United States Patent

Hepner

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[45] Apr. 11, 1972

[54] ROTATING FIXTURE-MOLD FOR FABRICATING PRINTING DRUMS

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[73] Assignee: **Burroughs Corporation**, Detroit, Mich.

[22] Filed: **Mar. 13, 1969**

[21] Appl. No.: **806,829**

Related U.S. Application Data

[62] Division of Ser. No. 690,041, Nov. 15, 1967, Pat. No. 3,529,054.

[52] **U.S. Cl.**.....**425/109**, 425/120, 425/123, 425/435

[51] **Int. Cl.**.....**B29d 3/00**, B29c 5/04

[58] **Field of Search**.....18/36, 5 RR, 26 R, DIG. 8, 18/DIG. 10; 264/261, 275, 596, 241, 245, 260; 249/83, 85, 88, 137, 146

[56] **References Cited**

UNITED STATES PATENTS

2,023,040	12/1935	Adam, Jr.	164/298 X
3,214,506	10/1965	Corbin, Jr.	18/26 R UX
3,505,437	4/1970	Eichmann et al.	18/26 RR

Primary Examiner—J. Spencer Overholser
Assistant Examiner—David S. Safran
Attorney—Paul W. Fish and Edwin W. Uren

[57] **ABSTRACT**

A rotating fixture-mold for locating and holding type bearing print members in a spatical relationship to each other and to the axis of rotation of the fixture mold. The type bearing print members when molded together form a drum structure which may be used as a printing drum or as an intermediate mold.

9 Claims, 18 Drawing Figures

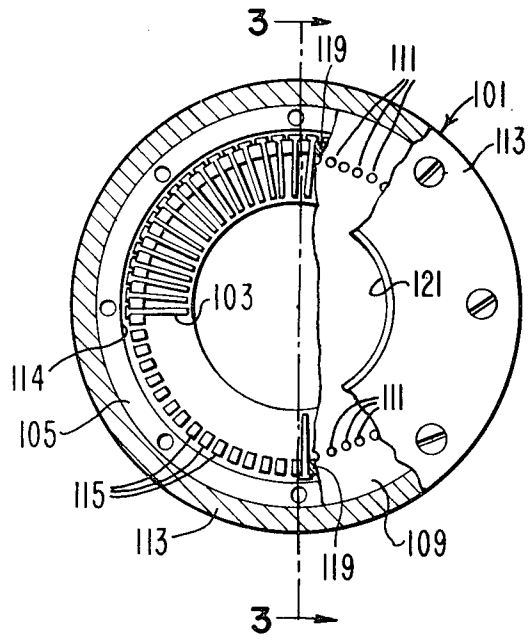


Fig. 1.

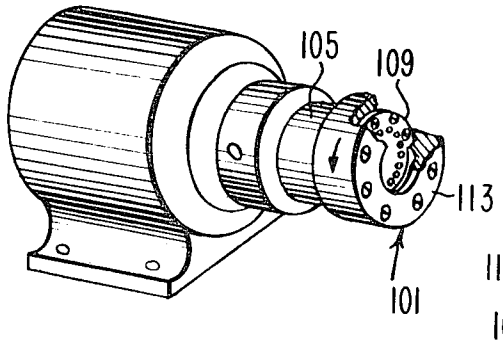


Fig. 2.

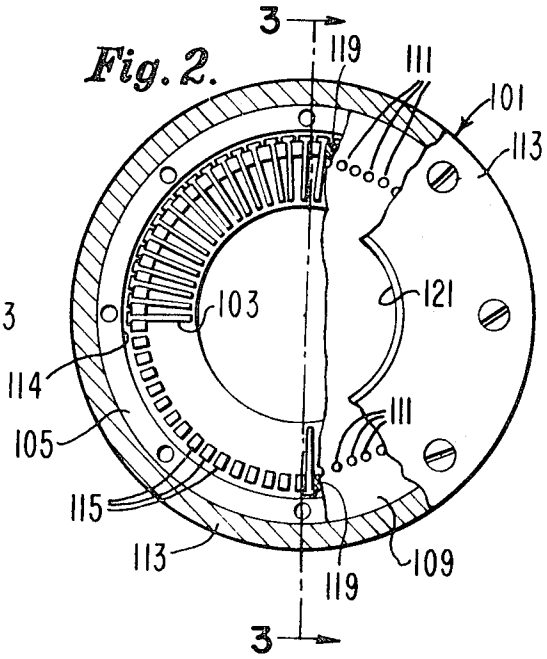


Fig. 3.

