bodies **1** move from an “upstream” location to a “downstream” location; as used herein, “upstream” generally means closer to the infeed assembly **11** and “downstream” means closer to an exit assembly **12**. With regard to elements that define the work path **9**, each of those elements have an “upstream” end and a “downstream end” wherein the can bodies move from the “upstream” end to the “downstream end.” Thus, as used herein, the nature/identification of an element, assembly, sub-assembly, etc. as an “upstream” or “downstream” element or assembly, or, being in an “upstream” or “downstream” location, is inherent. Further, as used herein, the nature/identification of an element, assembly, sub-assembly, etc. as an “upstream” or “downstream” element or assembly, or, being in an “upstream” or “downstream” location, is a relative term.
[0044] Each processing station **20** has a similar width W (FIG. **3**) and the can body **1** is processed and/or formed (or partially formed), i.e., “necked”, as the can body **1** moves generally across the width W. Generally, the processing/forming occurs in/at a turret **22**. That is, the term “turret **22**”

identifies a generic turret. Each processing station **20** includes a non-vacuum starwheel **24**. As used herein, a “non-vacuum starwheel” means a starwheel that does not include, or is not associated with, a vacuum assembly that is structured to apply a vacuum to the starwheel pockets. Further, each processing station **20** typically includes one turret **22** and one non-vacuum starwheel **24**.

[0045] It is noted that the plurality of processing stations **20** are structured to neck different types of can bodies **1** and/or to neck can bodies in different configurations. Thus, the plurality of processing stations **20** are structured to be added and removed from the necker machine **10** depending upon the need. To accomplish this, the necker machine **10** includes a frame assembly **32** to which the plurality of processing stations **20** are removably coupled. Alternatively, the frame assembly **32** includes elements incorporated into each of the plurality of processing stations **20** so that the plurality of processing stations **20** are structured to be temporarily coupled to each other. The frame assembly **32** has an upstream end **34** and a downstream end **36**. Further, the frame assembly **32** includes elongated members, panel members (neither numbered), or a combination of both. As is known, panel members coupled to each other, or coupled to elongated members, form a housing. Accordingly, as used herein, a housing is also identified as a “frame assembly **32**.” Generally, each processing station **20** is structured to partially form (i.e., neck) the can body **1** so as to reduce the cross-sectional area of the can body first end **6** a predetermined amount. The processing stations **20** include some elements that are unique to a single processing station **20**, such as, but not limited to, a specific die. Other elements of the processing stations **20** are common to all, or most, of the processing stations **20**.

[0046] The transfer assembly **30** is structured to move the can bodies **1** between adjacent processing stations **20**, and typically between process turrets **22** of adjacent processing stations **20**. As shown in the example embodiment of FIG. **3**, the transfer assembly **30** includes a plurality of transfer turrets **40**. Referring now to FIGS. **5**, **6** and **9**, each transfer turret **40** includes a transfer starwheel **42** rotatable about a rotation axis **44**. The transfer starwheel **42** is configured to transfer can bodies **1** to/from a given process station **20** or between process stations **20** as the starwheel **42** rotates about axis **44** in a direction as shown by arrow **45**. Although shown as rotating in a counter-clockwise direction (i.e., a right-handed machine) in the example discussed herein, it is to be appreciated that arrangements of the disclosed concept may be likewise applied to arrangements rotating in a clockwise direction (i.e., a left-handed machine) without varying the scope of the disclosed concept. The transfer starwheel **42** is generally circular in shape and includes a plurality of peripheral pockets **46** (only some are numbered) disposed about an outer periphery (not numbered) of the transfer starwheel **42**. Each pocket **46** is adapted to receive a can body **1** (e.g., see FIG. **9**) and includes a vacuum port **48** for conveying a vacuum pressure/force to hold a can body **1** in each pocket **46** of the transfer starwheel **42** while each can body **1** is transported by the transfer starwheel **42** from an infeed point IP (shown generally in FIGS. **3** and **9**) wherein a can body **1** is received in a particular pocket **46** from an upstream processing turret **22** (or other arrangement), to an outfeed point OP (shown generally in FIGS. **3** and **9**) wherein the can body **1** received in the particular pocket **46** is released/transferred from the pocket **46** to a downstream processing turret **22** (or other arrangement), as discussed further below. In the example embodiment shown in FIGS. **5-9**, the transfer starwheel **42** is formed from an assembly of four pocket segments **50**, each segment **50** having five pockets **46**, it is to be appreciated, however, that the quantity of segments may be varied (e.g., from a single to a suitable plurality) as well as the quantity of pockets **46** defined in each segment **50** without varying from the scope of the disclosed concept. As shown in FIGS. **5** and **6**, the segment(s) **50** of the transfer starwheel **42** are selectively coupled (e.g., via a number of threaded fasteners, not numbered) to a transfer turret hub **52** such that the segments **50**, and thus the transfer starwheel **42**, can be selectively removed from the remainder of the transfer turret **40**, as discussed further below. The transfer turret hub **52** is generally disc-shaped and fixedly coupled with a transfer turret driveshaft **54** of the transfer turret **40** that is driven by a drive arrangement of the necker machine **10**. Accordingly, when the transfer turret driveshaft **54** is driven, and thus rotates about rotation axis **44**, the transfer turret hub **52** and the transfer starwheel **42** likewise rotate about rotation axis **44**.

