March 12, 1963 J. B. WILEY 3,081,411

"TIN-CAN" HOUSING FOR A DYNAMOELECTRIC MACHINE

Filed Sept. 8, 1958 8 Sheets-Sheet 1

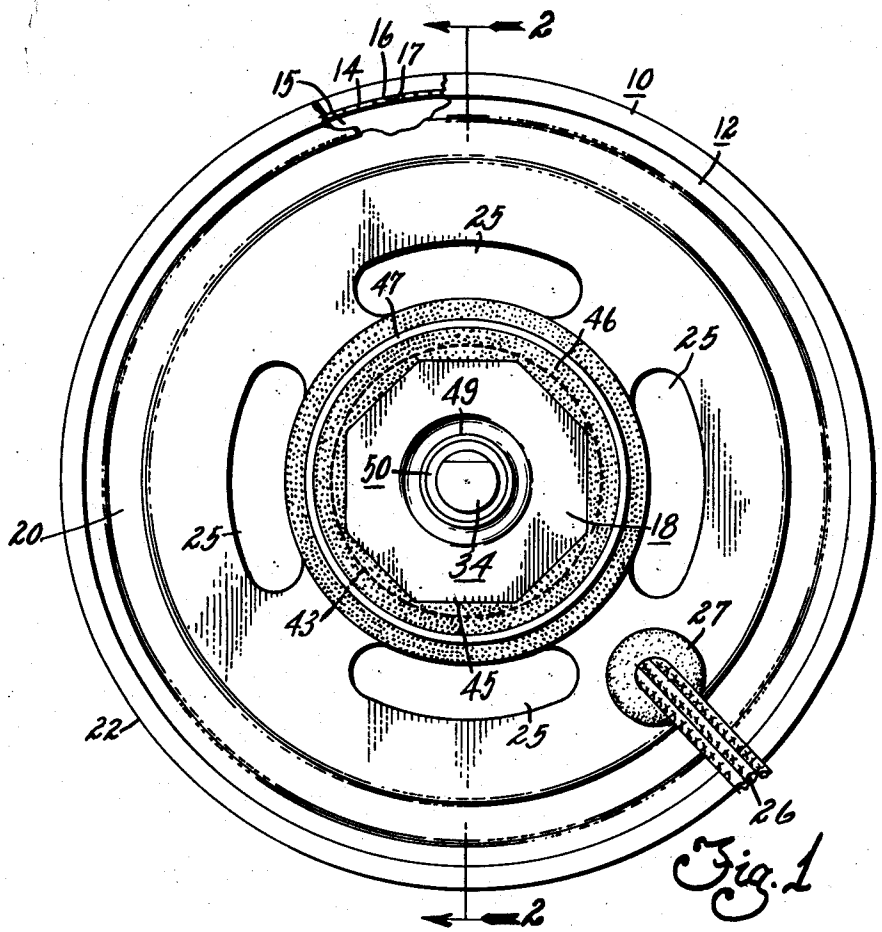


Fig. 1

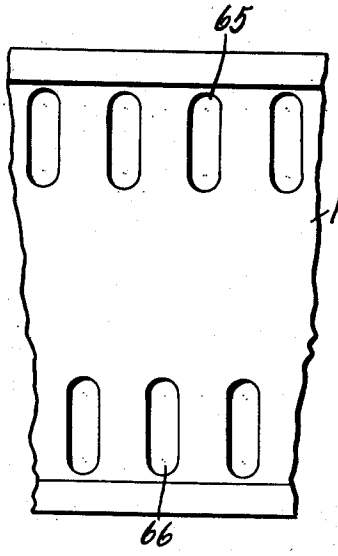


Fig. 3

INVENTOR.
JOHN B. WILEY

BY John P. Marvin

HIS ATTORNEY

March 12, 1963 J. B. WILEY 3,081,411

"TIN-CAN" HOUSING FOR A DYNAMOELECTRIC MACHINE

Filed Sept. 8, 1958 8 Sheets-Sheet 2

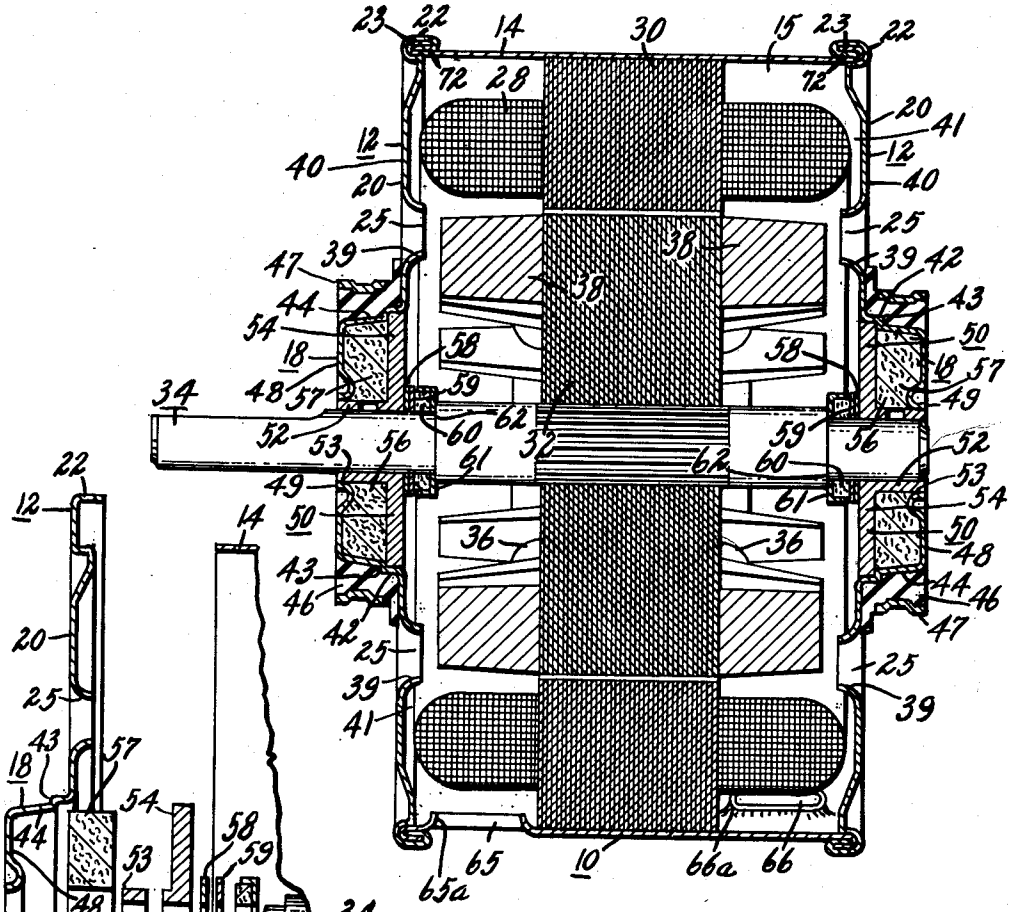


Fig. 2

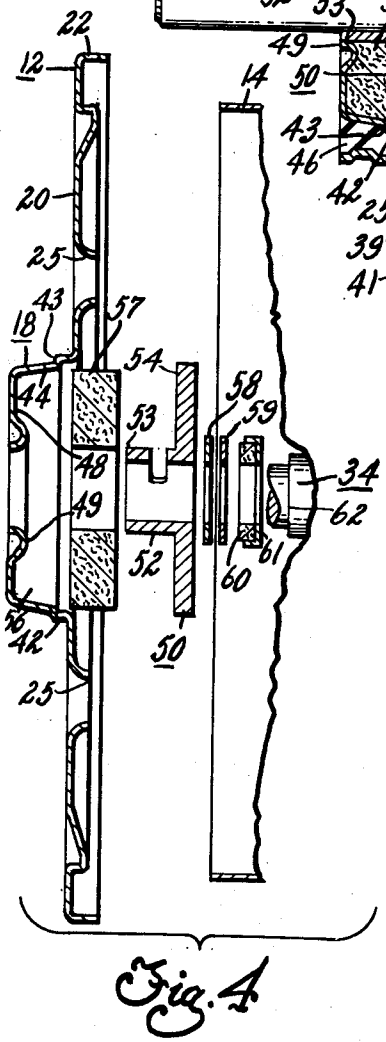


Fig. 4

INVENTOR.
JOHN B. WILEY

BY John T. Marvin

HIS ATTORNEY

March 12, 1963 J. B. WILEY 3,081,411

"TIN-CAN" HOUSING FOR A DYNAMOELECTRIC MACHINE

Filed Sept. 8, 1958 8 Sheets-Sheet 3

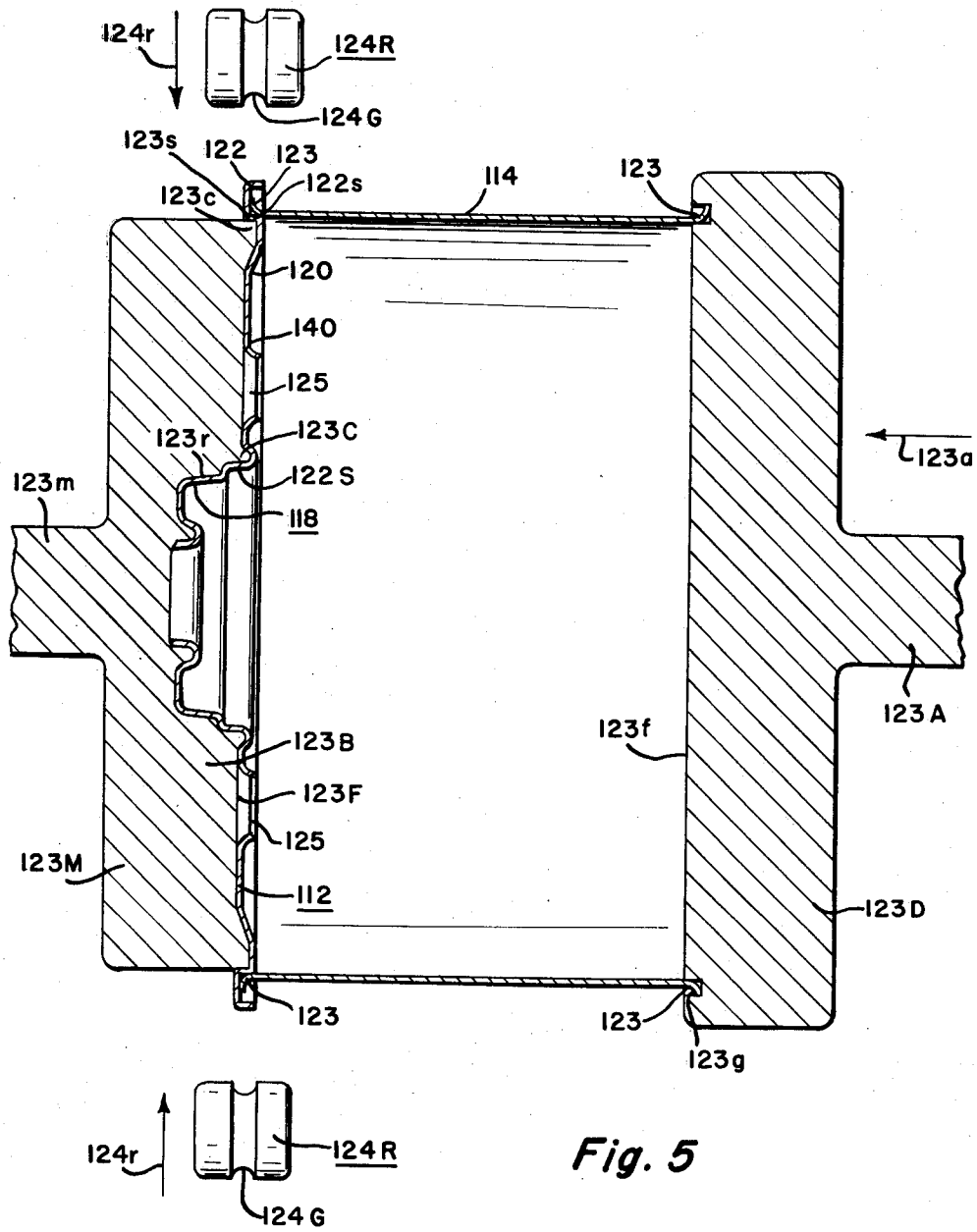


Fig. 5

INVENTOR.
John B. Wiley

BY

John N. Marmin
His Attorney

March 12, 1963 J. B. WILEY 3,081,411

"TIN-CAN" HOUSING FOR A DYNAMOELECTRIC MACHINE

Filed Sept. 8, 1958 8 Sheets-Sheet 4

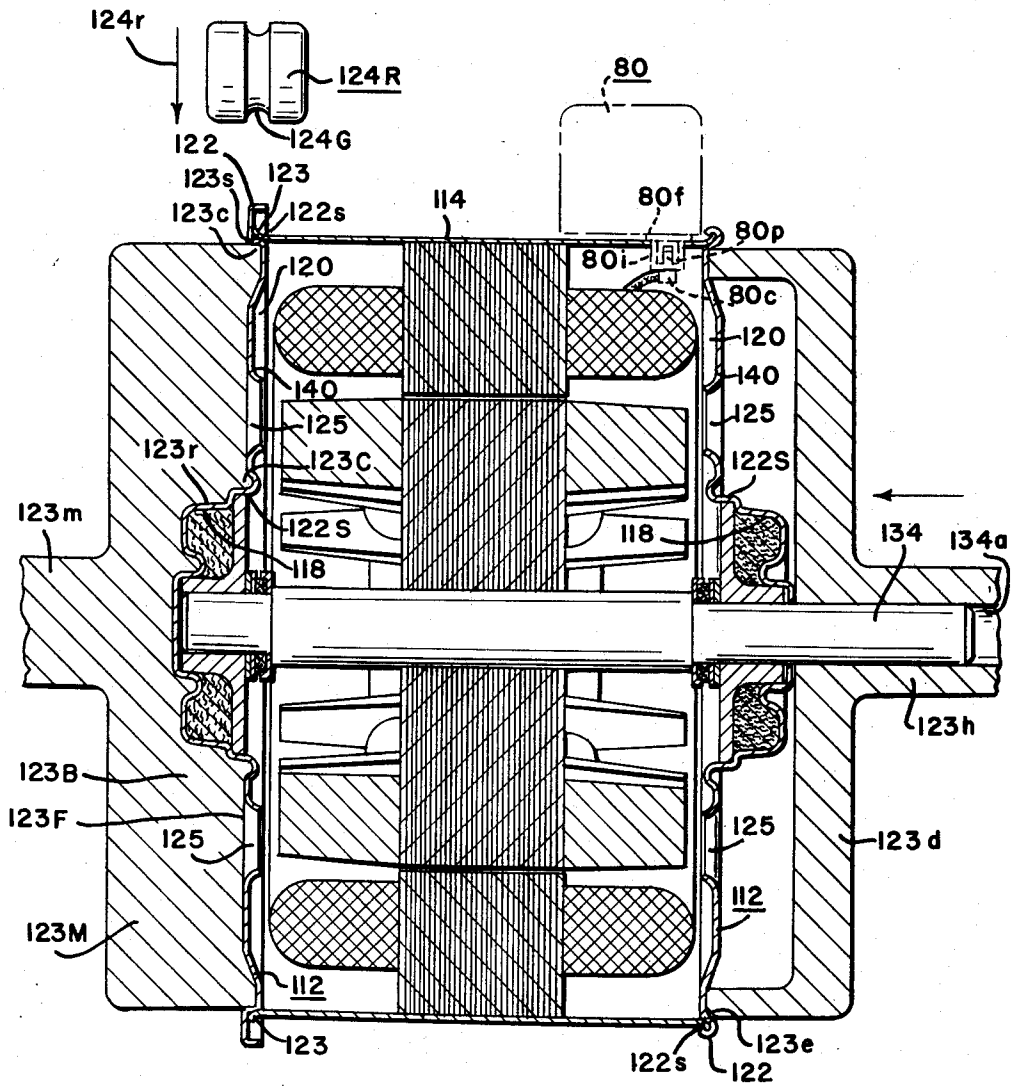


Fig. 5a

INVENTOR.
John B. Wiley
BY
John D. Morris
His Attorney

March 12, 1963 J. B. WILEY 3,081,411

"TIN-CAN" HOUSING FOR A DYNAMOELECTRIC MACHINE

Filed Sept. 8, 1958 8 Sheets-Sheet 5

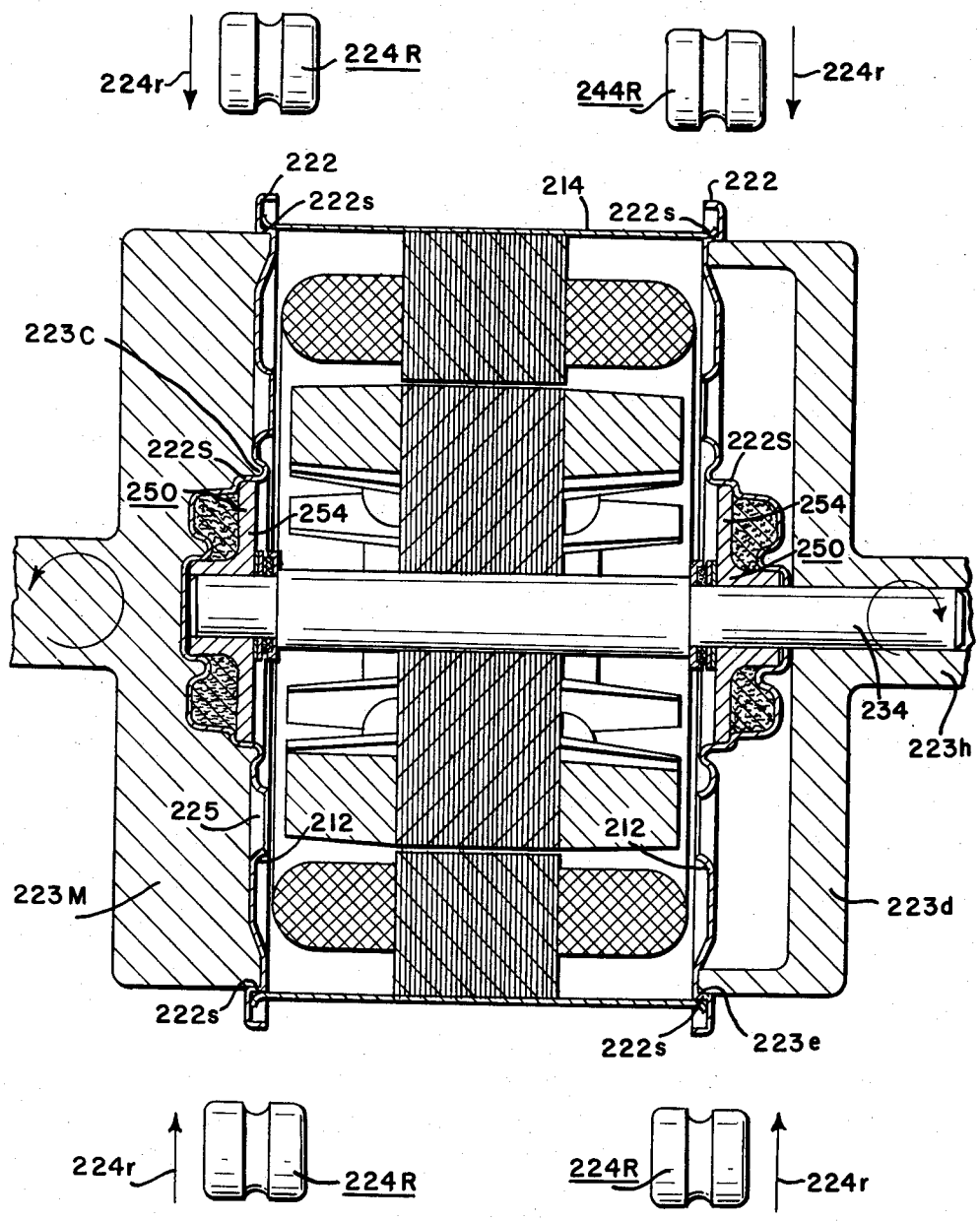


Fig. 6

INVENTOR.
John B. Wiley

BY
John T. Marvin
His Attorney

March 12, 1963 J. B. WILEY 3,081,411

"TIN-CAN" HOUSING FOR A DYNAMOELECTRIC MACHINE

Filed Sept. 8, 1958 8 Sheets-Sheet 6

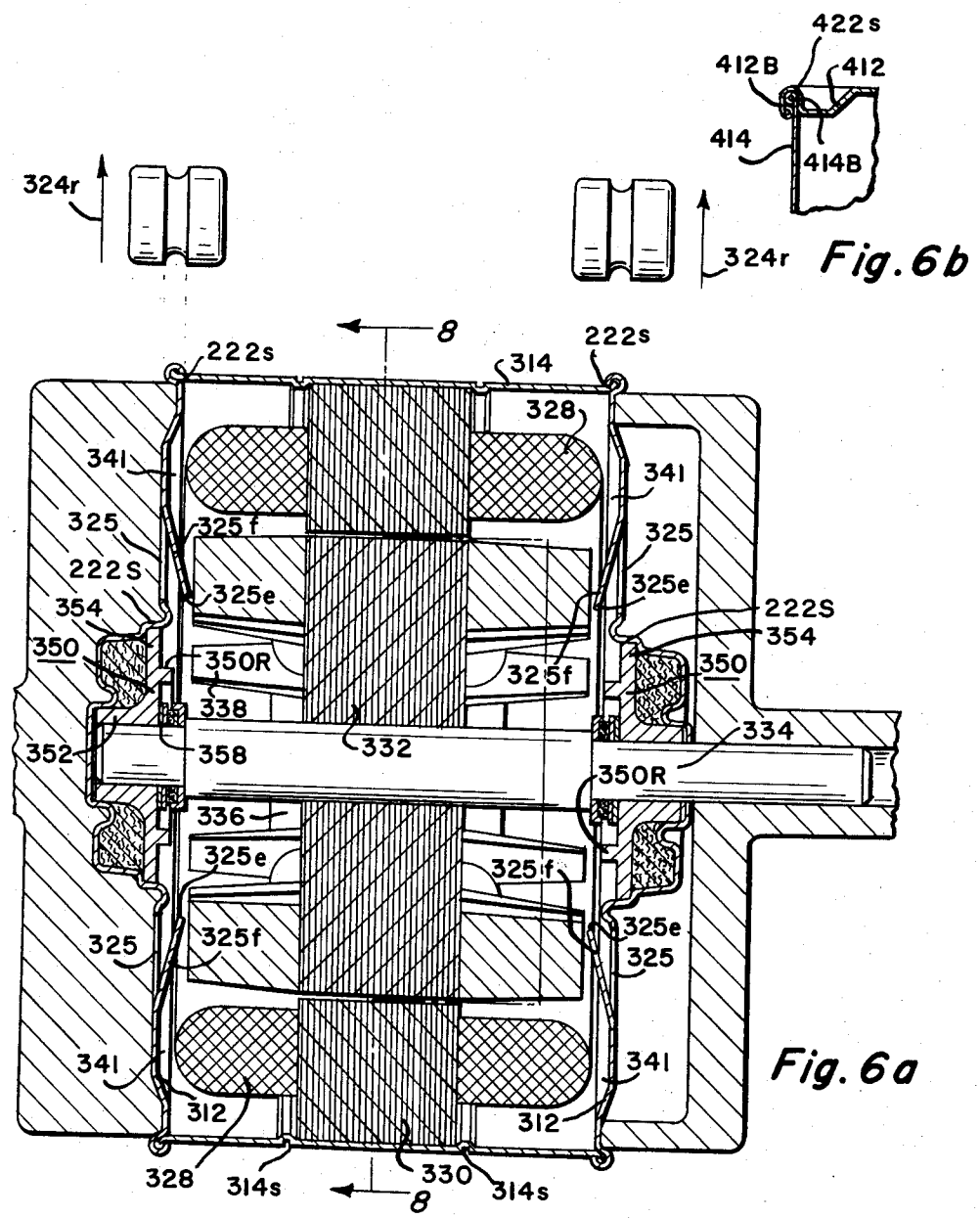


Fig. 6b

Fig. 6a

March 12, 1963 J. B. WILEY 3,081,411

"TIN-CAN" HOUSING FOR A DYNAMOELECTRIC MACHINE

Filed Sept. 8, 1958

8 Sheets-Sheet 7

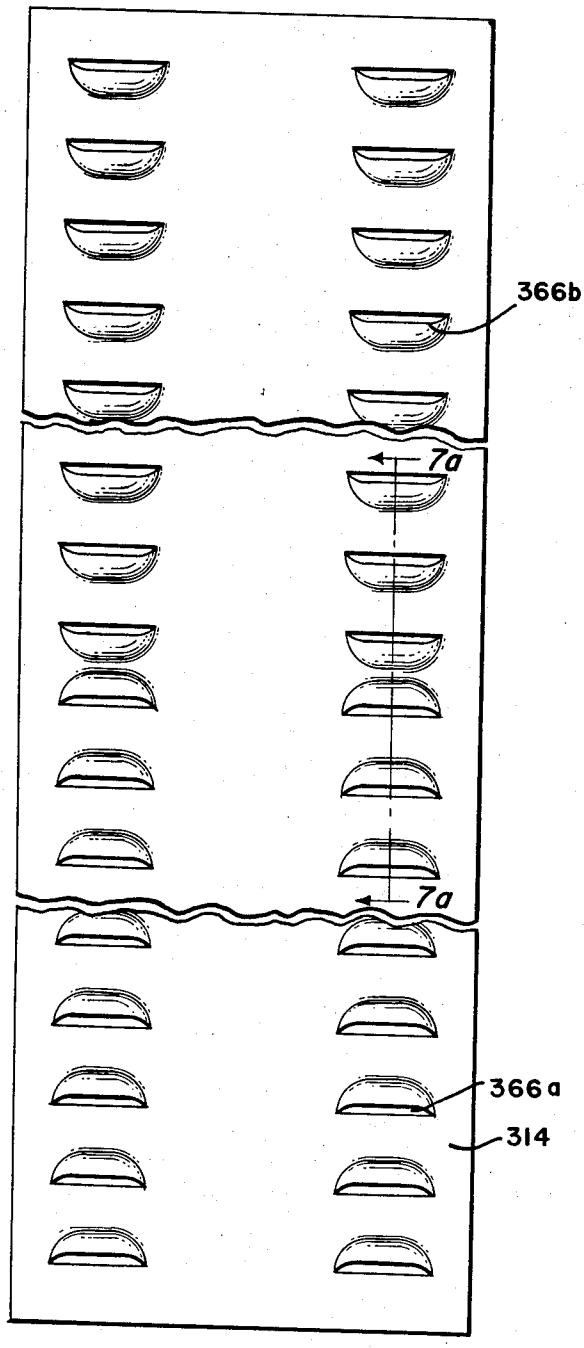


