



US006634187B1

(12) **United States Patent**
Cirincione et al.

(10) Patent No.: **US 6,634,187 B1**
(45) Date of Patent: **Oct. 21, 2003**

(54) **APPARATUS FOR DELIVERING A CASED GLASS STREAM HAVING A RAISED AND SEALED ORIFICE BUSHING**

(75) Inventors: **Ronald A. Cirincione**, Sylvania, OH (US); **Garrett L. Scott**, Toledo, OH (US)

(73) Assignee: **Owens-Brockway Glass Container Inc.**, Toledo, OH (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 331 days.

(21) Appl. No.: **09/713,430**

(22) Filed: **Nov. 15, 2000**

(51) Int. Cl.⁷ **C03B 7/088**

(52) U.S. Cl. **65/145; 65/325; 65/374.11; 65/374.12**

(58) Field of Search **65/145, 325, 374.11, 65/374.12**

(56) **References Cited**

U.S. PATENT DOCUMENTS

1,603,160 A 10/1926 Soubier
1,608,967 A 11/1926 Tucker et al.
2,052,269 A * 8/1936 Woods 65/145
2,198,742 A * 4/1940 Salskov-Iverson 65/132
3,580,976 A * 5/1971 le Clerc de Bussy 373/35
4,017,294 A * 4/1977 Sanford et al. 65/326
4,600,426 A * 7/1986 Schwenninger 65/330
4,740,401 A 4/1988 Barkhau et al.
4,780,122 A * 10/1988 Schwenninger et al. ... 65/134.2
4,950,321 A 8/1990 DiFrank
5,567,218 A * 10/1996 Ladirat et al. 65/327

5,735,925 A 4/1998 Scott
5,855,640 A 1/1999 Scott et al.
5,868,812 A 2/1999 Scott
5,900,033 A * 5/1999 Gearing 65/126
5,906,666 A 5/1999 Scott et al.
6,119,484 A * 9/2000 Takei et al. 65/134.2

FOREIGN PATENT DOCUMENTS

EP 0413128 A1 2/1991

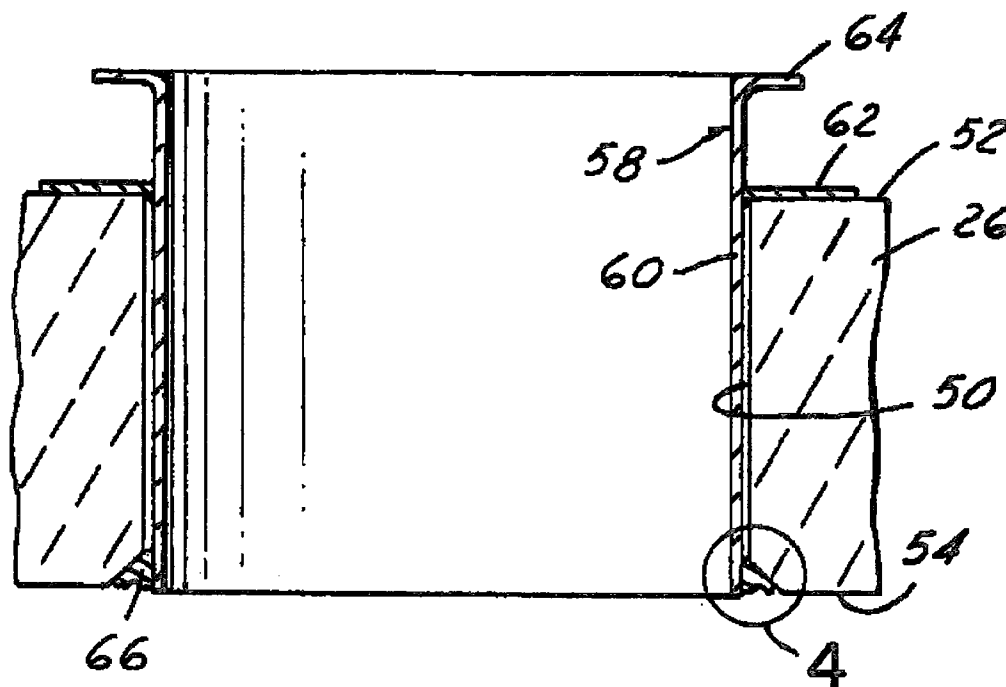
* cited by examiner

Primary Examiner—Sean Vincent

(57) **ABSTRACT**

Apparatus for delivering a cased glass stream having an inner core glass surrounded by an outer casing glass includes a first or upper orifice ring having at least one orifice for receiving core glass, and a second or lower orifice ring secured beneath the first orifice ring and having a second orifice aligned with each first orifice. A chamber for receiving casing glass is formed between the first and second orifice rings surrounding the second orifice. A bushing is received in an opening in the second orifice ring to form each second orifice in the second orifice ring. The bushing has a first radially extending flange supported on an upper surface of the second orifice ring and a bushing end spaced upwardly from the first flange for admitting casing glass from the chamber to the second orifice. The first flange thus effectively spaces the bushing end above the surface of the second orifice ring, eliminating any need for the ceramic pedestal that can erode due to casing glass flow along the surface of the second orifice ring. The flange remains in firm facing abutment with the second orifice ring surface, reducing leakage of casing glass between the bushing and the opposing surface of the second orifice ring.

2 Claims, 2 Drawing Sheets



3

FIG. 5 is an exploded sectional view of the metal orifice ring bushing in the apparatus of FIGS. 1-4; and

FIG. 6 is a bottom plan view of the ferrule for securing the bushing to the lower orifice ring in accordance with a presently preferred embodiment of the invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

The disclosures of U.S. Pat. Nos. 5,855,640 and 5,906,666 are incorporated herein by reference for purposes of background.

FIGS. 1-2 illustrate a system 10 for delivering a stream of cased glass. A first forehearth 12 delivers core glass to a spout 14 that has an opening 16 at the lower end thereof. Spout 14 is surrounded by a protective case 18, preferably constructed of non-magnetic metal such as stainless steel. A tube 20 controls delivery of core glass from spout 14 through opening 16 to and through at least one first orifice 22 carried by an upper orifice ring 24 beneath spout 14. A lower orifice ring 26 carries at least one second orifice 28 positioned beneath orifice(s) 22 and axially aligned therewith. Orifice 28 is surrounded by an annular chamber 30 formed between orifice rings 26, 28 by a pocket 32 in lower orifice ring 26. Chamber 30 communicates with lower orifice 28 by means of a lateral metering space or gap 34 between orifices 22, 28. A laterally extending passage 36 in lower orifice ring 26 is coupled by a delivery tube 38 to the opening 40 at the lower end of a casing glass delivery spout 42. Delivery tube 38 is resistance-heated by control electronics 44 for maintaining flow of casing glass to chamber 30. Upper and lower orifice rings 24, 26 are of heat-resistant ceramic construction. Upper orifice ring 24 has a coating 46 of platinum or the like for preventing erosion of the ceramic material. Upper and lower orifice rings 24, 26 preferably are provided in the form of an orifice ring assembly 48.

Each orifice 28 in lower orifice ring 26 is formed by a cylindrical opening 50 (FIGS. 2-4) that extends through orifice ring 26. The upper surface 52 of orifice ring 26 surrounding each opening 50 is essentially flat, as opposed to forming a raised pedestal as in the prior art discussed above. The lower surface 54 of orifice ring 26 has a conically countersunk portion 56 surrounding each opening 50. A metal bushing 58 is secured to orifice ring 26 within each orifice opening 50. Each bushing 58 comprises a cylindrical body 60 with opposed axially spaced ends. A circumferentially continuous first flange 62 is welded or otherwise secured to the external surface of bushing body 60, projecting radially outwardly therefrom in a plane perpendicular to the axis of the bushing at a position spaced beneath the upper end of the bushing body. A circumferentially continuous second flange 64 extends radially outwardly from the upper end of bushing body 60 spaced from and parallel to flange 62, preferably by being integrally formed with the body of the bushing. Each flange 62, 64 is of uniform radial dimension around the circumference of bushing 58. A split ferrule 66 is welded or otherwise fixedly secured to the lower end of bushing body 60. Ferrule 66 has a conical surface 68 in opposed abutment with countersunk portion 56 of orifice body undersurface 54. Thus, bushing 58 is firmly clamped to orifice ring 26 by means of bushing flange 62 in opposed abutment with upper surface 52 and ferrule surface 68 in opposed abutment with countersunk surface portion 56.

In assembly, lower orifice ring 26 is cast of suitable heat-resistant ceramic material, and opening(s) are formed in the orifice ring, either by casting or drilling. Flange 64

4

preferably is integrally formed with bushing body 60, and flange 62 is welded or otherwise secured to the body of the bushing as illustrated in FIG. 5. The lower end of bushing body 60 is then inserted through opening 50 in orifice ring 26, and split ferrule 66 is welded or otherwise secured to the lower end of the bushing body. As best seen in FIGS. 3 and 4, the outer surface of bushing body 60 is radially spaced from the opposing surface of opening 50 when the lower orifice ring assembly is cold to accommodate thermal expansion during use. The opposed conical surfaces 56, 68 at ferrule 66 accommodate axial and radial thermal expansion of bushing body 60 and ferrule 66 while maintaining opposed sliding contact between surfaces 56, 68. During use, casing glass entering chamber 30 through passage 36 is free to flow along the upper surface of pocket 32 around each bushing 28 so as to form a uniform layer of casing glass around the core glass stream. That is, core glass flows through orifice(s) 22 from forehearth 12 and spout 14, while casing glass flows from spout 42 through tube 38, passage 36, chamber 30 and gap 34 around the core glass stream, so that a cased glass stream emerges from lower orifice 28. Elimination of ceramic pedestals supporting orifice bushing 58 eliminates the problem of erosion of such pedestals and potential leakage of glass through the space between the bushing and opening 50 in lower orifice ring 26. Instead, bushing flange 62 remains in sealing contact with surface 52, greatly reducing any glass leakage.

There have thus been disclosed a method and apparatus for forming a cased glass stream that fully satisfy all of the objects and aims previously set forth. A number of modifications and variations have been disclosed. Other modifications and variations will readily suggest themselves to persons of ordinary skill in the art in view of the foregoing description. The invention is intended to embrace all such modifications and variations as fall within the spirit and broad scope of the appended claims.

What is claimed is:

1. An orifice ring assembly for an apparatus for forming a cased glass stream, comprising:

a) an orifice ring of ceramic construction having a pocket with a flat upper surface, a passage extending laterally from said pocket for receiving casing glass, and at least one opening extending through said ring from said flat upper surface,

b) a metal bushing secured in said at least one opening, said bushing having a cylindrical body with opposed ends, a first flange extending from said bushing body between said ends in facing abutment with said flat upper surface and a second flange at one of said bushing ends spaced from said flat upper surface providing an unobstructed flow of glass along said flat upper surface beneath said second flange, the other end of said bushing body being disposed adjacent to an undersurface of said orifice ring, and

c) a ferrule secured to said other bushing end in facing abutment with said undersurface and sealingly clamping said orifice ring between said ferrule and said first flange.

2. The assembly set forth in claim 1 wherein said undersurface has a conical countersunk portion surrounding said opening, and said ferrule has a conical surface in facing abutment with said conical countersunk portion for maintaining facing abutment with said conical countersunk surface portion during thermal expansion of said bushing.