[0047] Referring now to FIGS. **7** and **8** in addition to FIGS. **5**, **6** and **9**, the transfer turret **40** further includes a stationary vacuum assembly **56** for providing/controlling the vacuum provided to pockets **46** via vacuum ports **48** as transfer starwheel **42** rotates about rotation axis **44**. The stationary vacuum assembly **56** includes a frame **58** that is structured to be fixedly coupled to (and thus not rotate), and thus be a portion of, the frame assembly **32** of the necker machine **10** as previously discussed. The stationary vacuum assembly **56** further includes an infeed baffle **60** and an outfeed baffle **61**. Each of the infeed baffle **60** and the outfeed baffle **61** is a generally solid member, selectively fixedly coupled to the frame **58** via a respective coupling portion **62**, **63** thereof. Baffles **60** and **61** have been formed from generally Nylon material, however baffles **60** and **61** may be made from any suitable material without varying from the scope of disclosed concept, with lightweight materials being preferred due to the need for an operator to handle in removing/replacing them. In the example embodiment shown in FIGS. **6-9**, each of the infeed and outfeed baffle **60** and **61** is selectively fixedly coupled to a stationary transfer turret backer plate **64** (provided as a portion of the stationary vacuum assembly **56**) that is generally disc-shaped and fixedly coupled to the frame **58**. The infeed baffle **60** and the outfeed baffle **61** may be coupled to the frame **58**/transfer turret backer plate **64** via any suitable arrangement that provides for repeated coupling/uncoupling in the same location relative to the frame **58**/backer plate **64** (e.g., without limitation, Allen bolts or any other suitable arrangement). Each of the infeed and outfeed baffle **60** and **61** is of a sufficient thickness t (FIG. **7**) so as to generally span the gap g (FIG. **6**) between the transfer turret hub **52** and the transfer turret backer plate **64** so as to block the vacuum port(s) **48** of the pockets **46** of the transfer starwheel **42** aligned therewith, as discussed in detail below. Further, as shown in FIG. **9**, each of the infeed and outfeed baffles **60**, **61** include a leading end **60**A, **61**A, an opposite trailing end **60**B, **61**B, a curved upper surface **60**C, **61**C (having the same radius as the inner surface of the transfer starwheel **42**) extending between the leading end and the trailing end, and a lower surface **60**D, **61**D also extending between the leading end and the trailing end. Further details of the infeed and outfeed baffles **60** and **61** and purpose/function thereof is discussed below.

[0048] As shown in FIGS. **7-9**, the stationary turret backer plate **64** has a number of apertures **66** defined therein (three are shown in such example), with each aperture **66** in communication with an associated conduit **68** communicating a vacuum from a vacuum source **69** associated with the necker machine **10**. When the transfer turret hub **52** and the transfer starwheel **42** are fixedly coupled in an operating position, such as shown in FIGS. **5** and **9**, a vacuum manifold defining a stationary manifold volume **70** is created. The stationary manifold volume **70** is defined generally on either end by the transfer turret backer plate **64** and the transfer turret hub **52**, on an inner portion by the transfer turret driveshaft **54** and on an outer periphery/circumference by a cylindrical inner surface **72** (FIGS. **6** and **9**) of the transfer starwheel **42**. When the infeed baffle **60** and outfeed baffle **61** are coupled to the transfer turret backer plate **64**, the baffles **60** and **61** serve as further boundaries defining the manifold volume **70**. More particularly, the leading end **60**A, **61**A, trailing end **60**B, **61**B and lower surface **60**D, **61**D of each of the infeed baffle **60** and outfeed baffle **61** serve as further boundaries of the stationary manifold volume **70**.