Fig. 7

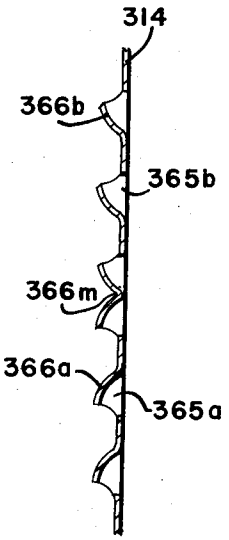


Fig. 7a

INVENTOR.
John B. Wiley

BY

John L. Marvin
His Attorney

March 12, 1963 J. B. WILEY 3,081,411

"TIN-CAN" HOUSING FOR A DYNAMOELECTRIC MACHINE

Filed Sept. 8, 1958

8 Sheets-Sheet 8

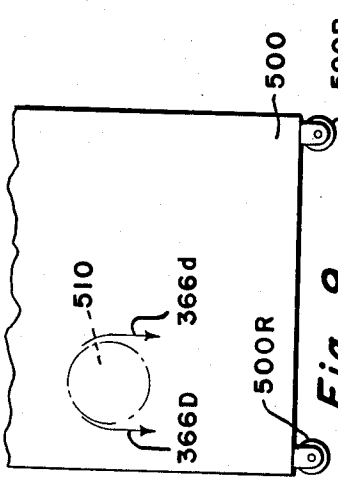


Fig. 9

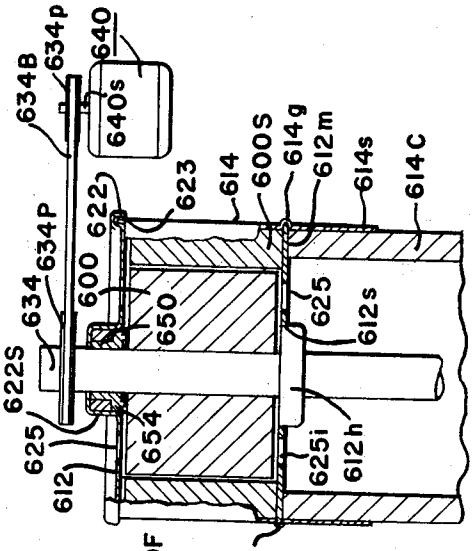


Fig. 9a

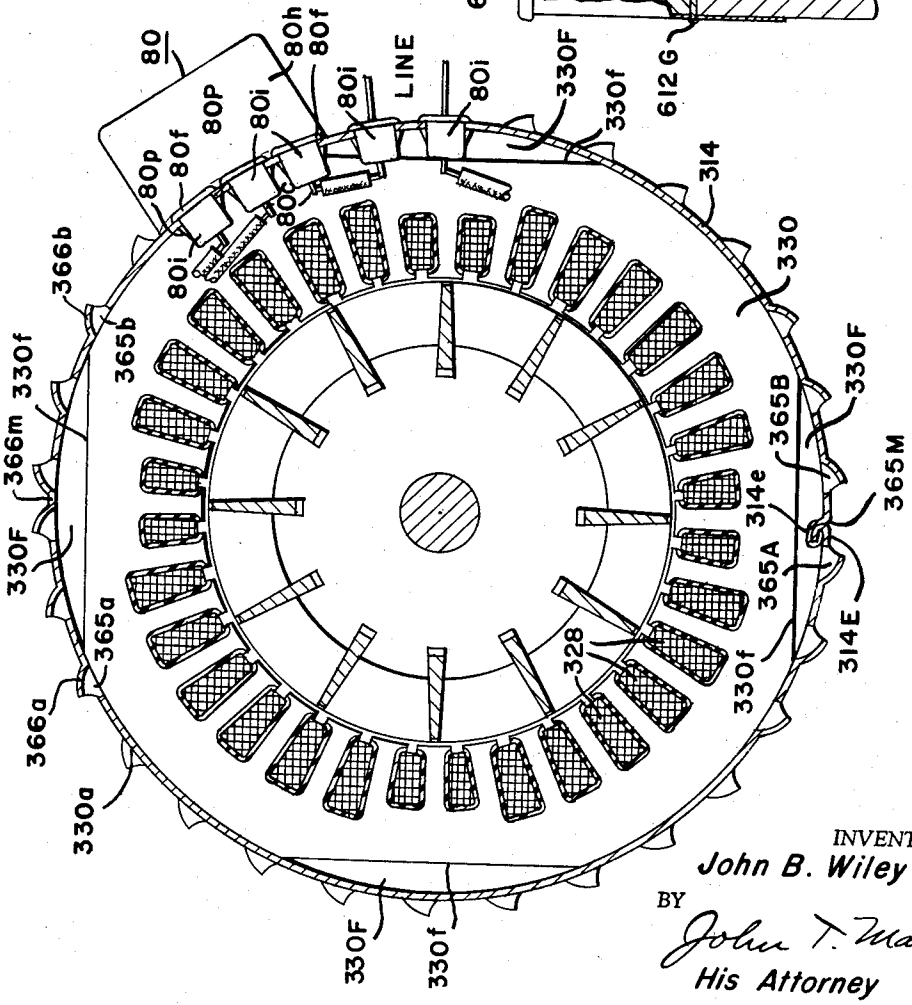


Fig. 8

INVENTOR.
John B. Wiley
BY
John T. Marvin
His Attorney

United States Patent Office 3,081,411 Patented Mar. 12, 1963

3,081,411

"TIN-CAN" HOUSING FOR A DYNAMOELECTRIC MACHINE

John B. Wiley, St. Catharines, Ontario, Canada., assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Filed Sept. 8, 1958, Ser. No. 759,475
7 Claims. (Cl. 310—254)

This invention relates to a housing and process for making the same to support a rotating mechanism concentrically within the housing in aligned relationship thereto. This is a continuation-in-part of my copending U.S. parent application S.N. 694,593 filed November 5, 1957, now abandoned.

An object of this invention is to provide a housing for rotating mechanism maintained concentrically within the housing in aligned relationship thereto using a bearing and flange cover for journalling the rotating mechanism in aligned and lubricated condition relative to the housing which is mounted stationary and removable for inexpensive replacement of the entire housing and rotating mechanism.

Another object of this invention is to provide a machine having a rotating mechanism housed within the inexpensive "canned" frame construction removable with the machine in the event of defect or failure and replaceable with a new machine and frame construction for less cost than encountered in field repair under warranty.