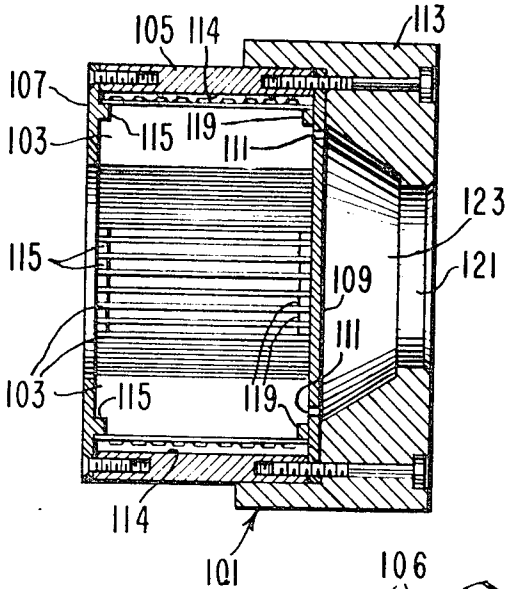


Fig. 4.

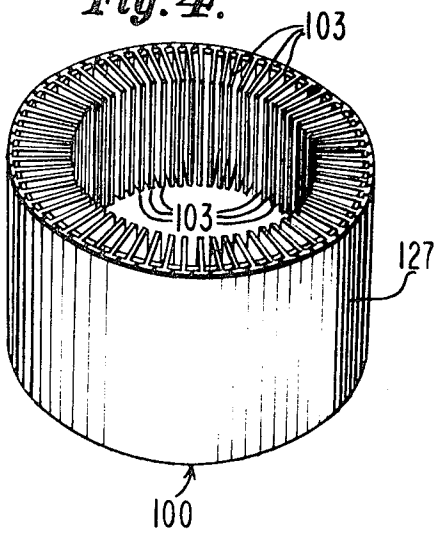
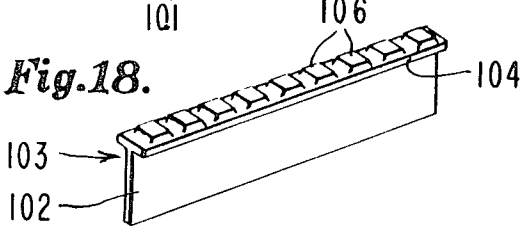


Fig. 18.



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Fig. 5.

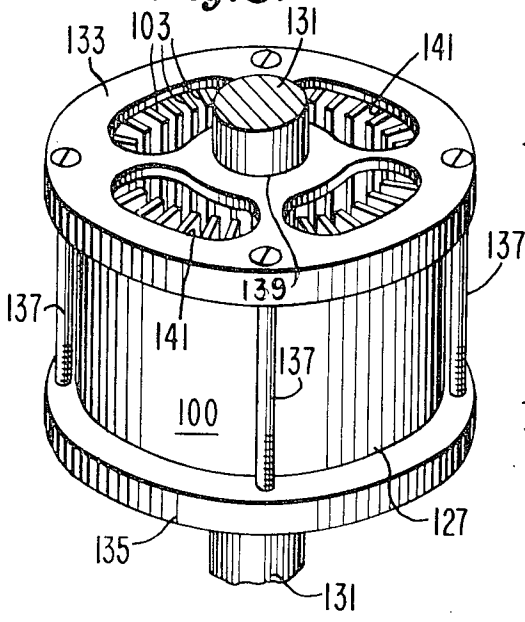


Fig. 6.

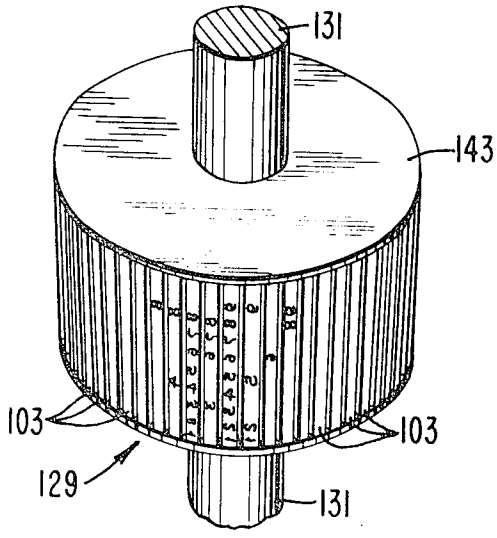


Fig. 7.