* * * * *

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11)

EP 1 207 137 A3

(12)

EUROPEAN PATENT APPLICATION

(88) Date of publication A3:
24.07.2002 Bulletin 2002/30

(51) Int Cl.7: C03B 7/088, C03B 7/08

(43) Date of publication A2:
22.05.2002 Bulletin 2002/21

(21) Application number: 01126893.5

(22) Date of filing: 12.11.2001

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE TR
Designated Extension States:
AL LT LV MK RO SI

(72) Inventors:
• Cirincione, Ronald A.
Sylvania, OH 43560 (US)
• Scott, Garrett L.
Toledo, OH 43617 (US)

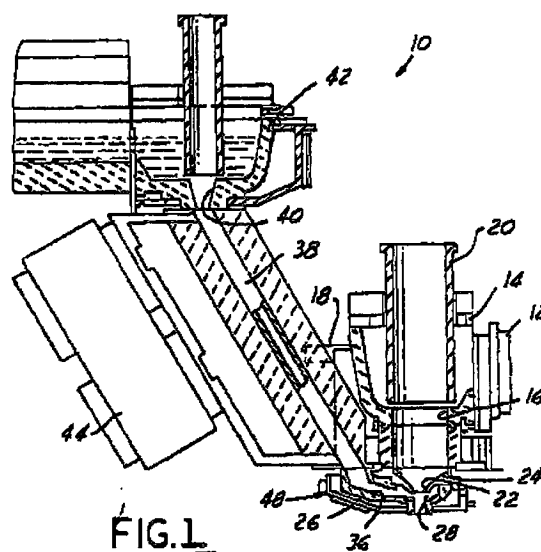
(30) Priority: 15.11.2000 US 713430

(71) Applicant: OWENS-BROCKWAY GLASS
CONTAINER INC.
Toledo, Ohio 43666 (US)

(74) Representative:
Blumbach, Kramer & Partner GbR
Patentanwälte,
Alexandrastrasse 5
65187 Wiesbaden (DE)

(54) Method and apparatus for delivering a cased glass stream

(57) Apparatus for delivering a cased glass stream having an inner core glass surrounded by an outer casing glass includes a first or upper orifice ring (24) having at least one orifice (22) for receiving core glass, and a second or lower orifice ring (26) secured beneath the first orifice ring and having a second orifice (28) aligned with each first orifice. A chamber (30) for receiving casing glass is formed between the first and second orifice rings surrounding the second orifice. A bushing (58) is received in an opening in the second orifice ring to form each second orifice in the second orifice ring. The bushing has a first radially extending flange (62) supported on an upper surface (52) of the second orifice ring and a bushing end spaced upwardly from the first flange for admitting casing glass from the chamber to the second orifice. The first flange thus effectively spaces the bushing end above the surface of the second orifice ring, eliminating any need for the ceramic pedestal that can erode due to casing glass flow along the surface of the second orifice ring. The flange remains in firm facing abutment with the second orifice ring surface, reducing leakage of casing glass between the bushing and the opposing surface of the second orifice ring.



EP 1 207 137 A3

around the core glass stream, so that a cased glass stream emerges from lower orifice 28. Elimination of ceramic pedestals supporting orifice bushing 58 eliminates the problem of erosion of such pedestals and potential leakage of glass through the space between the bushing and opening 50 in lower orifice ring 26. Instead, bushing flange 62 remains in sealing contact with surface 52, greatly reducing any glass leakage.

[0012] There have thus been disclosed a method and apparatus for forming a cased glass stream that fully satisfy all of the objects and aims previously set forth. A number of modifications and variations have been disclosed. Other modifications and variations will readily suggest themselves to persons of ordinary skill in the art in view of the foregoing description. The invention is intended to embrace all such modifications and variations as fall within the scope of the appended claims.

Claims

1. Apparatus for forming a cased glass stream having an inner core glass surrounded by an outer casing glass, comprising a first orifice ring (24) having at least one first orifice (22) for receiving core glass, a second orifice ring (26) secured beneath said first orifice ring and having at least one second orifice (28) aligned with each said first orifice, a chamber (30) for receiving casing glass, between said first and second orifice rings and surrounding said second orifice, and at least one bushing (58) received in an opening (50) in said second orifice ring to form each said second orifice (28),

characterized in that said bushing (58) has a first radially extending flange (62) supported on an upper surface (52) of said second orifice ring (26) and a bushing end spaced upwardly from said first flange for admitting casing glass from said chamber to said second orifice.

2. The apparatus set forth in claim 1 wherein said bushing (58) has a second flange (64) at said end spaced from and parallel to said first flange (62).
3. The apparatus set forth in claim 2 wherein said upper surface (52) of said second orifice ring (26) is flat providing an unobstructed path for glass flow along said upper surface through said chamber and beneath said second flange (64).
4. The apparatus set forth in claim 3 wherein said bushing (58) is dimensioned with respect to said opening (50) so as to be radially spaced from said opening when cold, heating of said bushing by glass flow expanding said bushing into radial engagement with said opening.
5. The apparatus set forth in claim 4 wherein said

bushing (58) includes a ferrule (66) engaging an undersurface (56) of said second orifice ring (26) surrounding said opening (50).

6. The apparatus set forth in claim 5 wherein said undersurface (54) has a conical countersunk portion (56) surrounding said opening, and wherein said ferrule (66) has a conical surface (68) opposing said conical countersunk portion to remain in facing engagement therewith during axial and radial thermal expansion of said bushing (58).
7. The apparatus set forth in any preceding claim wherein said upper surface (52) of said second orifice ring (26) is flat surrounding said bushing (58), and wherein said first radially extending flange (62) is in opposed facing abutment with said flat upper surface.
8. An orifice ring assembly for an apparatus for forming a cased glass stream, comprising: an orifice ring (26) of ceramic construction having a pocket (32) with a flat surface (52), a passage (36) extending laterally from said pocket for receiving casing glass, and at least one opening (50) extending through said orifice ring from said flat pocket surface (52), a metal bushing secured in said at least one opening, said bushing having a cylindrical body with opposed ends,

characterized in that said bushing (58) includes a first flange (62) extending from said bushing body between said ends in facing abutment with said flat pocket surface (52) and a second flange (64) at one of said bushing ends spaced from said pocket surface, the other end of said bushing body being disposed adjacent to an undersurface (54) of said orifice ring, and a ferrule (66) secured to said other bushing end in facing abutment with said undersurface.
9. The assembly set forth in claim 8 wherein said undersurface (54) has a conical countersunk portion (56) surrounding said opening (50), and said ferrule (66) has a conical surface (68) in facing abutment with said conical countersunk portion for maintaining facing abutment with said conical countersunk surface portion during thermal expansion of said bushing (58).
10. A method of making a lower orifice ring assembly for an orifice assembly in an apparatus for delivering a cased glass stream, said method including the steps of:
 - (a) providing a lower orifice ring (26) having a pocket (32) with a laterally extending passage (36) for receiving casing glass, and at least one opening (50) extending through said orifice ring

from said pocket,

(b) providing a bushing (58) having a cylindrical body (60) with opposed ends, a first flange (62) extending radially from said body between said ends, and a second flange (64) extending radially from said body at one of said ends,

(c) inserting said bushing (58) into said opening (50) through said pocket (32) such that said first flange (62) is in facing abutment with a surface (52) of said pocket surrounding said opening, and said second flange (64) is spaced from said surface, and

(d) securing said bushing (58) to said orifice ring (26).

11. The method set forth in claim 10 wherein said step (d) comprises the step of securing a ferrule (66) to the other end of said bushing body (60) against an opposing undersurface (54) of said orifice ring.

12. The method set forth in claim 11 wherein said undersurface (54) has a conical countersunk portion (56) surrounding said opening (50), and said ferrule (66) has an opposing conical surface (68) in facing engagement with said countersunk surface portion.

Patentansprüche

1. Vorrichtung zur Bildung eines überfangenen Glasstroms mit einem inneren Kernglas, das von einem äußeren Überfangglas umgeben ist, umfassend:

einen ersten Düsenring (24) mit mindestens einer ersten Düse (22) zur Aufnahme von Kernglas,

einen zweiten Düsenring (26), der unterhalb des ersten Düsenrings befestigt ist und mindestens eine zweite Düse (28) aufweist, die jeweils mit der ersten Düse ausgerichtet ist, eine Kammer (30) zur Aufnahme von Überfangglas zwischen dem ersten und dem zweiten Düsenring und die zweite Düse umgebend, und

mindestens eine Buchse (58), die in einer Öffnung (50) in dem zweiten Düsenring aufgenommen ist, um jeweils die zweite Düse (28) zu bilden;

dadurch gekennzeichnet, dass

die Buchse (58) einen ersten, sich radial erstreckenden Flansch (62) aufweist, der auf einer Oberseite (52) des zweiten Düsenrings (26) abgestützt ist, sowie ein Buchsenende, das im Abstand nach oben von dem ersten Flansch vorgesehen ist, um Überfangglas von der Kammer zu der zweiten Düse zuzuführen.

2. Vorrichtung nach Anspruch 1,

wobei die Buchse (58) einen zweiten Flansch (64) an dem besagten Ende im Abstand von und parallel zu dem ersten Flansch (62) aufweist.

3. Vorrichtung nach Anspruch 2,

wobei die Oberseite (52) des zweiten Düsenrings (26) flach ist, wobei sie einen freien Weg für den Glasstrom entlang dieser Oberseite durch die Kammer und unterhalb des zweiten Flansches (64) bereitstellt.

4. Vorrichtung nach Anspruch 3,

wobei die Buchse (58) in Bezug auf die Öffnung (50) derart bemessen ist, dass sie radial von der Öffnung beabstandet ist, wenn sie kalt ist, wobei die Erwärmung der Buchse infolge des Glasstroms die Buchse bis zur radialen Anlage an der Öffnung ausdehnt.

5. Vorrichtung nach Anspruch 4,

wobei die Buchse (58) einen Ringbeschlag (66) umfasst, der an einer Unterseite (56) des zweiten Düsenrings (26) um die Öffnung (50) herum anliegt.

6. Vorrichtung nach Anspruch 5,

wobei die Unterseite (54) einen konisch eingesenkten Abschnitt (56) um die Öffnung herum aufweist und wobei der Ringbeschlag (66) eine konische Oberfläche (68) gegenüberlegend dem konisch eingesenkten Abschnitt aufweist, um während der axialen und radialen thermischen Ausdehnung der Buchse (58) dem Abschnitt zugewandt und in Anlage an diesem zu verbleiben.

7. Vorrichtung nach einem der vorhergehenden Ansprüche,

wobei die Oberseite (52) des zweiten Düsenrings (26) um die Buchse (58) herum flach ist und wobei der erste, sich radial erstreckende Flansch (62) der flachen Oberseite gegenüber liegt und in Anlage an dieser angeordnet ist.