Another object of this invention is to provide a process of producing an inexpensive yet precision made housing for a machine having a rotating mechanism that is journalled and accurately aligned relative to the housing due to use of spaced bearings aligned relative to the housing during the process including steps of providing a rotor having a shaft and a stator carried within a body portion of a "tin-can" housing and aligning the rotor relative to the stator by means of "tin-can" annular members used to journal opposite shaft ends concentrically relative to the body portion of the housing.

Another object of this invention is to provide a process of producing an electric machine having a stator and rotor housed concentrically within a sheet metal body manufactured using rollers movable relative to dies for concentrically turning at least one end of a wrap-around body portion in alignment relative to a bearing-locating flange of a lid member by which a shaft of the rotor is rotatably journalled, the process requiring no bolting or machining except for fabrication of the shaft rotatably journalled in lubricated impregnated sintered metal bearings supported by the lid members stamped and then assembled to the body portion to form an expendable or "canned" machine.

Another object of this invention is to provide an expendable dynamoelectric machine having a frame formed of a "tin-can" sheet metal cylindrical body portion having louvers extending and opening for cooling in opposite directions from a radial median location and having stamped annular members providing a bearing-locating flange relative to which a rotor shaft is journalled by means of a bearing supported concentrically and in aligned relationship to the body portion and a stator carried therein, the stamped annular members having inwardly directed angularly displaced louvered openings terminating adjacent to fan blades carried by the rotor for circulating cooling air through the dynamoelectric machine and radially outwardly and downwardly away from the body portion.

Another object is to provide an expendable motor having a frame formed of a stamped sheet metal cylindrical body portion having radially oppositely and outwardly extending ventilating apertures spaced from each other adjacent to stamped annular ridges projecting radially inwardly relative to the body portion for concentrically supporting laminations of a wound stator in alignment relative to a rotor having a shaft journalled by lubricant-impregnated sintered metal bearings adjacent to a lubricating cavity formed by stamped annular members having a bearing-locating flange provided for maintaining concentricity and alignment of the rotor relative to the stator with a high degree of precision despite low-cost of manufacture of the expendable motor.