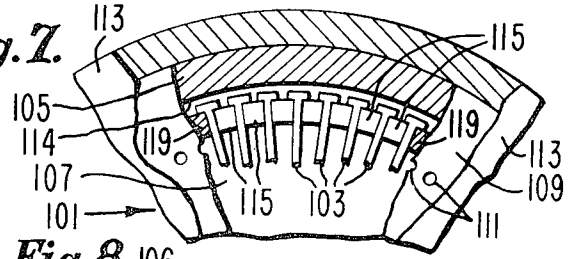


Fig. 8.

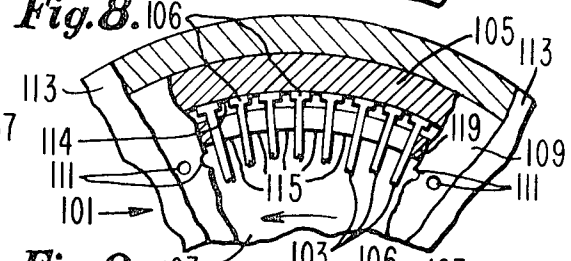


Fig. 9.

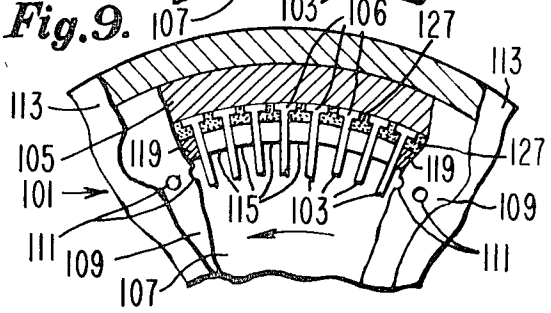


Fig. 10.

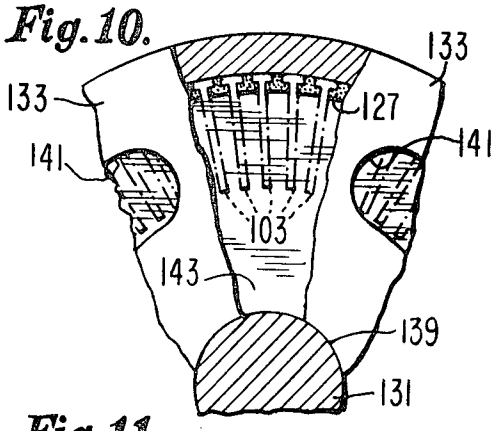


Fig. 11.

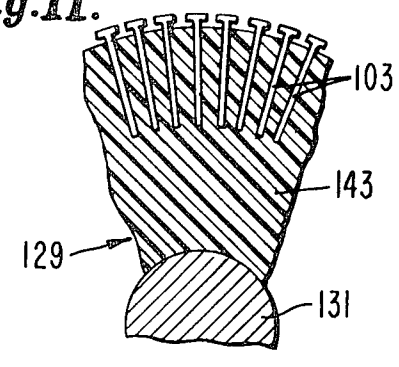


Fig.12.