[0049] As shown in FIG. **9**, when the stationary manifold volume **70** is under vacuum from vacuum source **69**, a transfer zone TZ extending a circumferential length from the trailing end **60**B of the infeed baffle **60** to the leading end **61**A of the outfeed baffle **61** is defined wherein vacuum is conveyed from the manifold volume **70** to the each of the vacuum ports **48** that are aligned therewith. Prior to passing the trailing end **60**B of the infeed baffle **60**, vacuum from the manifold volume **70** is blocked by the infeed baffle **60** and thus is not conveyed from the manifold volume **70** to the vacuum port(s) **48** of one or more pockets **46** of the transfer starwheel **42** aligned with the infeed baffle **60**. As the transfer starwheel **42** rotates (in the direction of arrow **45** in FIG. **9**) about the rotation axis **44**, the vacuum port(s) **48** of the pocket(s) **46** move from being aligned with (and thus blocked by) the infeed baffle **60** to the start of the transfer zone TZ. Once aligned with/passing along the transfer zone TZ, the vacuum port **48** of each pocket **46** conveys vacuum from the stationary manifold volume **70** to the pocket **46**, thus securing a can body **1** in the pocket **46** as the can body **1** traverses the transfer zone TZ. When the vacuum port **48** of each pocket **46** reaches the leading end **61**A of the outfeed baffle **61**, the vacuum port **48** becomes blocked by the outfeed baffle **61**, thus cutting the conveyance of the vacuum from stationary manifold volume **70** holding the can body **1** in the pocket **48**, and thus releasing the can body **1** from the pocket **46**.

[0050] In operation, it is essential for the vacuum in a pocket **46** of the rotating transfer starwheel **42** to turn on in time for a can body **1** being provided thereto at the infeed point IP to be held in the pocket **46**. Similarly, it is also essential for the vacuum in a pocket **46** of the rotating transfer starwheel **42** to turn off in time for a can body **1** to be released from the pocket **46** at the outfeed point OP. If the timing of the vacuum at either of such positions is off, i.e., not set properly for a given operating/rotational speed, the transfer of the can bodies **1** by the transfer turret **40** will not properly occur and the necking process cannot be carried out by the necking machine **10**.

[0051] To provide for operation of the transfer turret **40**, and thus the necking machine **10** at different predetermined speeds, the disclosed concept provides for the start and/or finish of the transfer zone TZ (and thus the vacuum timing at the infeed point IP and/or the outfeed point OP) to be incrementally changed and/or selectively set for a particular different operating speed. Such change is provided by replacing the infeed baffle **60** and/or the outfeed baffle **61** with another, differently dimensioned infeed baffle **60**′ and/or outfeed baffle **61**′ selected respectively, from among an array **80** of differently sized infeed baffles and/or from among an array **90** of differently sized outfeed baffles, such as shown in FIGS. **10**A and **10**B. More particularly, referring to FIGS. **9** and **10**A, the infeed baffle **60** may be replaced by a differently dimensioned infeed baffle **60**′ wherein the trailing end **60**B is spaced a different circumferential distance CD′ from the coupling portion **62** than the circumferential distance CD between the trailing end **60**B and the coupling portion **62** of the infeed baffle **60**. Such replacement may be readily carried out by breaking the transfer turret **40** down to the arrangement generally shown in FIG. **7** wherein the transfer starwheel **42** has been uncoupled from the transfer turret hub **52**, and the transfer turret hub **52** has been uncoupled from the transfer turret driveshaft **54**, thus exposing the infeed and outfeed baffles **60** and **61** along with the fasteners coupling the coupling portions **62**, **63** of each to the backer plate **64**. Similarly, the outfeed baffle **61** may be replaced by a differently dimensioned outfeed baffle **61**′ wherein the leading end **61**A is spaced a different circumferential distance CD′ from the coupling portion **63** than the circumferential distance CD between the leading end **61**A and the coupling portion **63** of the outfeed baffle **61**. After the desired infeed and/or out baffle(s) **60**′, **61**′ have been installed in place of the infeed and/or outfeed baffle(s) **60**, **61**, the transfer turret hub **52** and transfer starwheel **42** are recoupled and the transfer turret **40** is ready again for operation.