A further object of this invention is to provide a "tin-can" housing for a machine having a rotor and a stator supported concentrically within a thin sheet metal wrap-around body portion with at least one end provided with a crimped-over annular beaded portion adapted to be complementary to a crimped-over annular beaded portion of an annular removable member of stamped sheet metal having an aligning portion provided substantially concentrically with a high degree of precision relative to the crimped-over portion, the rotor having a shaft journalled relative to the annular member in concentric relationship relative to the aligning portion thereof.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

FIGURE 1 is an end elevational view of an expendable dynamoelectric motor in accordance with the present invention.

FIGURE 2 is a cross-sectional view of the motor taken along line 2—2 of FIGURE 1.

FIGURE 3 is a fragmentary developed view of a can-type body portion with ventilating apertures stamped therein for the motor of FIGURE 2.

FIGURE 4 is a fragmentary exploded view of one end head assembly including a stamped can-type lid and sintered metal bearing that cooperate to form a lubricating cavity provided adjacent to the bearing in the motor assembled in a "tin-can-type" method of motor manufacture of the present invention.

FIGURES 5 and 5*a* illustrate rollers and dies used in one embodiment of a process for making a "tin-can" housing for rotating mechanism in accordance with the present invention.

FIGURES 6 and 6*a* illustrate rollers and dies used in another embodiment of a process for making a housing for a machine having a rotating mechanism concentrically aligned in accordance with the present invention.

FIGURE 6*b* illustrates another embodiment of structure for joining portions of the "tin-can" housing.