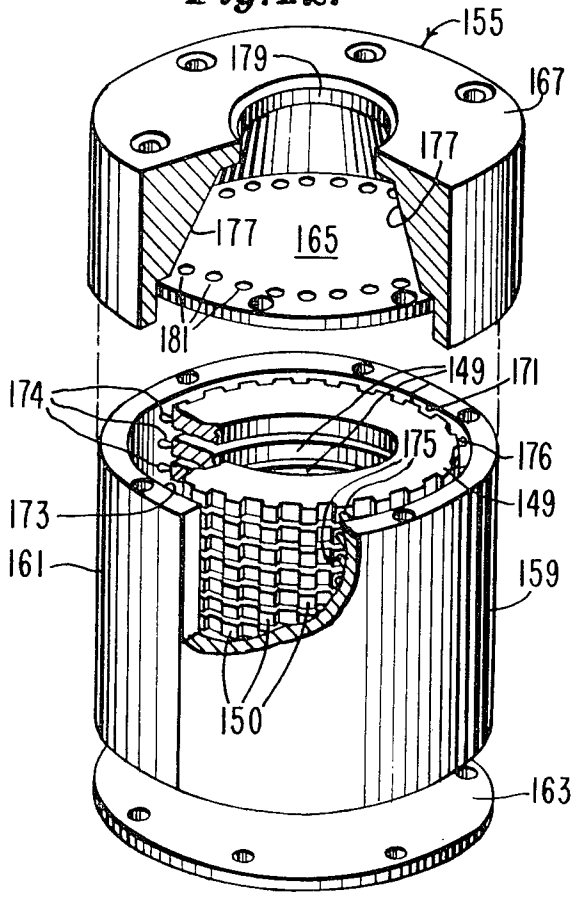


Fig.13.

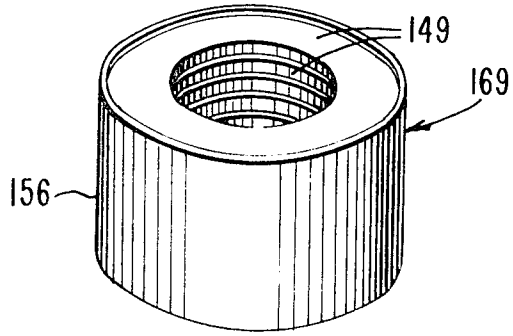


Fig.14.

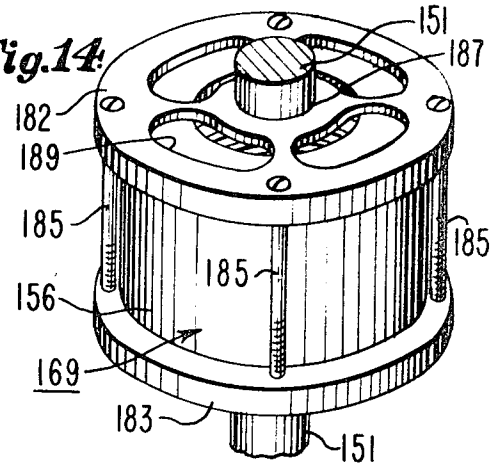


Fig.15.

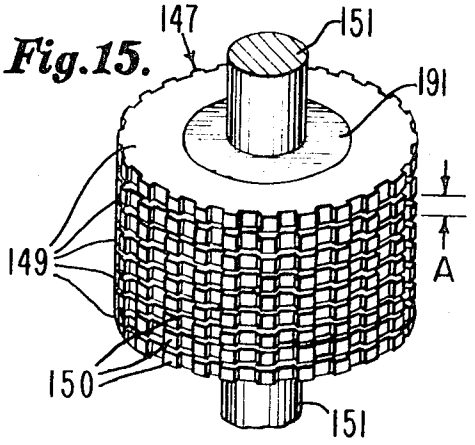


Fig.16.

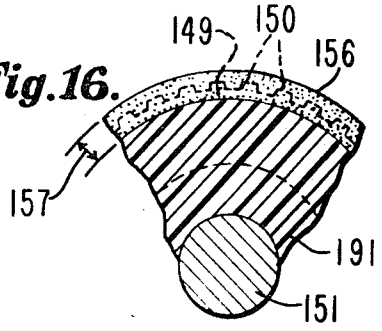
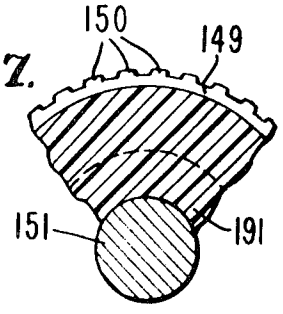


Fig.17.



ROTATING FIXTURE-MOLD FOR FABRICATING PRINTING DRUMS

This is a division of application Ser. No. 690,041 filed Nov. 15, 1967 U.S. Pat. No. 3,529,054 issued Sept. 15, 1970 entitled Method for Fabricating Printing Drums which is assigned to the same assignee.

FIELD OF THE INVENTION

This invention relates generally to an apparatus for use in fabricating structures of various geometric shapes having an axis of rotation such as printing drums and wheels.