8. Düsenringanordnung für eine Vorrichtung zur Bildung eines überfangenen Glasstroms, umfassend:

einen keramisch aufgebauten Düsenring (26), der eine Ausnehmung (32) mit einer flachen Oberfläche (52) aufweist, einen Kanal (36), der sich seitlich von der Ausnehmung aus erstreckt, um Überfangglas aufzunehmen, und mindestens eine Öffnung (50), die sich von der flachen Oberfläche der Ausnehmung (52) aus durch den Düsenring hindurch erstreckt, wobei eine Metallbuchse in der mindestens einen Öffnung befestigt ist, wobei die Buchse einen zylindrischen Körper mit entgegengesetzten Enden aufweist,

[54] FURNACE OUTLET

[75] Inventors: Steve Douglas Sanford, Richmond, Ind.; Vaughn Charles Chenoweth, Hollanburg, Ohio; Duane Harold Faulkner, Cambridge City, Ind.

[73] Assignee: Johns-Manville Corporation, Denver, Colo.

[*] Notice: The portion of the term of this patent subsequent to Oct. 14, 1992, has been disclaimed.

[22] Filed: Sept. 4, 1975

[21] Appl. No.: 610,211

Related U.S. Application Data

[63] Continuation of Ser. No. 491,885, July 25, 1974, Pat. No. 3,912,488.

[52] U.S. Cl. 65/326; 13/6; 65/134

[51] Int. Cl.² C03B 5/26

[58] Field of Search 65/326, 327, 325, 134; 13/6

[56] References Cited

UNITED STATES PATENTS

2,190,296 2/1940 Richardson 65/325
3,160,492 12/1964 Chapman et al. 65/326 X
3,216,815 11/1956 Hartwig 65/326
3,558,296 1/1971 Bracken 65/326 X

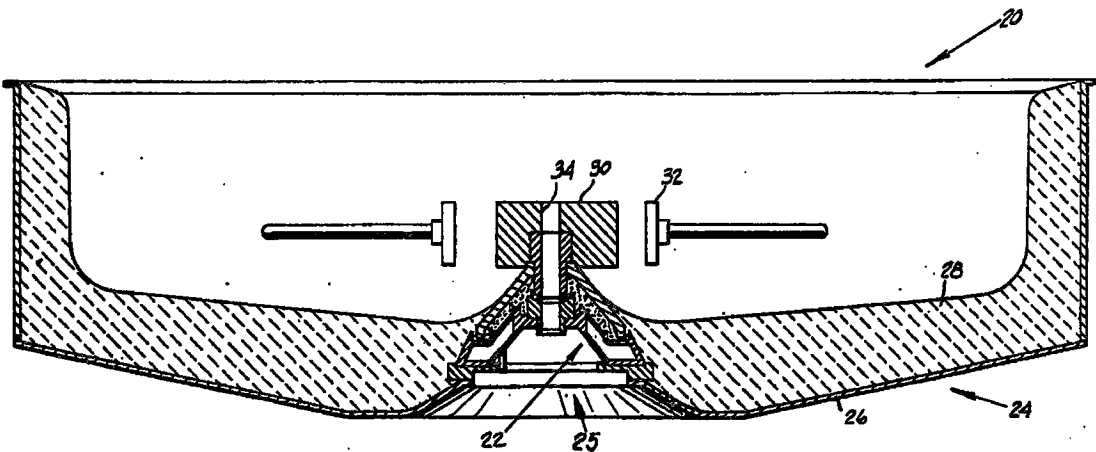
3,560,188 2/1971 Winzer 65/326 X
3,634,588 1/1972 Steitz et al. 13/6
3,912,488 10/1975 Sanford et al. 65/326

Primary Examiner—S. Leon Bashore
Assistant Examiner—Frank W. Miga
Attorney, Agent, or Firm—Robert M. Krone; Joseph J. Kelly

[57] ABSTRACT

A two-stage orifice outlet is provided for an electric furnace. The structure defining the inner orifice adjacent the interior of the furnace through which molten material passes in its initial stages of withdrawal from the furnace is made of a refractory metal to withstand the high temperatures present within the furnace and this refractory metal must be protected from the oxidizing effects of air. The outer structure defining the outer orifice is made from a more oxidation resistant material and acts as a shield to prevent the oxidation of the refractory metal inner orifice. The outer orifice is maintained below a temperature at which it will undergo rapid deterioration by the use of cooling means. The outlet described above is operated without injecting neutral or reducing gases into the area surrounding the furnace outlet as was required by prior art furnaces of this type.

15 Claims, 5 Drawing Figures





US005735925A

United States Patent [19]
Scott

[11] Patent Number: 5,735,925
[45] Date of Patent: Apr. 7, 1998

[54] METHOD AND APPARATUS FOR
DELIVERING A CASED GLASS STREAM

[75] Inventor: Garrett L. Scott, Toledo, Ohio

[73] Assignee: Owens-Brockway Glass Container
Inc., Toledo, Ohio

[21] Appl. No.: 716,918

[22] Filed: Sep. 20, 1996

[51] Int. CL⁶ C03B 5/16; C03B 7/00

[52] U.S. CL 65/121; 65/126; 65/128;
65/325; 65/326; 65/327; 65/355; 65/356

[58] Field of Search 65/121, 122, 126,
65/128, 135.1, 145, 146, 325, 326, 327,
355, 356

4,217,123 8/1980 Titchmarsh .
4,247,320 1/1981 Bansal et al. .
4,299,609 11/1981 Aulich et al. .
4,305,747 12/1981 Kirkman et al. .
4,340,160 7/1982 van Geel et al. .
4,351,664 9/1982 Bansal 65/135.1
4,381,932 5/1983 Olson et al. .
4,457,771 7/1984 Ambrogi .
4,466,818 8/1984 Brongersman .
4,740,401 4/1988 Barkau et al. .
4,875,917 10/1989 Lentz .
4,897,100 1/1990 Nice .
5,204,120 4/1993 Hirschberger .

Primary Examiner—Steven P. Griffin

[57] ABSTRACT

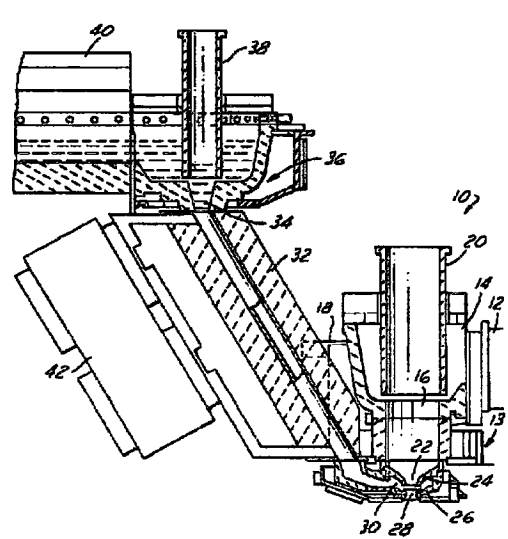
Apparatus for forming a cased glass stream having an inner core glass surrounded by an outer casing glass includes a spout for receiving core glass from a first source and delivering such glass through a first orifice. A second orifice is vertically spaced beneath and aligned with the first orifice, and is surrounded by an annular chamber that communicates with the second orifice through the gap between the first and second orifices. A tube delivers casing glass from a second source to the annular chamber in such a way that glass flows by gravity from the first and second sources through the orifices to form the cased glass stream. The core glass delivery spout includes a reservoir for receiving and holding the core glass, and having at least one lower opening of a first diameter. An orifice ring is positioned beneath the reservoir, and has at least one opening of second diameter less than the first diameter aligned with the first opening and forming the first orifice. A collar of uniform inside diameter equal to the first diameter extends from the first opening to the orifice ring, and thereby spaces the reservoir from the orifice ring so as to increase hydrostatic head pressure on glass flowing from the reservoir through the first orifice. The core glass reservoir is surrounded by a metal casing, and the casing glass delivery tube extends through a notch in the sidewall of the core glass casing. An air-cooled liner controls heat transfer from the casing glass delivery tube to the core glass reservoir.

[56] References Cited

U.S. PATENT DOCUMENTS

1,529,947 3/1925 Freese 65/121
1,622,666 3/1927 Peiler .
1,828,217 10/1931 Barker, Jr. .
1,853,843 4/1932 Bates et al. 65/326
1,946,879 2/1934 Peltier 65/121
1,963,763 6/1934 Smith 65/326
2,052,269 8/1936 Woods 65/145
2,186,718 1/1940 Ferguson 65/128
3,015,842 1/1962 Stalego .
3,078,695 2/1963 Kozak et al. .
3,160,492 12/1964 Chapman et al. 65/128
3,288,583 11/1966 Sheldon .
3,291,584 12/1966 Sheldon .
3,508,904 4/1970 Keefer .
3,554,726 1/1971 Daly .
3,558,296 1/1971 Bracken 65/128
3,580,713 5/1971 Schirm et al. .
3,582,299 6/1971 Gladwell, Jr. .
3,607,184 9/1971 Williams .
3,625,671 12/1971 Schirm et al. .
3,817,736 6/1974 Kojo et al. 65/128
3,899,315 8/1975 Siegmund .
3,960,530 6/1976 Iyengar .
4,023,953 5/1977 Megles, Jr. et al. .
4,133,664 1/1979 Aulich et al. .

34 Claims, 3 Drawing Sheets





US005855640A

United States Patent [19]
Scott et al.

[11] Patent Number: 5,855,640
[45] Date of Patent: Jan. 5, 1999

[54] APPARATUS FOR DELIVERING A COATED
GLASS STREAM FOR FORMING CHARGES
OF GLASS

[75] Inventors: Garrett L. Scott, Toledo; Jeffery P.
Henning, Sylvania, both of Ohio

[73] Assignee: Owens-Brockway Glass Container
Inc., Toledo, Ohio

[21] Appl. No.: 782,552

[22] Filed: Jan. 10, 1997

Related U.S. Application Data

[62] Division of Ser. No. 374,372, Jan. 18, 1995, abandoned.

[51] Int. Cl.⁶ C03B 7/14

[52] U.S. Cl. 65/145; 65/121; 65/128;
65/356; 65/382; 65/444; 65/491; 65/502

[58] Field of Search 65/126, 128, 129,
65/134.5, 136.3, 137, 347, 348, 29.14,
66, 145, 160, 164, 187, 327, 356, 374.13,
374.12, 382, 412, 444, 491, 492, 499, 502,
DIG. 11; 425/97, 133.1; 222/145.1, 145.7,
145.8, 146.1, 146.2

[56] References Cited

U.S. PATENT DOCUMENTS

1,622,666	3/1927	Peiler	65/126
1,828,217	10/1931	Barker, Jr.	65/126
3,015,842	1/1962	Stalego	18/2.5
3,078,695	2/1963	Kozak et al.	65/183
3,288,583	11/1966	Sheldon	65/11
3,291,584	12/1966	Sheldon	65/11
3,508,904	4/1970	Keefer	65/326
3,554,726	1/1971	Daly	65/325
3,580,713	5/1971	Schirm et al.	65/327
3,582,299	6/1971	Gladwell, Jr.	65/12
3,589,879	6/1971	Yantsev et al.	
3,607,184	9/1971	Williams	65/83
3,625,671	12/1971	Schirm et al.	65/326
3,899,315	8/1975	Siegmund	65/23
3,960,530	6/1976	Iyengar	65/3 C