[0052] By making such change(s), the timing of the start of the transfer zone TZ (i.e., vacuum on in a pocket **46**) relative to the infeed point IP can be increased (i.e., by swapping to an infeed baffle **60**′ having a shorter circumferential distance CD′) or decreased (i.e., by swapping to an infeed baffle **60**′ having a longer circumferential distance CD′). Similarly, the timing of the end of the transfer zone TZ (i.e., vacuum off in a pocket **46**) relative to the outfeed point OP can be increased (i.e., by swapping to an outfeed baffle **61**′ having a shorter circumferential distance CD′) or decreased (i.e., by swapping to an outfeed baffle **61**′ having a longer circumferential distance CD′). In order to provide for a generally quick change to the operating speed, the infeed and outfeed baffles **60**, **61** may be provided with indicia **74** indicating the operating speed that each baffle is intended to be used. It is to be appreciated that in the example embodiment described herein that the infeed and outfeed baffles **60** and **61** are shown separated by a generally open space (not numbered), such space may be covered/filled/sealed via any suitable arrangement without varying from the scope of the disclosed concept.

[0053] From the foregoing example it is thus to be appreciated that embodiments of the disclosed concept provide transfer turret arrangements that can be operated predictably and reliably at different operating speeds.

[0054] While specific embodiments of the invention have been described in detail, it will be appreciated by those skilled in the art that various modifications and alternatives to those details could be developed in light of the overall teachings of the disclosure. Accordingly, the particular arrangements disclosed are meant to be illustrative only and not limiting as to the scope of disclosed concept which is to be given the full breadth of the claims appended and any and all equivalents thereof.

[0055] In the claims, any reference signs placed between parentheses shall not be construed as limiting the claim. The word “comprising” or “including” does not exclude the presence of elements or steps other than those listed in a claim. In any device claim enumerating several means, several of these means may be embodied by one and the same item of hardware. The word “a” or “an” preceding an element does not exclude the presence of a plurality of such elements. The mere fact that certain elements are recited in mutually different dependent claims does not indicate that these elements cannot be used in combination.

Claims

1. A transfer turret for a can necking machine, the transfer turret comprising: a transfer starwheel rotatable about a rotation axis and configured to transfer a plurality of can bodies between a first process station and a second process station, the transfer starwheel including a plurality of peripheral pockets, each pocket including a vacuum port and is adapted to receive a can body; a stationary vacuum assembly comprising: a frame; an infeed baffle fixedly coupled to the frame, the infeed baffle having a leading end and an opposite trailing end; an outfeed baffle fixedly coupled to the frame, the outfeed baffle having a leading end and an opposite trailing end; and a transfer zone that is structured to be under vacuum when the transfer turret is in use, the transfer zone extending a circumferential length from a trailing end of the infeed baffle to a leading end of the outfeed baffle; wherein when the transfer turret is in use: the transfer zone is structured to convey the vacuum to the vacuum ports of the transfer starwheel pockets that are aligned with the transfer zone to thereby retain the can bodies within the transfer starwheel pockets that are aligned with the transfer zone, and the infeed baffle and the outfeed baffle are each structured to block the vacuum to the vacuum ports of the transfer starwheel pockets that are aligned with either of the infeed baffle or the outfeed baffle.

2. The transfer turret of claim 1, wherein one or both of an angular positioning about the rotation axis and/or the circumferential length of the transfer zone is selectively changeable by: replacing the infeed baffle with a different infeed baffle having a differently positioned trailing end; and/or replacing the outfeed baffle with a different outfeed baffle having a differently positioned leading end.

3. The transfer turret of claim 2, wherein: the infeed baffle includes an infeed coupling portion for fixedly coupling the infeed baffle to the frame and which is spaced a first circumferential distance from the trailing end of the infeed baffle by a first circumferential distance; the different infeed baffle includes an infeed coupling portion for fixedly coupling the different infeed baffle to the frame and which is spaced a second circumferential distance, different than the first circumferential distance, from the trailing end of the different infeed baffle; the outfeed baffle includes an outfeed coupling portion for fixedly coupling the outfeed baffle to the frame and which is spaced a first circumferential distance from the leading end of the outfeed baffle by a third circumferential distance; and the different outfeed baffle includes an outfeed coupling portion for fixedly coupling the different outfeed baffle to the frame and which is spaced a fourth circumferential distance, different than the third circumferential distance, from the trailing end of the different outfeed baffle.