FIGURES 7 and 7*a* illustrate cooling duct structure in accordance with the present invention.

FIGURE 8 illustrates a cross-sectional elevational view taken along line 8—8 of FIGURE 6*a*.

FIGURE 9 shows a housing of the present invention installed in an appliance.

FIGURE 9*a* shows another use for a housing of the present invention with rotating mechanism.

With particular reference to FIGURE 1, there is shown an end elevational view of an electric motor produced in accordance with the present invention and generally indicated by a numeral **10**. This is an expendable motor having a "canned" construction for minimum initial cost and requiring a minimum of parts and machining during manufacturing while providing concentricities of a body portion and end assembly relative to a stator and rotor shaft far superior to concentricities achieved using either castings or pressed steel motor frames turned and machined

in acocrdance with previous motor manufacturing methods. For example, pressed steel motor end frames as previously manufactured include complicated assemblies of several pieces for forming end closures of a motor and for providing a lubricating system for bearings provided in an assembly with the end frames to rotatably journal a motor rotor shaft. In the motor of the present invention, end lids or end head assemblies made of a simplified stamping generally indicated by numeral **12** are illustrated in the drawings. FIGURE 1 shows one such end head assembly **12** which has a broken away portion adjacent an outer periphery of the lid where an end view of a body portion generally indicated by numeral **14** is partially visible.

The body and end heads of the motor in the present invention are manufactured on can making machines of a type known to those skilled in the art of making containers for shipment and storage of food products of both a solid and liquid nature. These can making machines produce a product commonly referred to as "tin" cans using a thin flat sheet metal which is formed to provide a cylindrical body with a hollow interior closed off at opposite ends by head portions or lids that are assembled to the sheet metal body by seaming, soldering, or by press-fitting peripheral edges of annular head members into tight engagement with opposite ends of the cylindrical body. A press fitted type of assembly between the lids and body portion results in a temporary fastening similar to that obtained in pressing a paint can lid as a cover onto a paint container for example. In any event, the body portion **14** of the motor in FIGURE 1 is formed on a can making machine into a cylindrical shape that provides a hollow interior portion **15** for the motor as longitudinal edges **16** and **17** of the body **14** are joined in any suitable manner known in manufacture of can containers. The edges **16** and **17** are shown forming a butt joint which could also be soldered or otherwise fused together in the manufacture of the motor of the present invention. The stamped lid **12** is provided with a central boss portion generally indicated by numeral **18** and a peripheral covering portion **20** that has an outer radial edge **22** which is bent or formed to engage an end periphery **23** of the body portion **14** in sealing engagement. The cover portion **20** of the lid is provided with axial openings **25** serving as ventilating passages communicating with the interior space **15** formed within the cylindrical body portion **14**. Electrical wiring generally indicated by numeral **26** passes through a grommet or eyelet **27** inserted through an opening located at one side of the cover portion of the lid. The wiring **26** is connected with the windings provided with the stator of the motor shown in further detail in FIGURE 2.

Windings generally indicated by numeral **28** are shown in FIGURE 2 as they are supported in a stator **30** which is formed of a plurality of stacked metal laminations in a usual manner by stamping out annular pieces and stacking the pieces having radially inwardly extending slots aligned relative to each other for receiving the windings **28** as is well known in the art of making dynamoelectric machines. Also shown in FIGURE 2 is a rotor lamination assembly **32** that is carried on a shaft **34** rotatable relative to the wound stator. The rotor **32** is preferably a squirrel-cage type of rotor having conducting metal cast extending longitudinally through slots provided in the rotor laminations aligned relative to each other and inter-connected by a cast end ring **36** on each of opposite sides of the rotor laminations. Also cast integral with the squirrel cage winding of the rotor are a plurality of longitudinally extending radial fins or fan blades **38** extending in opposite directions from the stacked rotor laminations. These fan blades **38** are spaced radially outwardly and concentrically relative to the shaft **34** and are positioned longitudinally of the openings **25** in the lids. As clearly seen in FIGURE 2, the openings **25** are formed by stamping sheet metal of the lids inwardly

toward the space **15** within the hollow body portion **14** of the can-type construction used for the motor of the present invention. For purposes of rigidity, each of the lids **12** is strengthened in the cover portion **20** by inwardly extending flanges **39** around each of the openings **25** extending into an outwardly bent annular ring **40** spaced longitudinally away from the stator windings **28** so as to form an annular passage **41** between the ring **40** and windings **28** permitting air circulation for ventilating purposes around the windings contained in the canned construction. The fan blades **38** rotate with the rotor **32** on the shaft **34** and create air turbulence within the canned construction for cooling of the electric motor. The fan blades **38** are cast with the rotor to be located concentrically and radially inside the windings **28** and the fan blades and rotor extend a length parallel to the shaft **34** for a distance slightly less than the length of the windings **28** parallel to the shaft **34**. The windings **28** are energized through wiring **26** and the motor of the present invention is produced having no switch in the motor body. A switch for controlling the motor is provided and mounted remote from the motor in some other portion of the device such as a refrigerator on which the electric motor of the present invention is to be used. An electric switch separate from the motor of the present invention can be quickly and easily replaced in the event of switch failure without disassembling the expendable type of motor thus decreasing the cost of repair and service on domestic appliance equipment such as a refrigerator. A similar separate switch arragnement can also be provided when the motor of the present invention is used for domestic equipment such as a washing machine or clothes dryer. Since a majority of motor failures experienced in field installations are attributed to switch failure, the removal of the switch from the motor proper results in less need for motor disassembly. For instances where the motor failure is not attributed to the switch, the electric motor of the present invention is designed to be disposed of or thrown away in the event that failure occurs in the motor itself. In these instances, the defective motor is replaced by a new "canned" or expendable motor which costs less to produce than the cost of labor and repair in servicing a defective motor under a warranty that may be applicable to the motor as supplied by the manufacturer. Thus the expendable motor of the present invention is designed for minimum initial cost and can be built in various horsepower ranges for quick replacement of a complete motor unit in the event of field failure which previously has been costly in repair charges. The windings and wiring illustrated in the drawings disclose a single phase type of fractional horsepower motor made with a "canned" construction having a minimum number of parts involving a minimum number of machining operations during manufacturing of the expendable motor. Since any type of electrical switch may be provided for the motor serving to control the motor in any well-known manner, no switch is shown and no switch in particular is to be taken as forming part of the present invention.

In the motor assembly illustrated in FIGURE 1, any existing laminations for forming the rotor and stator can be used and mounted concentrically within the body portion **14** and lids **12** of the motor construction. The cylindrical body portion **14** as made with can making machines known in the container industry are formed having concentricities far superior to tolerances resulting from manufacture of castings and motor frames turned and machined in a manner previously known in the motor manufacturing art. Each of the lids **12** illustrated in FIGURE 2 are stamped out of flat metal sheets into a rigid annular structure having the boss and cover portions mentioned above. Each boss is provided with an outwardly extending longitudinal annular shoulder **42** which is spaced radially inwardly of the openings **25**. The shoulder **42** is connected with a radial portion **43** of

the boss which in turn is connected to a polygonally shaped wall 44 having a tapered or oblique structure relative to the concentric cylindrical relationship of the body portion 14 and stator and rotor relative to the shaft 34. As visible in FIGURE 1, the polygonal structure of this hub is shown to be an octagon with flat surfaces 45 engageable by an inner periphery of a complementary shaped resilient annular mounting ring 46. The resilient annular mounting ring has a cylindrical outer periphery around which a metal band or grooved mounting sleeve 47 is supported for engagement by a strap or other suitable end support for mounting of the electric motor of the present invention. Since the particular mounting or band provided to clamp around the sleeve 47 does not form part of the present invention no such mounting is illustrated in the drawings. The ring 46 can be made of a rubber-like material having resilient characteristics for protecting the electric motor from shocks and vibration which can be transmitted from the device on which the motor is mounted or from the electric motor to the device on which it is mounted.