4,023,953	5/1977	Megles, Jr. et al.	65/86
4,133,664	1/1979	Aulich	65/3 A
4,217,123	8/1980	Titchmarsh	65/3
4,247,320	1/1981	Bansal	65/136
4,299,609	11/1981	Aulich	65/3.13
4,305,747	12/1981	Kirkman	65/128
4,340,160	7/1982	van Geel	222/595
4,381,932	5/1983	Olson et al.	65/66
4,457,771	7/1984	Ambrogi	65/66
4,466,818	8/1984	Brongersman	65/3.13
4,740,401	4/1988	Barkhau et al.	65/126 X
4,875,917	10/1989	Lentz	65/3.11
4,897,100	1/1990	Nice	65/3.13
5,204,120	4/1993	Hirschberger	425/132
5,229,194	7/1993	Lingle et al.	428/216
5,433,765	7/1995	Muniz et al.	65/178

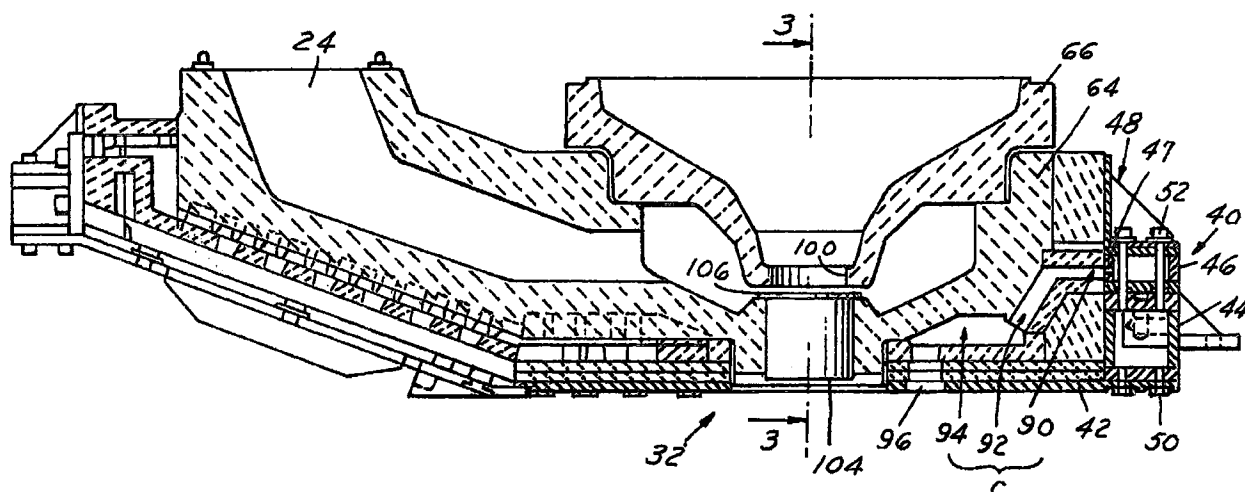
Primary Examiner—Peter Chin

Assistant Examiner—Sean Vincent

[57] ABSTRACT

A method for delivering a coated glass stream having a first inner layer and a second outer layer wherein the method includes providing a vertical orifice, delivering molten glass from a first source through the orifice, providing a gap about the orifice intermediate its upper and lower ends, delivering glass from a second source about the gap such that the glass from the second source flows through the gap to provide an outer layer about the glass from the first source as it flows through the orifice, and controlling the size and shape of the gap parallel to the flow and the size of the gap perpendicular to the flow such that the gap provides sufficient flow resistance and the gap is of sufficient size and shape to prevent clogging. The method includes the step of providing passages for the flow of the glass from the second source and controlling the size and shape of the passages such that the passages are sufficiently large to minimize flow resistance therein and to provide sufficient pressure to force the glass through the gap and provide less resistance than the metering gap. The method also includes providing a plurality of orifices, each having a gap, delivering glass from the first source through each of the orifices, delivering glass from the second source to the gaps and controlling the size and shapes of such gaps.

9 Claims, 8 Drawing Sheets



5

The lower orifice ring half 64 and upper orifice ring half 66 are herein shown as having three orifices defined by aligned upper and lower openings 100, 102 (FIG. 3). Each opening 102 is defined by a bushing 104 having a flange 106 at its upper end.

In accordance with the invention, a gap G is provided between the openings 100 and 102 (FIG. 12). This separation between the openings 100, 102 is chosen to minimize clogging. By mathematical analysis it can be shown that the resistance to flow derives not only from the separation distance G but from the length L of the passage formed by the flange 106. In the present invention, the length L of the passage is the flange width. For example, a narrow separation G and small flange L width can present the same resistance to flow as a wider separation and wider flange provided the correct relationships are maintained.

Therefore, the separation distance G is also chosen in conjunction with the width of the flange L so that the combination of the separation G and flange width L provides flow resistance sufficient to create a uniform inward flow of casing glass at all points circumferentially around each gap. This results in a concentric distribution of the casing layer to the core glass stream.

Referring to FIG. 10, the casing glass must travel longer distances from the inlet through the supply chamber reach points on the far side of the gap. This additional distance could cause more flow resistance and a reduction of casing glass to the far side. To develop the most uniform and concentric distribution of the casing glass flow around the core glass stream, the design of the metering gap G, the flange width and the supply passages L are chosen in conjunction so that the resistance to flow occurring at the metering gap G is large and the flow resistance within the supply passages is relatively small.

In accordance with the invention, the gap G is provided between the openings 100, and bushing 104 in opening 102. Glass from second source 24 flows into an annular casting glass chamber 108 defined between orifice ring halves 64, 68 (FIG. 11). The glass then flows through the gap G to surround the glass flowing from first source 22 and provide a coated stream of glass that passes downwardly from each opening 102.

Existing glass coating techniques involve the introduction of multiple glass streams in the forehearth or furnace section of the glass forming operation. This requires new equipment to be installed for the handling of main glass stream as well as the coating glasses.

In accordance with the present invention, a single orifice ring assembly and delivery system for the coating glass can be installed and may be retrofitted to existing single glass forming processes. The design allows multiple glass streams to be combined at the last moment before entering the forming machines. This introduction of glass streams is maintained external to the melting, conditioning and delivery systems of the glass manufacturing process and may be retrofitted to existing installations.

Prior existing orifice ring designs may be either electrically or gas fired. Of the gas fired versions, the level of heat input has been relatively low due to the difficulty in transferring the heat of combustion into the confined area of the orifice ring. The design of the orifice ring assembly embodying the invention yields higher temperatures in the area surrounding the orifice ring than previously attainable with gas/air firing. The orifice ring incorporates a ceramic combustion chamber adjacent to the underside of the orifice. The assembly is designed to promote high temperatures within the combustion chamber while using ordinary gas-air mixtures.

6

In accordance with the invention, a relatively conventional ceramic orifice ring rests upon a second ring of cast ceramic burner tile shapes 58, 60, 62. The underlying ring of tile forms a hollow burner chamber concentrically surrounding the orifice hole. The exposed underside of the upper ring acts as the top surface of the burner chamber so that heat is directly applied to the orifice ring. The burner tile ring is segmented to aid construction and minimize cracking from thermal expansion. The stack of burner tile pieces and overlying orifice ring are held in a metal housing. The relatively heavy metal casing acts as a structural support for the ceramic parts and maintains alignment of the gas supply manifolds with the burner chambers.

Much like a larger furnace, startup of the burner requires a gradual building of fuel input until the combustion chamber becomes incandescent and supports combustion internally. The high temperatures and turbulent flow of the combustion gasses within the chamber promote rapid combustion. A significant portion of the combustion heat is released within the chamber. The high-alumina ceramic chamber lining has a much lower heat transfer rate than a metal liner and consequently develops a higher surface temperature. Additionally the combustion chamber is backed up by insulation to further reduce heat loss and elevate internal temperatures. The internal surfaces of the burner combustion chamber become incandescent during operation and typically reach 2650 degrees Fahrenheit.

The burner chamber ceramic parts are designed to structurally support the orifice ring which is in a soaking heat environment rather than being cool on the outer side. The burner chamber tile contain fuel inlet passages that are relatively long and with abrupt changes in cross-section to cause turbulent flow and impingement of the fuel with the hot ceramic walls for rapid combustion.

The burner manifolds are purposely set as far outboard radially as possible for cooling. The burner tiles are made radially longer than they are high so as to increase the heat transfer path and make the outer edges which contact the manifolds as cool as possible. This minimizes the chance for pre-ignition within the manifolds. The long fuel inlet passages in the burner tile serve to both cool the outer edge adjacent to the manifold and preheat the fuel for rapid combustion.

The present design further includes specific placement of insulation board underneath the burner chamber to both mechanically support the orifice ring inner structure and block heat loss outwardly to the metal casing. The area above the burner chamber and near the orifice ring is three graded layers of ceramic castable cements chosen to provide mechanical support of the orifice ring, bond the burner tile edges to seal off combustion gas leaks, and to provide further insulation to block heat loss around the circumference.

In order to heat the orifice ring, three things must occur:

1. The capacity of gas burner must be sufficiently high to yield the desired heat output.
2. A major portion of the heat must be generated and retained within the orifice ring assembly.
3. Peak temperatures attained must be equal or higher than the glass temperature to offset external losses.

It can thus be seen that there has been provided a method and apparatus for delivering a coated glass stream for forming charges of glass; wherein the introduction of glass streams is maintained external to the melting, conditioning and delivery systems of the glass manufacturing process; which may be retrofitted to existing installations; and which includes an orifice ring assembly that permits the glass stream to be coated uniformly with a second glass stream.



US005868812A

United States Patent [19]
Scott

[11] Patent Number: 5,868,812
[45] Date of Patent: Feb. 9, 1999

[54] METHOD AND APPARATUS FOR
DELIVERING A CASED GLASS STREAM

[75] Inventor: Garrett L. Scott, Toledo, Ohio

[73] Assignee: Owens-Brockway Glass Container
Inc., Toledo, Ohio

[21] Appl. No.: 717,040

[22] Filed: Sep. 20, 1996

[51] Int. Cl.⁶ C03B 5/00; C03B 5/26;
C03B 7/08

[52] U.S. Cl. 65/121; 65/126; 65/128;
65/129; 65/145; 65/179; 65/326; 65/328;
65/330; 65/347

[58] Field of Search 65/121, 122, 126,
65/128, 129, 135.1, 145, 146, 179, 180,
325, 326, 327, 328, 330, 346, 331, 347

[56] References Cited

U.S. PATENT DOCUMENTS

1,680,543	8/1928	Howard	65/128
1,812,534	6/1931	Jewett	65/128
1,828,217	10/1931	Barker, Jr.	65/326
1,953,407	4/1934	Honiss	65/326
1,999,744	4/1935	Wadman	65/128
2,139,770	12/1938	Peiler et al.	65/326
2,139,911	12/1938	Peiler et al.	65/326
2,282,554	5/1942	Barker, Jr.	65/128
2,340,729	2/1944	Barker, Jr.	65/128
2,539,145	1/1951	Light	65/128
2,623,330	12/1952	Griffin	65/327
3,160,492	12/1964	Chapman et al.	65/128
3,326,655	6/1967	Penberthy	65/128
3,508,904	4/1970	Keefer	65/128

3,554,726	1/1971	Daly	65/128
4,305,747	12/1981	Kirkman et al.	65/128
4,740,401	4/1988	Barkhau et al.	65/121

FOREIGN PATENT DOCUMENTS

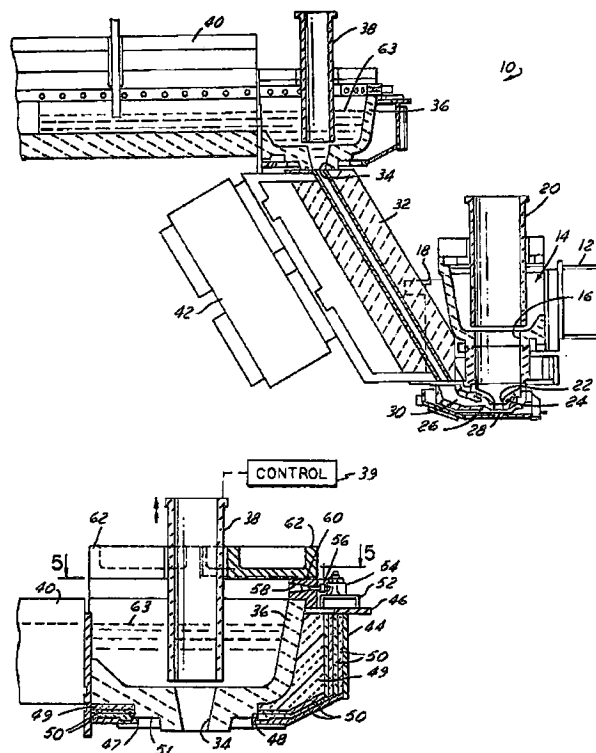
0 722 908 A2	7/1966	European Pat. Off.
0 722 907 A2	7/1996	European Pat. Off.