SUMMARY OF THE INVENTION

A rotatable fixture mold having a cylindrical cavity along its axis of rotation. The ends of the cavity are defined by a pair of detachable end plates. The volume enclosed by the cylindrical wall of the cavity and the inside faces of the end plates define a fixture chamber into which a plurality of type bearing print members are placed. The type bearing print members are located by a plurality of projections placed on at least one surface within the cavity. Adjacent to one end plate and coupled thereto is an inlet chamber for receiving a moldable material which is to be placed within the fixture chamber. In order to transfer the moldable material from the inlet chamber to the fixture chamber there is at least one port extending through one end plate through which the molding material can transfer.

IN THE DRAWINGS

FIG. 1 is a perspective view of apparatus which may be employed to rotate the fixture-mold;

FIG. 2 is an end view of the fixture-mold partly broken away and in section;

FIG. 3 is a sectional view, taken along the line 3—3 of FIG. 2;

FIG. 4 is a perspective view of a drum rim structure fabricated with the use of the fixture-mold of FIGS. 2 and 3 and the apparatus of FIG. 1;

FIG. 5 is a perspective view of another fixture-mold to receive the rim structure of FIG. 4;

FIG. 6 is a perspective view of the finished printing drum;

FIGS. 7 to 11 are fragmentary sectional views, illustrating the steps of a method utilizing the fixture-mold;

FIG. 12 is an exploded perspective view of a fixture-mold of another embodiment;

FIG. 13 is a perspective view of a drum rim structure fabricated with the use of the fixture-mold of FIG. 12;

FIG. 14 is a perspective view of another fixture-mold to receive the rim structure of FIG. 13;

FIG. 15 is a perspective view of the completed printing drum;

FIGS. 16 and 17 are fragmentary sectional views illustrating certain steps of a method utilizing the fixture-mold of FIG. 12; and

FIG. 18 is a perspective view of a rim structure element of the drum rim structure of FIG. 5.

DETAILED DESCRIPTION

Referring to the drawings by characters of reference, and in particular to FIGS. 2, 3, 4, and 18, there is illustrated a fixture-mold **101** for use in fabricating a plurality of rim segments **103** into a drum rim structure **100**. The mold **101** is of sectional construction comprising a sleeve **105**, defining a cylindrical wall, closure walls comprising a first end plate **107**, and a second end plate **109**, and an end cap **113**. The several sections of the mold **101** are fastened together by any suitable means such as screws and bolts which are shown in FIG. 3. The two axially opposed end plates **107** and **109** and the sleeve **105**, when fastened together, define an annular molding chamber surrounding a cylindrical fixture chamber or cavity, into which the rim segments **103** are placed and held. Each rim segment **103** has an elongated web **102** to which a rim

forming head or flange **104** is attached. As is illustrated in FIG. 18, along the broad surface of the head **104** there is securely located in a row a plurality of type faces or characters **106**.

In the cylindrical fixture cavity, the rim segments **103** are located and held between a plurality of spacers **115** which are integral with and on the inner surface of the first end plate **107** and a plurality of axially opposed spacers **119** which are integral with and on the inner surface of the second end plate **109**. Both sets of spacers **115** and **119** are equally spaced in an angular relationship about the center of the plates **107** and **109**. The circumferential distance between adjacent spacers is slightly larger than the thickness of the web **102** of the rim segment. Therefore, each segment is held by adjacent spacers so as to permit movement within the fixture in the radial direction only. The axial distance between the spacers **115** and **119** and the inner wall **114** of the sleeve **105** or the annular molding chamber defines the radial thickness of the drum rim cavity and is slightly greater than the thickness of the head **104** of the rim segment **103**.

In the second end plate **109**, there is also a plurality of ports or apertures **111** equally spaced in an angular relationship about the center of the plate **109**. With respect to the spacers **119**, the apertures **111** are located adjacent to each spacer and on the inside of each spacer. It is through these apertures **111** that the molding material **127** enters into the cylindrical fixture cavity.

The end cap **113** provides an inlet cavity **123** to the mold **101**. The cavity is conical in shape extending from the inlet **121** to the surface of the second end plate **109**. The major diameter or flared end of the inlet cavity **123** is equal to or greater than the diametric distance spanning two apertures **111**; thereby each aperture **111** is wholly within the conical cavity.

With the second end plate **109** and the end cap **113** removed, the rim segments **103** are loaded into the fixture cavity by slideably inserting a web **102** between each spacer **115**. The head portion **104** is positioned between the spacer **115** and the inner wall **114** of the sleeve in the molding chamber. The second end plate **109** is then positioned over the opposite end of the rim segment **103** thereby securely holding each segment **103**. The end cap **113** is then placed over the end plate forming the completed fixture-mold. This is illustrated in FIG. 7.