The hub is bent over to have a radial wall 48 which terminates in a bent over flange portion 49 shaped having an inner peripheral surface extending longitudinally and concentrically relative to the shaft 34.

The ring 49 of the hub does not form a bearing surface for the shaft but provides radial support for one end of a bearing generally indicated by numeral 50 provided to journal opposite ends of the shaft extending through each of the lids 12. This bearing 50 is preferably made of sintered bronze or other sintered metal that can be impregnated with oil so that a circulatory lubricating system including oil sumps and lubricating passages is not required for lubrication of shaft journalling surfaces provided between the bearing and shaft. The bearing 50 includes a cylindrical portion 52 having an end surface 53 which is press fitted into engagement with the inner surface of the ring 49 of the hub. At the end of the cylindrical portion 52 opposite the end surfaces 53 there is a radially outwardly extending annular flange or wall portion of the bearing 50 and this flange portion indicated by numeral 54 has an outer peripheral surface which is press fitted into engagement with the inner surface of the shoulder 42 provided with each lid 12. The hub of the lid 12 and bearing 50 press fitted into engagement therewith form a lubricating space or cavity 56 adjacent each of the journalled ends of the shaft 34. The cavity 56 is preferably filled with a lubricant impregnated cellulose material or other oil impregnated lubricating packing 57 for feeding lubricant to the sintered metal bearing 50 as required. Since all free-flowing oil or lubricant from the journalling surfaces will be flowing over sintered metal through which the lubricant passed, there is little, if any, loss of lubricant because the cellulose material absorbs the free-flowing lubricant for redelivery to the journalling surfaces when neded. Thus the electric motor of the present invention can be considered to be lubricated permanently for the life of the motor. It is noted that a cellulose type of material available commercially under a trade name "Permawick" can be used as a packing for the cavity 56.

Each lid 12 as stamped from thin sheet metal is provided with flange 42 and ring or lip 49 concentrically spaced relative to the shaft 34 such that the sintered metal bearing 50 can be press fitted in tight sealing engagement with the lid to form journalling surfaces relative to the shaft axially aligned on opposite sides of the rotor and stator assembly as well as the cavity 56. The cellulose material used as a packing in the cavity 56 replaces felt wicking systems previously provided with complicated assemblies for end frame hubs and journalling bearings for electric motor shafts where leakage of lubricant often is found to be difficult to control. The sintered metal bearing 50 is relatively porous for passage of lubricant through the journalling surfaces and the cellulose packing is effective in soaking up and absorbing any free-flowing lubricant or oil. Thus the stamped lid 12 provided at each end of the can-type body portion 14 for housing the stator and rotor in the motor of the present invention provide rigid support for concentrically positioning bearings 50 on opposite sides of the rotor with a minimum of parts and machining during manufacture of the motor.

Only the shaft 34 actually needs machining and the rotor laminations can be press fitted or otherwise secured to the shaft at an intermediate portion thereof. For spacing the rotor relative to the bearings 50, a metal washer 58 and a shim 59 are fitted around each of the journalling portions of the shaft 34 together with a felt or fibrous sleeve 60 and cup-shaped member 61 adjacent a shoulder 62 at each of opposite ends of the shaft. The felt or fibrous sleeve 60 serves also to absorb vibration and axial shocks which may be transmitted in the motor of the present invention through the mounting thereof provided in a domestic appliance for example.

Since the bearings and packing 57 are assembled simultaneously with the hub of each of the lids, no boring or turning operations are necessary to provide lubrication of journalling surfaces for the shaft 34. Concentric spacing of the shaft 34 is attained through the bearings 50 and lids 12 relative to the body portion 14 of the can motor which also concentrically supports the stator and coil assembly about an inner periphery of the body portion 14 by a very light press fit relative to the stator laminations. If necessary a pinning operation can be added in the manufacture of the canned motor for clamping or crimping the stator laminations into position inside the body portion 14.

In addition to the openings 25 provided in each of the lids 12 for ventilation of the motor inside the canned construction, a plurality of radially outwardly extending ventilating apertures 65 and 66 are provided around at least one side of the body portion 14. The apertures 65 and 66 are displaced from each other angularly relative to the axis of rotation of shaft 34 as is visible in a fragmentary developed view of the body portion 14 shown in FIGURE 3. Each of the apertures 65 and 66 is stamped through an initially provided flat sheet of metal such that inwardly extending flanges 65*a* and 66*a* are formed on each of opposite sides of the stacked stator laminations as illustrated in FIGURE 2. The can making machine used in manufacturing the electric motor of the present invention operates to form the flat piece of metal that is bent into a cylindrical shape resulting in formation of the body portion 14. This formation of the cylindrical body portion effects a binding or press fitting of the stator laminations within the inner periphery of the sheet metal for the body portion 14 and abutting edges 16 and 17 described with the drawings in FIGURE 1 can be fused together or otherwise fastened or locked to each other. It is also possible to hold the body portion in a cylindrical shape by providing a cylindrical die on the can making machine for holding the body portion 14 in shape until at least one lid 12 is seamed to one peripheral edge of the body portion 14.

To further illustrate the method of manufacturing the canned type or expendable motor of the present invention, a fragmentary exploded view of a lid 12, bearing 50, packing 57, shaft 34, and one peripheral edge of the body portion 14 are shown in FIGURE 4. The method of manufacturing the canned type or expendable motor includes the steps of stamping a lid or end head member with ventilating openings and a hub portion, providing a bearing 50 to form a cavity between the bearing and hub portion of the lid, stamping a flat sheet of metal with ventilating apertures and making a cylindrical body portion of the flat piece for supporting a stator lamination and coil assembly, assembling the bearing 50 relative to the hub of the lid by a press fitting operation including formation of a cavity filled with a cellulose type of lubricant impreg-

nated material, journalling ends of the shaft **34** in cylindrical portions of the bearings **50**, and seaming or otherwise crimping and securing a peripheral edge portion of each lid to peripheral end **23** of the body portion **14** in a "tin-can" type of motor housing structure.

The completed motor assembly illustrated in the cross sectional view of FIGURE 2 is inexpensive to produce and provides adequate ventilation through the apertures **25** as well as apertures **65** and **66** described above. The fan blades **38** rotating with the rotor on the shaft **34** create air turbulence sufficient to circulate air around the windings **28** and within the hollow cylindrical space **15** inside the can type motor structure. The flanges **65***a* and **66***a* around openings **65** and **66**, respectively, are bent radially inwardly in the form of louvers to direct a flow of air toward the windings **28** and also to serve in retaining the stator laminations of the stator **30** in a central location intermediate the lids **12** seamed at opposite sides to the body portion **14**. The seaming operation as illustrated in FIGURE 2 includes a crimping of a peripheral edge of the body portion **14** with a bent over locking edge **72** of each lid **12** positively engaging the lids concentrically relative to the body portion **14** and stator and rotor. It is to be understood that other means for fastening the lids to the body portion **14** can be used. It is also possible to solder the lids in place or to press fit the lids against the peripheral edges of the body portion **14** in a manner similar to a fastening commonly found on paint can lids. If a temporary paint can lid type of fastening is used between the lids and the body portion, the can type construction for the electric motor will permit removal of one of the lids so that the windings inside the can type container can be reached for service after the motor unit has been removed from an installation in the field and brought back for possible rebuilding at the factory where the can type or expendable motor was manufactured or in a service shop set up specifically for servicing the expendable type of motors which are capable of being salvaged. However, in the majority of instances, the cost of repairing and servicing a defective motor of the expendable type having a can type structure as described above will exceed the cost of throwing away the defective motor and replacing it with a new unit of the expendable or "canned-type" motor of the present invention.