Primary Examiner—Steven P. Griffin

[57] ABSTRACT

Apparatus for forming a cased glass stream having an inner core glass surrounded by an outer casing glass includes a first orifice for receiving core glass from a first source. A second orifice is vertically spaced beneath and aligned with the first orifice, and is surrounded by an annular chamber that communicates with the second orifice through the gap between the first and second orifices. A spout delivers casing glass from a second source through a tube to the annular chamber in such a way that glass flows by gravity from the first and second sources through the orifices to form the cased glass stream. A plurality of gas burners are disposed in the spout above the glass pool. The casing glass delivery spout is configured for improved heat transfer to, and improved heat retention within, the casing glass pool within the spout. Specifically, the glass pool surface area is enlarged, and the glass pool depth is reduced. Free space above the glass pool is enlarged to accommodate gas flames from more burners, and to increase surface heat radiation into the glass pool. The housing that supports the spout is designed such that an annular spout support surface engages the spout radially outwardly of the spout opening(s) for reducing heat transfer to the housing from casing glass flowing through the opening.

15 Claims, 3 Drawing Sheets



1

METHOD AND APPARATUS FOR DELIVERING A CASED GLASS STREAM

The present invention is directed to delivery of a glass stream for forming glass charges or gobs for glassware manufacture, and more particularly to a method and apparatus for delivering a so-called cased glass stream in which an inner or core glass is surrounded by an outer or casing glass layer.

BACKGROUND AND SUMMARY OF THE INVENTION

It has heretofore been proposed to provide a cased glass stream for forming glassware having layered wall segments. U.S. application Ser. Nos. 08/374,371 now abandoned (refiled as Ser. No. 08/787,061, now U.S. Pat. No. 5,776,221) and 08/374,372 now abandoned (refiled as Ser. No. 08/782,552), both assigned to the assignee hereof, disclose techniques for delivering such a cased glass stream in which core glass from a first source is delivered through a first orifice. A second orifice is vertically spaced beneath and aligned with the first orifice, and is surrounded by an annular chamber that communicates with the second orifice through the gap between the first and second orifices. A heated tube delivers casing glass from a second glass source to the annular chamber that surrounds the second orifice. Glass flows by force of gravity from the first and second sources through the first and second orifices in such a way that a cased glass stream emerges from the second orifice. This cased glass stream may be sheared by conventional techniques to form individual cased glass gobs for delivery to conventional individual section glassware forming machines.

Although the techniques disclosed in the noted patent applications address and overcome problems theretofore extant in the art, further improvements remain desirable. For example, since the casing glass layer is relatively thin, it is necessary that the casing glass delivery mechanism be capable of delivering glass at very low pull rates, such as on the order of five to ten tons per day. Furthermore, the casing glass delivery spout must be capable of arresting flow for an extended period of time, such as up to forty-five minutes during installation and start-up, without the flow control tube becoming frozen to the bottom of the spout. It has been proposed in the above-noted applications to provide an array of gas burners within the casing glass spout above the glass pool for both convection and radiant heating of the glass pool in an effort to maintain an elevated glass temperature. These prior art constructions operate satisfactorily during normal operation, but are not as efficient as desired during start-up or periods of non-use. It is therefore a general object of the present invention to provide a method and apparatus of the described character for delivering a cased glass stream in which the casing glass delivery spout is adapted to deliver glass at very low pull rate, including a zero flow pull rate, for an extended period of time without freezing or malfunction.

In general, the foregoing and other objectives of the present invention are accomplished by configuring the casing glass delivery spout for improved heat transfer to, and improved heat retention within, the casing glass pool or bath within the spout. To accomplish this, a number of structural and functional improvements are implemented as compared with conventional glass spout designs. Specifically, in a casing glass spout having one or more spout tubes for controlling glass flow through one or more spout openings, the ratio of the glass pool surface area occupied by the spout

2

tube(s) to the actual overall casing glass pool surface area is not more than 15%, more preferably not more than 10%, and most preferably about 8%. This enlarged glass pool surface area, as compared with ratios on the order of 25% to 27% in conventional spout designs, promotes heat transfer into the glass pool, both directly from the gas burners and from the radiant walls of the spout and covers above the glass pool. Depth of the glass pool is also reduced as compared with conventional spouts to promote heat transfer from the pool surface through the pool to the glass surrounding the spout opening. The ratio of pool surface area to pool depth in the preferred embodiments of the invention is at least 50/1, and more preferably at least 75/1, as compared with conventional ratios on the order of 28/1 to 32/1.

Furthermore, in accordance with another aspect of the present invention, the free space above the glass pool is enlarged so as to provide more volume for gas combustion without contact of gas flames with the pool surface, and a greater area for heat transfer by radiation from the spout sidewall and cover to the surface of the glass pool. The number of gas burner ports is increased for additional heat transfer into the glass pool. The housing that supports the casing glass spout is designed such that an annular spout support surface engages the spout radially outwardly of the spout opening(s) for reducing heat transfer from casing glass flowing through the opening. Increased insulation is disposed between the outer wall surface of the casing glass spout and the inner wall surface of the housing for further reduction of heat transfer.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention, together with additional object, features and advantages thereof, will be best understood from the following description, the appended claims and the accompanying drawings in which:

FIG. 1 is a fragmentary elevational schematic diagram of a glass delivery system in accordance with a presently preferred embodiment of the invention;

FIG. 2 is a fragmentary sectional view on an enlarged scale of the casing glass delivery spout in the system of FIG. 1;

FIG. 3 is a schematic plan view of the casing glass delivery spout in FIG. 1 comparing the actual glass pool surface area to the portion of the surface area occupied by the spout tube;

FIGS. 4A and 4B are fragmentary schematic diagrams that illustrate casing glass pool depth in accordance with the present invention;

FIG. 5 is a sectional view taken substantially along the line 5-5 in FIG. 2; and

FIG. 6 is an exploded view of a portion of the gas burner mechanism illustrated in FIG. 5.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

FIG. 1 illustrates a system 10 for delivering a stream of cased glass. A first forehearth 12 delivers core glass to a spout 14 that has at least one opening 16 (usually several openings) at the lower end thereof. Spout 14 is surrounded by a protective case 18, preferably constructed of non-magnetic metal such as stainless steel. A tube 20 controls delivery of core glass from spout 14 through opening 16 to and through a first orifice 22 carried by an upper orifice ring 24 beneath spout 14. A lower orifice ring 26 carries a second orifice 28 positioned beneath orifice 22 and axially aligned

therewith. Orifice 28 is surrounded by an annular chamber 30 formed between orifice rings 24, 26. Chamber 30 communicates with orifice 28 by means of a lateral space or gap between orifices 22, 28. Annular chamber 30 is coupled by a delivery tube 32 to the opening 34 at the lower end or base of a casing glass spout 36. Spout 36 includes a delivery control tube 38, and is coupled to a casing glass forehearth 40. Delivery tube 32 is resistance heated by control electronics 42 for maintaining flow of casing glass to chamber 30. To the extent thus far described, system 10 in FIG. 1 is essentially the same as disclosed in above-noted U.S. application Ser. Nos. 08/374,371 now abandoned (refiled as Ser. No. 08/787,061 now U.S. Pat. No. 5,776,221) and 08/374,372 now abandoned. The former of such applications is directed in particular to construction of casing glass delivery tube 32, while the latter of such applications is directed in particular to construction of orifice rings 24, 26. The disclosures of such applications, both of which are assigned to the assignee hereof, are incorporated herein by reference for purposes of background.

In conventional glass delivery spout designs, flow is stopped by temporarily lowering the spout tube so that it contacts the bottom of the spout. While the flow is stopped, the orifice ring is externally plugged or is replaced with an orifice having no openings. The spout tube is then raised off of the spout bottom. This must be accomplished within a few minutes to keep the spout tube from freezing to the spout bottom. To prevent such freezing, it is conventional practice to raise the tube periodically during the orifice change to flush fresh hot glass through the spout and re-warm the exit hole. Once the spout is capped and the tube raised, convection of glass will keep the bottom glass within the spout fluid enough to reestablish flow at some later time when the external plugs are removed. However, in casing glass system 10 illustrated in FIG. 1, the exit end of casing glass spout 36 is joined to delivery tube 32, and thus not exposed for plugging or replacement. Hence, flow control tube 38 and control 39 (FIG. 2) provide the only means for stopping casing glass flow. It has been found through implementation of the present invention to be described that spout tube 38 may be rested on the bottom of spout 36 for over forty-five minutes without freezing, and thereafter raised to successfully reopen the spout for glass flow.

Casing glass spout 36 is illustrated in greater detail in FIG. 2. Spout 36 is surrounded by an outer housing 44 of metal such as steel. Housing 44 has an upper ledge 46 and a lower support ring 48. Support ring 48 engages and supports the lower end of spout 36 at a position spaced radially outwardly from the casing glass spout opening(s) 34 so as to minimize heat transfer between the casing glass flowing through opening 34 and housing 44. Specifically, support ring 48 has an upwardly extending annular flange 47 with a shoulder that engages and supports the radially outer edge of a table 51 that surrounds spout opening 34. There is thus a minimum area of contact between ring 48 and spout 36, reducing heat transfer therebetween. Support ring 48 is of a construction to reduce heat transfer therethrough. The volume or air space between spout 36 and housing 44 is filled with high-efficiency insulating material, such as multiple layers 50 of insulating material marketed under the trademark MICROTHERM and the remainder filled with aggregate insulation 49.