4. The transfer turret of claim 1, wherein the frame comprises a transfer turret backer plate to which

the infeed manifold and the outfeed manifold are each rigidly coupled.
5. The transfer turret of claim 4, wherein: the transfer starwheel is fixedly coupled to a transfer turret hub; and the transfer turret hub is fixedly coupled to a transfer turret driveshaft that is structured to be rotated about the rotation axis by a drive arrangement.
6. The transfer turret of claim 1, wherein the transfer starwheel comprises a plurality of segments.
7. The transfer turret of claim 6, wherein the plurality of segments consists of four segments.
8. The transfer turret of claim 1, wherein each of the infeed baffle and the outfeed baffle comprise a curved upper surface extending between the leading end and the trailing end.
9. The transfer turret of claim 8, wherein: the transfer starwheel comprises a cylindrical inner surface; and the curved upper surface of each of the infeed baffle and the outfeed baffle is cooperatively shaped to the cylindrical inner surface.
10. The transfer turret of claim 1, wherein: the frame comprises a transfer turret backer plate to which the infeed manifold and the outfeed manifold are each rigidly coupled; the transfer starwheel is fixedly coupled to a transfer turret hub; the transfer turret hub is fixedly coupled to a transfer turret driveshaft that is structured to be rotated about the rotation axis by a drive arrangement; each of the infeed baffle and the outfeed baffle comprise a lower surface extending between the leading end and the trailing end; the transfer zone is structured to be under vacuum from a stationary manifold volume in communication with the transfer zone; and the stationary manifold volume is defined: on a first end by the transfer turret backer plate; on an opposite second end by the transfer turret hub; on an inner portion by the transfer turret driveshaft; and on an outer circumference by a cylindrical inner surface of the transfer starwheel and by the leading end, trailing end, and lower surface of each of the infeed baffle and the outfeed baffle.
11. A necker machine for use in forming can bodies, the necker machine comprising: a plurality of forming stations structured to carry out forming operations on the can bodies; and a transfer assembly structured to move the can bodies between adjacent processing stations, the transfer assembly comprising a plurality of transfer turrets, each transfer turret comprising: a transfer starwheel rotatable about a rotation axis and configured to transfer a plurality of can bodies between a first process station and a second process station, the transfer starwheel including a plurality of peripheral pockets, each pocket including a vacuum port and adapted to receive a can body; a stationary vacuum assembly comprising: a frame; an infeed baffle fixedly coupled to the frame, the infeed baffle having a leading end and an opposite trailing end; an outfeed baffle fixedly coupled to the frame, the outfeed baffle having a leading end and an opposite trailing end; and a transfer zone that is structured to be under vacuum when the transfer turret is in use, the transfer zone extending a circumferential length from a trailing end of the infeed baffle to a leading end of the outfeed baffle; wherein when the transfer turret is in use: the transfer zone is structured to convey the vacuum to the vacuum ports of the transfer starwheel pockets that are aligned with the transfer zone to thereby retain the can bodies within the transfer starwheel pockets that are aligned with the transfer zone, and the infeed baffle and the outfeed baffle are each structured to block the vacuum to the vacuum ports of the transfer starwheel pockets that are aligned with either of the infeed baffle or the outfeed baffle.
12. A method of adjusting vacuum timing in a transfer turret comprising: a transfer starwheel rotatable about a rotation axis and configured to transfer a plurality of can bodies between a first process station and a second process station, the transfer starwheel including a plurality of peripheral pockets, each pocket including a vacuum port and adapted to receive a can body; a stationary vacuum assembly comprising: a frame; an infeed baffle fixedly coupled to the frame, the infeed baffle having a leading end and an opposite trailing end; an outfeed baffle fixedly coupled to the frame, the outfeed baffle having a leading end and an opposite trailing end; and a transfer zone that is structured to be under vacuum when the transfer turret is in use, the transfer zone extending a circumferential length from a trailing end of the infeed baffle to a leading end of the outfeed baffle; wherein when the transfer turret is in use: the transfer zone is structured to convey the

vacuum to the vacuum ports of the transfer starwheel pockets that are aligned with the transfer zone to thereby retain the can bodies within the transfer starwheel pockets that are aligned with the transfer zone, and the infeed baffle and the outfeed baffle are each structured to block the vacuum to the vacuum ports of the transfer starwheel pockets that are aligned with either of the infeed baffle or the outfeed baffle, the method comprising: uncoupling at least one of the infeed baffle and/or the outfeed baffle from the frame; and replacing the at least one of the infeed baffle or the outfeed baffle with a different infeed baffle having a differently positioned trailing end; and/or replacing the at least one of the infeed baffle or the outfeed baffle with a different outfeed baffle having a differently positioned leading end.

13. The method of claim 12, wherein: uncoupling the at least one of the infeed baffle and/or the outfeed baffle from the frame comprises uncoupling both of the infeed baffle and the outfeed baffle from the frame; and replacing the at least one of the infeed baffle and/or the outfeed baffle comprises replacing both the infeed baffle with the different infeed baffle having the differently positioned trailing end and replacing the outfeed baffle with the different outfeed baffle having the differently positioned leading end.