The mold **101** is rotated about its axis which may be accomplished by coupling the mold to the axis of a motor as is illustrated in FIG. 1. When the mold is rotating, the centrifugal force which is generated, causes the rim segments **103** to move in a radially outward direction so that the type faces **106** are in an abutting relationship with the inner wall or surface **114** of the sleeve. This is illustrated in FIG. 8.

During rotation, a predetermined amount of molding material **127** is introduced into the molding chamber through the inlet **121**. The tapered sides of the inlet chamber **123** direct the material toward the apertures **111**. The material is placed in rotation in the chamber, and when the material reaches the apertures, it enters therethrough into the annular molding cavity under rotation and does not splash against the rim segments **103**. With the apertures so positioned, the material is directed into the annular cavity without touching the segments **103** in the area where the material is not to be molded. The reason for avoiding any contact other than that desired, is to prevent contamination which may be detrimental to any subsequent operations. The radial thickness of the rim depends upon the amount of material **127** which is introduced into the inlet **121**. This is illustrated in FIG. 9.

The purpose of the molding material in such a drum rim structure **100** as shown for example, in FIG. 4, is to provide a temporary holding fixture which holds the rim segments **103** together unaided and which also seals the encapsulated flange **104** of the rim segments during a subsequent molding operation. Since the structure **100** is used as a temporary holding fixture, one of the fusible alloys such as Cerrolow **117**, an alloy

comprising Bismuth 44.7 percent, Lead 22.6 percent, Tin 8.3 percent, Cadmium 5.3 percent and Indium 19.1 percent, as marketed by Cerro de Pasco Sales Corporation can be used. Other materials could also have been used such as rubber, plaster, resin epoxy, phenolic, etc., depending upon the ultimate use of the drum rim structure **100**.

After the molding material has hardened, the mold **101** is disassembled and the unitary drum rim structure **100** is removed from within the sleeve **105**. Next the drum rim structure is placed within a second mold, as illustrated in FIG. **5** to complete the fabrication of a printing drum **129**, illustrated in FIG. **6**.

The second mold, as shown in FIG. **5**, comprises a pair of end caps **133** and **135** which are placed over each end of the rim structure **100**. Both caps **133** and **135** have a coaxial aperture **139** to locate and support a mounting shaft **131**. Also, the top end cap **133** has a plurality of openings **141** therein to allow a permanent molding compound to be poured into the inner chamber of the rim structure. The bottom end cap has no other openings other than the shaft location aperture. Both caps **133** and **135** are coupled together through a series of bolts **137** placed outwardly of the structure **100**.

After the second mold is assembled, a permanent molding material **143** is poured into the chamber. By way of illustration in the fabrication of the printing drum **129**, the molding material **143** comprised: 28 parts by weight of Shell Epon Resin 815, an epichlorohydrin/ bisphenol A-type epoxy resin having an average molecular weight of approximately 330 and an equivalent weight of about 185 , as marketed by Shell Chemical Co., 12 parts by weight of Genamid 250, a fatty amidoamine resin having an amine value of approximately 425, as marketed by General Mills, Co., which is the hardener, and 60 parts by weight of Reynolds Aluminum No. 200 a filler comprising 98 percent pure Aluminum powder and 2 percent impurities. This mixture provides a strong bond between the rim segments **103** and the shaft **131** and with the aluminum filler, the shrinkage is reduced to an acceptable amount. This is illustrated in FIG. **10**.

After the molding mixture **143** has cured the end caps **133** and **135** are removed and the dissolvable molding material **127** is removed from the periphery of the drum and the drum is complete as illustrated in FIG. **6**.

Referring to FIGS. **12** through **17**, there is shown and illustrated a fixture-mold of another embodiment. The fixture-mold **155**, shown in FIG. **12**, is used to locate and hold a plurality of discs **149** in a predetermined spaced relationship for fabricating into a drum-like structure **169**, which is shown in FIG. **13**. The discs **149** have a plurality of type faces or characters **150** spaced around the periphery thereof.