Upper edge 46 of case 44 supports a gas manifold 52 (FIGS. 2, 5 and 6) that is connected to a source of gas not shown. A plurality of burner elbows 54 (FIG. 2) extend from corresponding openings 55 (FIG. 6) in manifold 52, and are respectively coupled to corresponding gas nozzles 56. Each

gas nozzle 56 extends radially inwardly to engage a corresponding nozzle opening 58, which are collectively disposed in an array around four burner blocks 60. Burner blocks 60 are supported on the upper edge of casing glass spout 36 so that the gas flames extend radially inwardly over the pool or bath of glass in spout 36. A series of cover blocks 62 are supported by burner blocks 60 and close the upper end of spout 36. Spout 36 and cover blocks 62 are of ceramic construction for absorbing heat from the gas flames and re-radiating the heat toward the glass pool surface 63 within spout 36. Thus, the heat necessary to maintain molten glass temperatures within spout 36 comes from two sources, the gas burners over the spout area and the latent heat of the glass delivered from forehearth 40, typically at a temperature of 2000° to 2300° F. If this glass were flowing at sufficiently high rate through spout 36, no additional heating would be necessary. However, because of the very low pull rates involved in flow of casing glass, additional heat is provided by means of the gas burners (in addition to heat applied to delivery tube 32 by electronics 42). Heat supplied by the gas burners offsets heat losses and minimizes variations in temperature due to changes in glass flow. The burner flames generate heat over the bath of molten glass in the free space between molten glass surface 63 and cover blocks 62. The burner flames should not impinge directly on the surface of the molten glass, which might cause the undesirable generation of bubbles.

FIG. 3 illustrates exposed surface area of the glass pool within spout 36 as compared with the surface area occupied by spout tube 38. In accordance with one aspect of the present invention, the ratio of the surface area occupied by tube 38 to the actual surface area of the glass pool within spout 36 (i.e., excluding the tube area) does not exceed 15%, more preferably does not exceed 10%, and most preferably is about 8%. In the specific example illustrated in FIG. 3, the area occupied by tube 38 is 33 square inches, while the molten bath surface area within spout 36 surrounding but not including tube 38 is 401 square inches, a ratio of about 8.2%. These preferred ratios compare with ratios of about 24%, to 27% typical in conventional spouts. Increasing the surface area of the molten glass bath relative to the volume of the bath increases the efficiency of radiative heating of the glass bath.

In accordance with another feature of the present invention illustrated in FIGS. 4A and 4B, the depth of the glass bath is reduced as compared with the prior art. This improves heat transfer from glass surface 63 to the bottom of the spout 36. The ratio of the glass surface area (excluding tube 38) to glass depth preferably is at least 50/1, and most preferably at least 75/1. (All ratios are based upon measurements in like units, such as square inches to square inches, square inches to inches, etc.) In the example illustrated in FIG. 4A, the glass bath or pool has a surface area of 401 square inches and a depth of 7.5 inches, resulting in a ratio of about 53.5/1. In the example of FIG. 4B, the ratio of the 401 square inch surface area to a depth of 4.25 inches is about 94.4/1.

Decreasing the depth of the glass pool as discussed immediately above has the additional advantage, in accordance with another aspect of the present invention, of increasing the free space above the glass pool for gas combustion and heating. By increasing the free space, the sidewalls of the spout become exposed and cooperate with the cover blocks to contribute to radiative surface heating of the glass bath. That is, there is additional surface area for absorption of heat from the burner flames, and corresponding additional surface area for re-radiation of heat to the



US005900033A

United States Patent [19]
Gearing

[11] Patent Number: 5,900,033
[45] Date of Patent: May 4, 1999

[54] APPARATUS AND METHOD FOR
IMPROVED OPTICAL GLASS GOB
PREFORM PRODUCTION

[75] Inventor: Daniel R. Gearing, Rochester, N.Y.

[73] Assignee: Eastman Kodak Company, Rochester,
N.Y.

[21] Appl. No.: 08/866,854

[22] Filed: May 30, 1997

Related U.S. Application Data

[60] Provisional application No. 60/027,733, Oct. 3, 1996.

[51] Int. Cl.⁶ C03B 7/00; C03B 7/08

[52] U.S. Cl. 65/126; 65/127; 65/324;
65/325; 65/375

[58] Field of Search 65/66, 122, 123,
65/126, 127, 128, 129, 207, 221, 303, 324,
325, 375, 333, 21.1, 142, 225, 304, 330;
222/575, 566, 571; 137/801, 802; 138/177;
141/392; 422/99

[56] References Cited

U.S. PATENT DOCUMENTS

1,458,834 6/1923 Lott .
1,675,273 6/1928 Keller .
1,790,984 3/1931 Greer .
3,119,679 1/1964 Seymour .
3,130,028 4/1964 Seymour .
3,211,196 10/1965 Rozinak .
3,271,126 9/1966 Jenkins .

3,293,017 12/1966 Jenkins .
3,351,449 11/1967 Ambrogi .
3,833,347 9/1974 Angle et al. .
3,874,866 4/1975 Iacovazzi et al. 65/164
4,139,677 2/1979 Blair et al. .
4,168,961 9/1979 Blair .
4,460,398 7/1984 Sasaki .
4,832,725 5/1989 Rehring .
5,114,456 5/1992 Weisenburger et al. .
5,540,746 7/1996 Sasaki et al. .
5,709,723 1/1998 Gearing .

FOREIGN PATENT DOCUMENTS

97202897 9/1997 European Pat. Off. .
05052979 2/1993 Japan .
07002270 1/1995 Japan .
1131746 5/1966 United Kingdom .

Primary Examiner—Steven P. Griffin

Attorney, Agent, or Firm—Mark G. Bocchetti

[57] ABSTRACT

A gob formation device and method for improved production of molten glass preforms for use in the precision glass molding of optical glass elements. The device is a dispensing tip which is attached to a stem extending from a working crucible containing a supply of molten glass. The dispensing tip includes a longitudinal bore through which the molten glass flows, and a downwardly projecting gob formation surface located at a distal end of tip. The downwardly projecting gob formation surface is preferably convex which aids in achieving greater uniformity of mass in the gob formation process as well as improving preform internal quality.

9 Claims, 3 Drawing Sheets

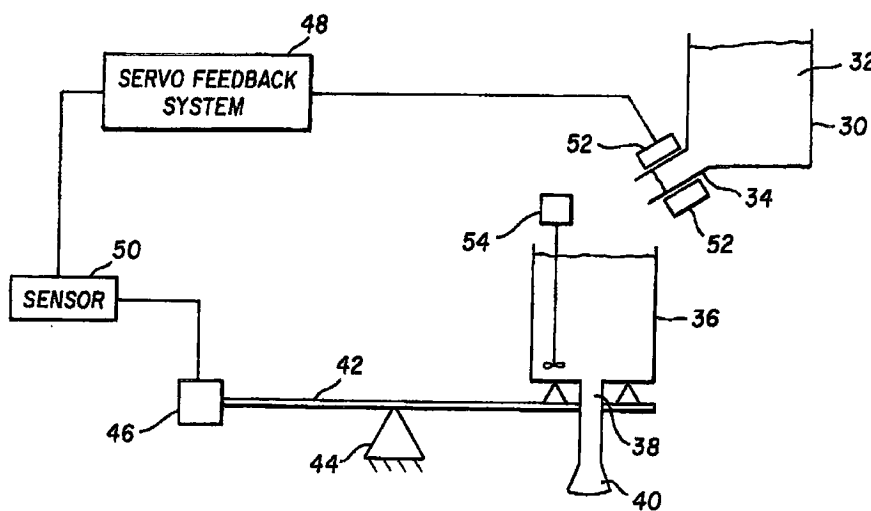


Fig 3

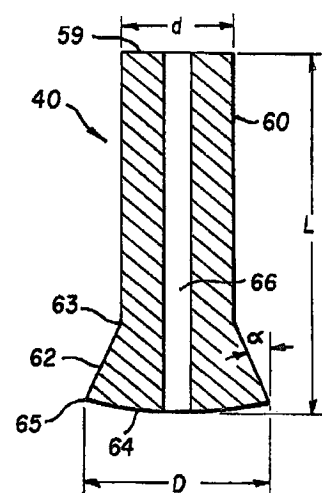


Fig 4

In the production of molten preforms which are repeatable in size and have good internal quality, it is necessary to consider not only tip geometry but also the wettable characteristics of the particular glass being used. Wettability is the degree to which a solid is wetted by a liquid and is measured by the force of adhesion between the two phases and evidenced by the angle formed at the interface junction with air. In the production of glass preforms, the solid is the material from which the tip is made and the liquid is the molten glass. It is necessary to consider wettability in tip design because excess glass clinging to the outer circumference of the tip can cause problems relating to quality (striae) as well as weight control.

Typically, the material of choice for the tip is a platinum alloy. There are several optical glass types which have been observed to be non-wetting to platinum. In these cases, a straight wall of the tip design such as shown in FIG. 1a is acceptable thereby producing a gob 24 which is repeatable in size and has good internal quality. With those glasses which are very wetting, they produce the undesirable phenomenon depicted in FIG. 1b wherein the portion of the gob 26 creeps up the outside surface of tip 10. This can result in striae and size variability. The tip 12 shown in FIG. 2 is a prior art solution to the wetting phenomenon and results in the production of a gob 28. Glass still wets the outer surface but will not creep over and around circular edge 22, and therefore, circular edge 22 acts as a wetting limit. However, glass still wets the cylindrical surface 20. Further, because the angle of undercut to produce circular edge 22 is as sharp as possible, for small tips 12, this geometry is difficult to machine. In such cases, the use of a platinum/gold alloy instead of pure platinum will sometimes produce the desired wetting characteristics.

Turning next to FIG. 3, there is shown a schematic of an apparatus for producing gobs of molten glass. That apparatus includes a reservoir crucible 30 which holds a supply of molten glass 32. Reservoir crucible 30 is provided with an outlet stem 34 which feeds molten glass from the reservoir crucible 30 to a working crucible 36. The working crucible 36 has a discharge nozzle 38 extending from the bottom thereof. Attached to the discharge nozzle 38, preferably by welding, is the gob dispensing tip 40. The discharge nozzle 38 with its tip 40 are fabricated with the precise geometry in order to assist in defining a flow rate of molten glass therefrom and in order to define a repeatable gob volume. The working crucible 36 is supported at one end of a balance system including a beam 42 spanning a fulcrum 44. At the opposite end of beam 42 is a counterweight 46 as the weight of the working crucible 36 decreases, additional molten glass from the reservoir crucible 30 is delivered in a controlled manner to the working crucible 36. A servo feedback system 48 receives a signal from a sensor 50 sensing the position of counterweight 46. In such manner, as the working crucible 36 is depleted of molten glass, the servo feedback system 48, through sensor 50, detects the low mass of molten glass in the working crucible 36 and thereby produces a signal that regulates heat radiated from heater 52 positioned proximate to outlet stem 34. This temperature regulation of outlet stem 34 of the reservoir crucible 30 acts to meter the flow of molten glass 32 from the reservoir crucible 30 thereby replenishing molten glass to the working crucible 36. In this manner, the pressure head within working crucible 36 and, more particularly, at tip 40 is held relatively constant. Thus, the flow rate of molten glass through discharge nozzle 38 and tip 40 can be controlled to be substantially uniform over an extended period of time. The uniform flow rate in combination with the geometry of

the tip 40 ensures that the gob size is both repeatable and of good internal quality. For purposes of uniformity, it is beneficial to provide a supplemental heating device in close proximity to the discharge nozzle 38 and tip 40. The working crucible 36 maybe equipped with a stirring mechanism 54 in order to avoid the formation and entrainment of bubbles in the molten glass within working crucible 36.

Gobs are typically referred to as small gobs or large gobs. Usually, large gobs weigh one (1) gram and above. To make small gobs, the temperature controls on the tip 40 are set so that the molten glass drips to form drops or gobs of a predetermined and repeatable size. The gobs are dropped onto a catching tool (not shown).

Looking next at FIG. 4 there is shown in cross section the preferred embodiment of the tip 40 of the present invention. As with the prior art tips 10, 12 as depicted in FIGS. 1a, 1b and 2, tip 40 is preferably attached at a proximal end 59 to stem 38 by means of welding. Tip 40 includes a cylindrical portion 60 and a frusto-conical portion 62. Frusto-conical portion 62 includes a minor circumferential edge 63 and a major circumferential edge 65. The frusto-conical portion 62, which resides at the distal end of tip 40, terminates in a convex gob formation surface 64. There is, of course, a longitudinal bore 66 through tip 40. The term "convex" as used herein is intended to mean a curved form which bulges outwardly.

By way of example, tip 40 as depicted in FIG. 4 has been used to produce ball shaped gobs from an optical glass identified as Hoya TAC-4 as manufactured by Hoya Corporation of Tokyo, Japan. Each gob produced weighed $437 \text{ mg} \pm 7 \text{ mg}$. The temperature of the molten glass in the working crucible was 1200° C . The temperature in the tip was between 1000° C . and 1100° C . The dimensions of the tip 40 used for this example were such that the cylindrical portion 60 had a diameter (d) of 0.312 inches. The tip 40 had a length (L) of 0.700 inches. The diameter (D) of the base of the frusto-conical portion 62 was 0.435 inches. The radius of the convex gob formation surface was 1.00 inches. The angle (α) of the frusto-conical portion 62 to vertical was 25 degrees. The diameter of bore 66 was 0.040 inches.

An alternative embodiment tip 80 is depicted in FIG. 5. The alternative embodiment tip 80 includes a major cylindrical portion 82 and a minor cylindrical portion 84. Minor cylindrical portion 84 terminates in a convex gob formation surface 86. There is a longitudinal bore 88 through tip 80. This alternative embodiment tip 80 has been used successfully to form ball shaped gobs having a weight of $338 \text{ mg} \pm 6 \text{ mg}$ using Hoya TAF-3 as manufactured by Hoya Corporation of Tokyo, Japan. The temperature of the molten glass in the working crucible was 1200° C . The temperature in the tip was between 1000° C . and 1100° C . The dimensions of this alternative embodiment tip 80 for this example were such that the tip had an overall length (L) of 0.600 inches, the length (l) of the major cylindrical portion was 0.400 inches, the diameter of the major cylindrical portion was 0.312 inches, the diameter of the minor cylindrical portion 84 was 0.285 inches, and the radius of the convex formation surface 86 was 0.800 inches.

Looking next at FIG. 6 there is shown yet another alternative embodiment tip 90. By way of example, this alternative embodiment tip 90 has been used successfully to generate ball shaped gobs or preforms from Hoya TAC-4 crown glass as manufactured by Hoya Corporation of Tokyo, Japan. The ball shaped preforms had a consistent weight of $340 \text{ mg} \pm 7 \text{ mg}$. In the production of such gobs, the temperature in the working crucible 36 was 1200° C . and the



US00590666A

United States Patent [19]
Scott et al.

[11] **Patent Number:** **5,906,666**
[45] **Date of Patent:** **May 25, 1999**

[54] **METHOD AND APPARATUS FOR DELIVERING A CASED GLASS STREAM HAVING IMPROVED RESISTANCE TO HIGH-TEMPERATURE EROSION**

[75] **Inventors:** **Garrett L. Scott, Toledo; Philip D. Perry, Perrysburg, both of Ohio**

[73] **Assignee:** **Owens-Brockway Glass Container Inc., Toledo, Ohio**

[21] **Appl. No.:** **08/991,764**

[22] **Filed:** **Dec. 16, 1997**

[51] **Int. Cl.⁶** **C03B 17/00; C03B 17/02**

[52] **U.S. Cl.** **65/145; 65/121; 65/374.11; 65/374.12**

[58] **Field of Search** **65/121, 145, 374.11, 65/374.12**

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,740,401 4/1988 Barkhau et al. 428/34.6

FOREIGN PATENT DOCUMENTS

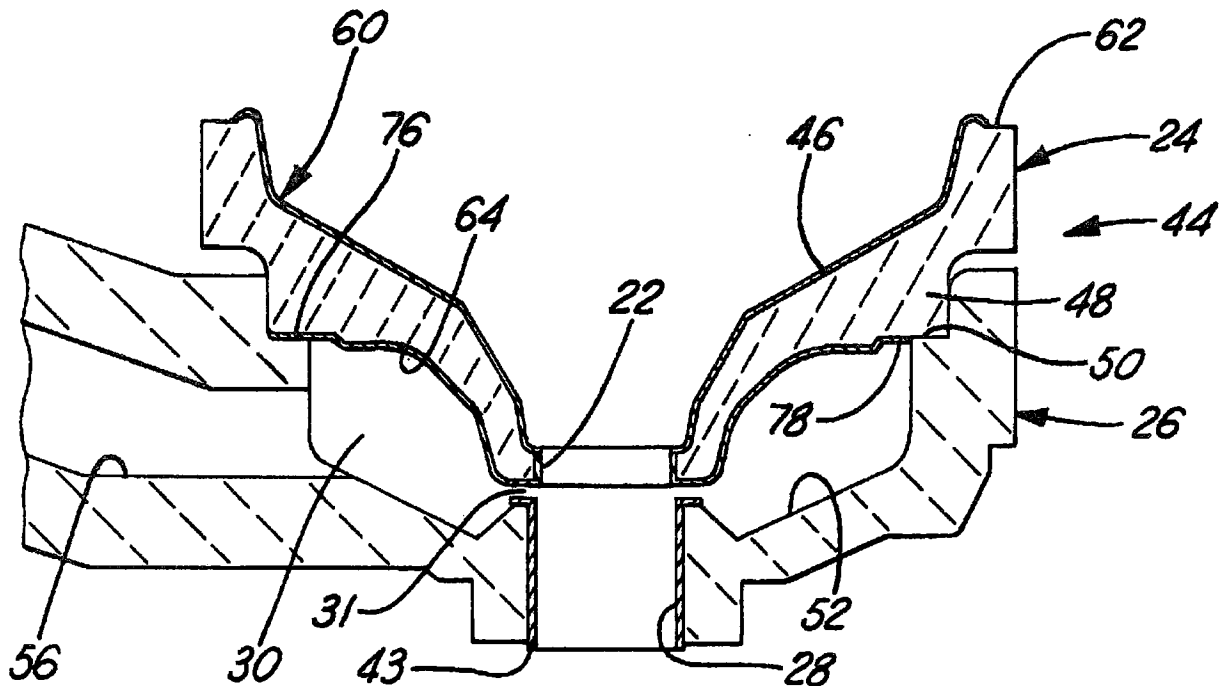
0722907 7/1996 European Pat. Off. .
0722908 7/1996 European Pat. Off. .

Primary Examiner—Stanley S. Silverman
Assistant Examiner—Sean Vincent

[57] **ABSTRACT**

Apparatus for forming a cased glass stream having an inner core glass surrounded by an outer casing glass includes a first orifice for receiving core glass from a first source, and a second orifice vertically spaced beneath and aligned with the first orifice. A chamber surrounds the second orifice and communicates with the second orifice through a metering gap between the first and second orifices. Casing glass is delivered from a second source to the chamber such that glass flows by gravity through the orifices from the first and second sources to form the cased glass stream. The first and second orifices are disposed in respective first and second orifice rings of refractory composition. The first orifice ring has a peripheral flange and an interior passage for glass flow from the first source to the first orifice. The second orifice ring has a peripheral ledge on which the flange rests, and a pocket for cooperating with the underside of the first orifice ring to form the chamber that surrounds the metering gap. At least the underside of the first orifice ring, and preferably the underside of the first orifice ring, the first orifice and the glass flow passage through the first orifice ring, includes a continuous layer of high-temperature erosion-resistant metallic composition such as platinum.

6 Claims, 3 Drawing Sheets



3

FIG. 9 is a fragmentary view in an enlarged scale of the portion of FIG. 8 within the circle 9.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIGS. 1 and 2 illustrate a system 10 for delivering a stream of cased glass. A first forehearth 12 delivers core glass to a spout 14 that has an opening 16 at the lower end thereof. Spout 14 is surrounded by a protective case 18, preferably constructed of non-magnetic metal such as stainless steel. A tube 20 controls delivery of core glass from spout 14 through opening 16 to and through at least one first orifice 22 carried by an upper orifice ring 24 beneath spout 14. A lower orifice ring 26 carries at least one second orifice 28 positioned beneath orifice(s) 22 and axially aligned therewith. Orifice 28 is surrounded by an annular chamber 30 formed between orifice rings 22, 26. Chamber 30 communicates with orifice 28 by means of a lateral metering space or gap 31 between orifices 22, 28. Annular chamber 30 is coupled by a delivery tube 32 to the opening 34 at the lower end of a casing glass spout 36. Spout 36 includes a delivery control tube 38, and is coupled to a casing glass forehearth 40. Delivery tube 32 is resistance-heated by control electronics 42 for maintaining flow of casing glass to chamber 30. A platinum sleeve 43 is mounted on orifice ring 26 to form each orifice 28. To the extent thus far described, system 10 in FIGS. 1 and 2 is essentially the same as disclosed in above-noted Published European Applications EPO722907A2 and EPO722908A2. The former of such applications is directed in particular to construction of casing glass delivery tube 32, while the latter of such applications is directed in particular to construction of orifice rings 24, 26. The disclosures of such applications, both of which are assigned to the assignee hereof, are incorporated herein by reference for purposes of background.

As illustrated in FIGS. 2-9, orifice rings 24, 26 preferably are provided in the form of an orifice ring housing assembly 44. Upper orifice ring 24 has a peripheral flange 48 and a central passage 46 through which core glass flows to three laterally aligned orifices 22 (in a currently preferred triple-gob implementation). Flange 48 rests upon an upwardly facing shoulder or ledge 50 (FIG. 2) on lower orifice ring 26 and is fastened thereto by means not shown. A pocket 52 (FIG. 2) in lower orifice ring 26 cooperates with the underside or undersurface 54 of upper orifice ring 24 to form chamber 30. A passage 56 (FIG. 2) extends in lower orifice ring 26 laterally and upwardly from chamber 30 for connection to casing glass delivery tube 32 (FIG. 1). Orifice rings 24, 26 are preferably of high-temperature refractory composition. It has been found during operation of system 10 that high-temperature core glass flow through passage 46 and orifices 22, and high-temperature casing glass flow through chamber 30, metering gap 31 and orifice 28, cause severe erosion of the refractory material of upper orifice ring 24. The areas of most serious erosion are within passage 46 immediately above orifices 22, and the underside of ring 24 immediately beneath orifices 22 contiguous with gap 31. At glass flow temperatures of 2,000° F., erosion rates as high as 0.007 inches per day have been noted. This high erosion is believed to be caused by a soaking heat in the refractory material of upper orifice ring 24 due to the fact that high-temperature glass flows both inside of and outside of the orifice ring material. Stated differently, while orifice rings in conventional uncased glass manufacturing applications typically are externally surrounded by ambient air that allows heat transport through the refractory material, the lower

4

portion of upper orifice ring 24 beneath flange 48 is surrounded both internally and externally by high-temperature flowing glass, thus allowing no heat transfer through the material. This soaking heat is believed to increase permeation of molten glass into the porous ceramic material of the orifice ring, greatly increasing the tendency to erode the refractory material.