The fixture-mold **155** is of sectional construction comprising a first end plate or closure wall **163**, a sectional sleeve **159** and **161** which together form a cylindrical wall, a second end plate **165** or closure wall and an end cap **167**. The several sections of the mold **155** are fastened together by any suitable means such as screws and bolts. The two end plates **163** and **165** and the sectional sleeve **159** and **161** when fastened together, form a cylindrical fixture cavity or chamber and an annular molding cavity or chamber within the fixture into which the several discs **149** are placed and held.

In the cylindrical fixture cavity, each disc is located and held by three projections **174**, **175**, and **176** which extend from the inner walls **171** and **173** of the sleeve sections. These projections are angularly spaced apart about the axis of the cavity with one projection **174** located on the inner wall **173** of the sleeve section **161** at the apex of the section. The other two projections **175** and **176** extend from the inner wall **171** of the other sleeve section **159**. In the present embodiment, the projections **174**, **175**, and **176** are basically shaped in the form of frustum of a cone with an impression of a type character formed in the outboard surface. The type face **150** on the disc **149** is located within the impression on each projection and securely held thereby. The axial distance between projections corresponds to the center to center distance "A" of adjacent type along a row of type. The length of the projections from the inner walls determines the amount of molding material **156** which will overlie and encapsulate the type faces **150**.

With both end plates **163** and **165** fastened to the sleeve section **159** which has two projections **175** and **176** per disc, the desired number of discs are loaded by positioning the correct type face on each projection **175** and **176** lying within a given circular plane of the cavity. After all the discs are loaded, the other sleeve section **161** is positioned over the discs and fastened between the two end plates **163** and **165**.

The second end plate **165** has a plurality of ports or apertures **181** equally spaced in an angular relationship about the center of the plate. The radial distance to the apertures **181** is such as to position them substantially above the type faces **150** of the discs **149**. It is through these apertures that the molding material **156** enters into the annular molding cavity.

The end cap **167** provides an inlet cavity to the mold **155**. The cavity is defined by an endless conical surface **177** extending from the inlet aperture **179** to the surface of the second end plate **165**. The diameter of the cavity at the end plate or flared end of the cavity is equal to or greater than the diametric distance spanning two apertures **181**; thereby each aperture is wholly within the conical inlet cavity. The end cap **167** is securely fastened over the second end plate **165** forming the completed fixture-mold **155** containing the discs therein.

The mold **155** is rotated about its axis which may be accomplished by coupling the mold to the axis of a motor or any similar rotating shaft.

During rotation, a predetermined amount of molding material **156** is introduced into the mold through the inlet **179**. The tapered sides **177** of the inlet chamber direct the material toward the apertures **181**. The material **156** is placed in rotation in the chamber and when the material reaches the apertures, it enters therethrough into the annular molding cavity under rotation and does not splash against the discs **149**. With the apertures **181** so positioned, the material is directed into the annular cavity without touching the discs in the fixture chamber where the material is not to be molded. The reason for avoiding contact with surfaces that are not to be molded, is to prevent contamination which may be detrimental to any subsequent operations. The radial thickness **157** of the rim depends upon the amount of material **156** which is introduced into the inlet **179**.

The purpose of the molding material **156** in such a drum structure **169**, as shown for example in FIG. **13**, is to provide a temporary holding fixture which holds the discs together unaided and which also seals the encapsulated type faces **150** of the discs during a subsequent molding operation. Since the structure **169** is used as a temporary holding fixture, one of the fusible alloys, such as Cerrolow **117**, an alloy comprising Bismuth 44.7 percent, Lead 22.6 percent, Tin 8.3 percent, Cadmium 5.3 percent and Indium 19.1 percent, as marketed by Cerror de Pasco Sales Corporation can be used for the molding material. Other material could also have been used such as rubber, plaster, resin epoxy, phenolic, etc., depending upon the ultimate use of the drum structure **169**.

After the molding material has hardened, the mold **155** is disassembled and the unitary drum structure **169** is removed. Next the drum structure is placed within a second mold, as illustrated in FIG. **14** to complete the fabrication of the printing drum **147** illustrated in FIG. **15**.

The second mold, as shown in FIG. **14**, comprises a pair of end caps **182** and **183** which are placed over each end of the drum structure **169**. Both caps **182** and **183** have a coaxial aperture **187** to locate and support a mounting shaft **151**. Also, the top end cap **182** has a plurality of openings **189** therein to allow a permanent molding compound **191** to be poured into the inner chamber of the drum structure. The bottom end cap **183** has no other openings other than the shaft location aperture. Both caps are coupled together through a series of bolts **185** placed outwardly of the drum structure **169**.