In accordance with the present invention, it has been found that this erosion of the refractory material of the upper orifice ring, with consequent loss of control of the amount of glass metered through gap 31, is greatly reduced by lining the entire interior and underside of the upper orifice ring with a continuous layer 60 of high-temperature erosion-resistant metallic composition such as platinum. In particular, layer 60 covers the entire interior of passage 46 from the upper surface 62 that seats against core glass flow spacer 64 (FIG. 1), along the compound frusto-conical interior of passage 46, to and through orifices 22. At upper surface 62, layer 60 is feathered at 70 over a continuous annular bead 72 that seats against spacer 64, as best seen in FIGS. 4, 8 and 9. Layer 60 continues through orifices 22 to and along underside 54 of upper orifice ring 24 to and onto flange 48. Preferably, layer 60 extends at 76 between flange 48 of upper orifice ring 24 and ledge 50 of lower orifice ring 26 to the edge of flange 48 at least at that portion of the flange that overlies casing glass flow passage 56, as best seen in FIGS. 2-4 and 6. Around the remainder of the periphery of underside 54, layer 60 is feathered at 78 to terminate at ledge 50, as best seen in FIGS. 2-5 and 8. In situations where platinum layer 60 was terminated at the edge of ledge 50 above passage 56, it was found that the flow of casing glass through passage 56 and chamber 30 caused erosion of the refractory material of upper orifice ring 24 around the edge of the platinum layer immediately above the opening of passage 56 into chamber 30.

Platinum layer 60 may be either sprayed onto orifice ring 24, or provided as one or more separate sheets of platinum that are formed onto and bonded to the refractory material. A sprayed layer thickness about 0.005 to 0.007 inches is preferred. Provision of layer 60 as described has been found to extend the useful life of the upper orifice ring to on the order of six to nine months. This may be compared with a useful life of as little as three weeks without the platinum layer.

We claim:

1. An apparatus for forming a cased glass stream having an inner core glass surrounded by an outer casing glass, said apparatus including means for delivering core glass from a first source through a first orifice, means forming a second orifice vertically spaced beneath and aligned with said first orifice with a chamber surrounding said second orifice and communicating with said second orifice through a metering gap between said first and second orifices, and means for delivering casing glass from a second source through a first passage having an outlet leading into said chamber such that glass flows by gravity through said orifices from said first and second sources to form said cased glass stream,

said first orifice being disposed in a first orifice ring of refractory composition having a peripheral flange and an interior second passage for glass flow from said first source to said first orifice, said second orifice being disposed in a second orifice ring of refractory composition having a peripheral ledge on which said flange is mounted and a pocket for cooperating with an underside of said first orifice ring to form said chamber, said underside of said first orifice ring including a layer over said refractory composition of high-temperature

68
B

B

material de cerámica de la cámara donde se almacena temporalmente el vidrio fundido.

- El problema planteado en esta solicitud es satisfacer la necesidad de evitar que se erosionen los orificios por donde circula el vidrio fundido para formar el vidrio de envoltura.
- Para solucionar este problema técnico la solicitud en estudio proporciona un cojinete que se monta sobre el orificio y que tiene dos bridas espaciadas entre sí de tal forma que la corriente de vidrio se levanta por encima de la superficie del anillo del orificio. Adicionalmente, se monta una férula que protege la parte inferior del extremo del cojinete y evita la erosión en este extremo.
- Clasificación Internacional de Patentes (IPC): C03B 7/088, 7/08

3. De la solicitud de Patente

Descripción (artículo 28 D. 486)

Durante el análisis del texto de la descripción y de las ilustraciones anexadas, se observaron los siguientes defectos:

- 1) El capítulo descriptivo no indica el nombre de la invención.
 - 2) En la página 1, folio 6, aparece por primera vez una expresión numérica (4,740,401) en la cual no se emplea la coma decimal, de uso obligatorio en Colombia.
 - 3) En la página 3, folio 8, aparece la expresión *La superficie inferior ... es contra sumidero cónicamente* que carece de sentido.
 - 4) En la misma página 3, aparece la expresión *la férula permanece en choque de sello* que, igualmente, carece de sentido.
 - 5) En la página 4, folio 9, aparece la expresión *una férula está asegurada (...) en choque de enfrentamiento*, que, asimismo, carece de sentido. Se anota que expresiones similares a las anteriores -alusivas a choques- aparecen en diferentes partes de la solicitud, por lo que el solicitante debe hacer una revisión concienzuda del texto.
 - 6) En la página 6, folio 11, aparece la expresión *es calentado por resistencia mediante electrónicos de control* que carece de sentido.
- La descripción no cumple con los requisitos de claridad y divulgación completa, lo que dificulta o impide su comprensión y ejecución de acuerdo al Art. 28 de la Decisión 486

Reivindicaciones (artículo 30 D 486)

Durante el análisis del texto de las reivindicaciones se observaron los siguientes defectos:

- 1) En la reivindicación 1, folio 14, aparece la expresión *tiene un vidrio de núcleo interno* que, según el contexto, debería ser *tiene un núcleo de vidrio*, simplemente, porque el núcleo siempre es interno y porque se especifica qué clase de núcleo es.
- 2) En la misma reivindicación 1 aparece la expresión *rodeado por un vidrio de envoltura exterior* que debería ser *rodeado por una envoltura de vidrio*, ya que el calificativo exterior sobra y porque se especifica qué clase de envoltura es.
- 3) En la misma reivindicación 1 aparece la expresión *dichos primero y segundo anillos de orificio que rodean dicho segundo orificio* que carece de

sentido porque sólo uno de los anillos es el que rodea al segundo orificio: el segundo anillo.

- 4) La reivindicación 4, folio 15, carece de sentido.
- 5) En la reivindicación 7, folio 15, aparece por primera vez en el capítulo reivindicatorio una expresión relativa a un choque que, como se vio arriba, carece de sentido, según el contexto. En la reivindicación 8, folios 15 y 16, también se encuentra una expresión que se objeta por la misma razón y lo mismo ocurre en las reivindicaciones 10 y 11, folios 16 y 17.
- 6) En la reivindicación 12, folio 17, aparece la expresión *acople de enfrentamiento* cuyo significado no está claro.

- Debe entenderse que las reivindicaciones dependientes de las reivindicaciones objetadas son, asimismo, objetadas, por razones análogas.
- Las reivindicaciones no cumplen con los requisitos de definición, claridad y concisión de acuerdo al Art. 30 de la Decisión 486.

Se deben presentar, entonces, nuevos capítulos descriptivo y reivindicatorio, ambos completos, donde se hayan corregido todas las objeciones que se han hecho arriba. Esto con el fin de evitar -cuando solo se presentan algunas páginas sueltas corregidas- que el lector tenga que desplazarse desde un sitio a otro de la solicitud y luego regresar a donde estaba antes sin perder la ilación de la lectura, porque esto produce confusión y afecta negativamente la claridad de dichos capítulos.

4. Determinación del Estado de la Técnica

- La fecha que se ha tenido en cuenta para determinar el Estado de la Técnica es la

Fecha de presentación de la solicitud prioritaria 2000-11-15

- Se realizó la búsqueda en el estado de la técnica de documentos relacionados con la solicitud teniendo en cuenta la fecha indicada; y durante la búsqueda de anterioridades se encontraron los siguientes documentos, que forman parte de la familia de patentes de la presente solicitud: Patente US 6 634 187 B1 del 03-10-21; publicación EP 1 207 137 A3 del 02-07-24 y patente EP 1 207 137 B1 del 05-03-30. Se anexa la copia de las primeras páginas de estos documentos junto con la copia del Informe de Búsqueda Europeo, la copia del capítulo reivindicatorio admitido por la USPTO y la copia del capítulo reivindicatorio admitido por la Oficina Europea, en su versión en inglés. También se encontraron los siguientes documentos que forman parte del estado de la técnica más cercano al objeto de la solicitud:

n.º	Documento	Título	Fecha de publicación
D1	Patente US 4 017 294, cuyos inventores son Steve Douglas Sanford, Vaughn Charles Chenoweth y Duane Harold Faulkner quienes le cedieron sus derechos a la Johns-Manville Corporation	«Furnace outlet»(Una salida para horno)	1977-04-12

n.º	Documento	Título	Fecha de publicación
D2	Patente US 4 950 321, cuyo inventor es Frank J. DiFrank, quien le cedió sus derechos a la Owens-Illinois Glass Container, Inc.	«Ceramic orifice ring»(Un anillo para orificio de cerámica)	1990-08-21
D3	Patente US 5 735 925, cuyo inventor es Garrett L. Scott, quien le cedió sus derechos a la Owens-Brockway Glass Container, Inc.	«Method and apparatus for delivering cased glass stream»(Un método y un aparato para suministrar una corriente de vidrio de envoltura)	1998-04-07
D4	Patente US 5 855 640, cuyos inventores son Garrett L. Scott y Jeffery P. Henning, quienes le cedieron sus derechos a la Owens-Brockway Glass Container	«Apparatus for delivering a coated glass stream for forming charges of glass»(Un aparato para suministrar una corriente recubierta de vidrio para formar cargas de vidrio)	1999-01-05
D5	Patente US 5 868 812, cuyo inventor es Garrett L. Scott, quien le cedió sus derechos a la Owens-Brockway Glass Container, Inc.	«Method and apparatus for delivering a cased glass stream»(Un método y un aparato para suministrar una corriente de vidrio de envoltura)	1999-02-09
D6	Patente US 5 900 033, cuyo inventor es Daniel R. Gearing, quien le cedió sus derechos a la Eastman Kodak Company	«Apparatus and method for improved optical glass gob preform production»(Un método y un aparato para la producción de preformas de gotas de vidrio óptico mejoradas)	1999-05-04
D7	Patente US 5 906 666, cuyos inventores son Garrett L. Scott y Philip D. Perry, quienes le cedieron sus derechos a la Owens-Brockway Glass Container, Inc.	«Method and apparatus for delivering a cased glass stream having improved resistance to high-temperature erosion»(UN método y un aparato para suministrar una corriente de vidrio de envoltura que tiene una resistencia mejorada a la erosión a altas temperaturas)	1999-05-25

Se anexa la copia de las páginas pertinentes de estos documentos

NOTAS: No se realizaron las evaluaciones de los demás requisitos de patentabilidad, porque se hicieron algunas objeciones respecto a la definición, la claridad, la concisión y el sustento por la descripción de las reivindicaciones.

A pesar de lo anterior, con base en el Informe de Búsqueda Europeo, se prevén objeciones respecto a la novedad o respecto al nivel inventivo del objeto de la solicitud.

5. Conclusión:

Los requisitos de patentabilidad de la presente solicitud se encuentran afectados negativamente por la falta de claridad de la descripción y las reivindicaciones y por la falta de definición de estas últimas.

En cumplimiento del artículo 45 de la Decisión 486 de la Comisión de la Comunidad Andina, se le indica que debe dar respuesta dentro del término de sesenta días contados a partir de la fecha de notificación de la presente