After the second mold is assembled, a permanent molding material **191** is poured into the chamber. By way of illustration in the fabrication of the printing drum **147**, the molding material **191** comprised: 28 parts by weight of Shell Epon Resin 815, an epichlorohydrin/ bisphenol A-type epoxy resin having an average molecular weight of approximately 330 and an equivalent weight of about 185, as marketed by Shell Chemical Co., 12 parts by weight of Genamid 250, a fatty amidoamine resin having an amine value of approximately 425, as marketed by General Mills, Co., which is the hardener, and 60 parts by weight of Reynolds Aluminum No. 200 a filler comprising 98 percent pure Aluminum powder and 2 percent impurities. This mixture provides a strong bond between the discs **149** and the shaft **151** and with the aluminum filler, the shrinkage is reduced to an acceptable amount. This is illustrated in Fig. **16**.

After the molding mixture **191** has cured the end caps **182** and **183** are removed and the dissolvable molding material **156** is removed from the periphery of the drum and the drum is complete as is illustrated in FIG. **15**.

I claim:

1. A rotating fixture-mold for fabricating printing drums from a plurality of character-bearing print members comprising:

a cylindrical wall open at each end,

closure walls closing each end of said cylindrical wall and cooperable therewith defining a fixture chamber,

locating members on at least one of said walls, said members projecting inwardly into said fixture chamber and concentric therewith providing means to locate and align the plurality of character bearing print members within said fixture chamber, and

a cap cooperating with one of said closure walls to define an inlet chamber, said one closure wall having a port therethrough to effect communication between said inlet chamber and said fixture chamber for the introduction of a moldable material into the fixture chamber.

2. The rotating fixture-mold according to claim **1** wherein the locating members are a plurality of angularly and axially spaced projections on the cylindrical wall.

3. The rotating fixture-mold according to claim **2** wherein the projections are in the form of a frustum of a cone extending inwardly from the cylindrical wall a predetermined distance.

4. The rotating fixture-mold according to claim **3** wherein the outboard surface of said projections has an impression of one of the type of the print members to receive the corresponding type on the print member for supporting the print member thereby.

5. The rotating fixture-mold according to claim **1** wherein the locating members are a plurality of axially opposed spacers equally and angularly spaced on each of the closure walls for maintaining the print members parallel to the axis of rotation of the fixture-mold.

6. A rotatable fixture-mold for fabricating drum rims comprising a cylindrical sleeve, closure members closing the ends of said sleeve, elongated rim segments having a flanged portion thereon extending in the direction of length of said segments, spacers on the inner faces of said closure members for holding said rim segments in angular spaced apart relationship about the axis of said sleeve and said spacers cooperable with said flanged portions for defining a fixture chamber and a molding chamber surrounding the fixture chamber and a cap cooperating with one of said closure members defining an inlet chamber, said one closure member having ports therethrough adjacent to and inwardly of said spacers for effecting communication between said molding chamber and said inlet chamber for the introduction of a moldable material into the molding chamber.

7. A rotatable fixture-mold according to claim **6** wherein said rim segments have a T-shaped cross section extending in the direction of length of said segments and flanged cross bar of said cross section being a separating member between said fixture chamber and said surrounding molding chamber.

8. A rotatable fixture-mold according to claim **6** wherein the other of said closure members has an aperture therein substantially the diameter of said fixture chamber for limiting the amount of moldable material in said molding chamber thereby limiting the thickness of the drum rim.

9. A rotatable fixture-mold for molding a plurality of rim segments into a drum rim structure, said fixture-mold comprising:

a cylindrical sleeve open at each end,

a first and second plate enclosing each end of said sleeve, each of said plates cooperating with the inner surface of said sleeve forming an annular molding chamber therein,

a plurality of axially opposed alignment members equally and angularly spaced on said plates extending inwardly of said annular molding chamber, said members for aligning and supporting the rim segments,

an inlet chamber adjacent to said first plate and having a flarred end substantially equal in dimension to said annular molding chamber for receiving and directing the molding material thereto, and

a plurality of equally and angular spaced apertures in said first plate interconnecting the flarred end of said inlet chamber with the annular molding chamber for transferring the molding material from said inlet chamber to said annular molding chamber.

* * * * *