FIGURE 5 illustrates one embodiment of a provision for making a "tin-can" housing for a dynamoelectric machine having features set forth above. It is to be noted that the "tin-can" housing can be provided for a dynamoelectric machine or for any other type of mechanism having a rotating member which must be accurately aligned relative to a stationary portion of the machine including the housing. Further disclosure as to such additional mechanism having a rotating member is made later in the description. To illustrate the one embodiment of a method in accordance with the present invention for making "tin-can" housings for rotating mechanisms, a cylindrical body portion **114** is shown in FIGURE 5 after the thin sheet metal has been curved into an annular or cylindrical shape described earlier in the specification. In the embodiment of the provision illustrated in FIGURE 5 only one end of the body portion **114** is crimped relative to outer peripheral edges of a lid or end member at a time. Thus an end periphery **123** of the wrap-around body portion **114** is supported in an annular groove **123***g* provided extending laterally inwardly relative to one face **123***f* of a support or die **123D**. The support or die **123D** preferably is provided on a machine adapted for making "tin-can" housings for rotating mechanisms and the die **123D** provides support and/or means for urging and exerting force on end periphery **123** in the direction of an arrow **123***a* shown in FIGURE 5. An arm or auxiliary portion **123A** of the support or die is shown extending laterally from a surface opposite to the face **123***f*, and this arm **123A** can be adapted to attach the die **123D** for movement by any suitable apparatus for effecting location of the groove **123***g* in a position where the die is in abutting relationship relative to one end periphery **123** of the wrap-around body portion **114** of the housing.

Also illustrated in FIGURE 5 is a mandrel **123M** having a main body portion **123B** provided with a surface **123F** on one side adjacent to a lid or end member generally indicated by numeral **112**. The lid or end member has an outer radial edge **122** which is adjacent to an outer radial edge or corner **123***c* of the mandrel **123M**. Due to a cylindrical shape of the mandrel **123M**, the corner **123***c* provides a substantially cylindrical radially outer surface edge portion **123***s* which is adapted to be complementary relative to a shoulder portion **122***s* of the outer radial edge portion **122** of the lid **112**. The shoulder portion **122***s* of lid **112** having a surface radially inwardly of edge **122** and complementary concentric outer surface edge portion **123***s* of the mandrel **123M** are structural features comprising first cooperating means essential and important so far as success of the use of the process of the present invention is concerned for making "tin-can" housings for rotating mechanisms.

Second and further essential cooperating means provided also between the mandrel **123M** and lid or annular member **112** can be seen in FIGURE 5 wherein the one side or surface **123F** of the mandrel **123M** is contoured to be substantially complementary to one side of the annular member or lid **112**. This complementary relationship between the annular member **112** and mandrel **123M** includes provision for an intermediate cover portion **120** including an outwardly bent annular ring **140** which is spaced longitudinally away from stator windings or other stationary portions of a machine having a rotating mechanism. A number of openings **125** for ventilating purposes can be provided if the housing is for a mechanism requiring ventilation. However, the surface **123F** of the mandrel **123M** need not be complementary to the openings **125** because the openings **125** can be omitted, though the first and second essential cooperating means for exercising the process of the present invention are still provided.

The mandrel **123M** is provided with a third and further complementary portion including a recess **123***r* extending laterally inwardly relative to the mandrel and adapted to complement a central boss portion generally indicated by numeral **118**. The central boss portion **118** forms part of the lid or annular member **112** and essentially there is provided an annular shoulder **122S** extending laterally to one side of the annular member **112** to form a radially outwardly extending surface concentrically spaced from the radially inwardly extending surface of shoulder portion **122***s* of the outer radial edge portion **122** of the annular member **112**. It is to be understood that the annular member **112** preferably is stamped from "tin-can" sheet metal or other thin metal material. The stamping of the annular member **112** results in provision of the shoulder portion **122***s* and shoulder **122S** such that a radially outer corner **123***c* and an intermediate inner corner **123C** of the mandrel **123M** are complementary to and concentric intermediate the shoulder portion **122***s* and shoulder **122S** of the annular member **112**.

As described earlier, the shoulder **42** illustrated in FIGURE 2 of the drawings is used for concentrically mounting a radially outwardly extending flange **54** of sintered metal bearing means **50**. The shoulder **122S** illustrated in FIGURE 5 is comparable to the shoulder **42** illustrated in FIGURE 2. The mandrel **123M** thus provides corner portions **123***c* and **123C** integral with surface **123F** on one side of the mandrel and adapted to be positioned concentrically and substantially radially in alignment intermediate a radially outer surface of shoulder **122S** of lid **112** and a radially inner surface of shoulder portion **122***s* of lid **112**.

The shoulder **122S**, inner corner **123C**, outer corner portion **123***c*, surface **123***s*, and shoulder portion **122***s* are substantially radially in alignment relative to each

other and lie substantially coplanar with a groove **124G** provided extending radially inwardly about an annular outer periphery of a rotatable means generally indicated by numeral **124R** and shown schematically in the drawings. A plurality of rotatable means or rollers **124R** can be provided or suitably carried by a machine or support and can be adapted to permit rotation relative to the edge portion **122** of the annular member **112**. Preferably the rollers **124R** are rotatably mounted or journalled by apparatus that also supports the die **123D** through arm or auxiliary portion **123A** also indicated schematically in the drawings. Suitable means for moving and driving the rollers **124R** must be provided with the apparatus that supports the rollers and a median portion **123***m* of the mandrel **123M** is provided integrally and indicated schematically with the mandrel for supporting the mandrel relative to the apparatus or other suitable carrier of the mandrel. The mandrel **123M** can be rotated independently relative to the rollers **124R**. This condition may be facilitated by coating the mandrel surface **123F** with an abrasive or clutching material to increase the frictional grip thereof. The surface **123F** frictionally engages one side of the lid or annular member **112** and thus effects rotation of the annular member **112** relative to the rotatably mounted or journalled rollers **124R** which remain in fixed locations but can rotate about an axis of the shaft on which they are carried relative to the apparatus providing support for the rollers. Conversely, the mandrel **123M** can also remain substantially fixed for holding the annular member or lid **112** in fixed relationship as the rollers **124** rotate on an axis of a shaft on which each roller is journalled and also as the rollers as a group are rotated around an axis that passes centrally through the median portion **123***m* and auxiliary or arm portion **123M** of the die **123D**.

Due to concentric relationship of the shoulder and shoulder portions of the lid as well as the corners of the mandrel as described earlier, the rollers **124R** are adapted to rotate concentrically relative to these annular corners and shoulders. As indicated by arrows **123***r*, the rollers **124R** are adapted to be radially indexed inwardly relative to edge portion **122** of the annular member or lid **112** and engagement of the groove **124C** of the rollers **124R** effects a crimping or bending of the outer peripheral edge portion **122** relative to at least one end periphery **123** of the wrap-around body portion **114**. Before describing the result of the crimping or bending of the outer peripheral edge portion of the annular members relative to one end periphery **123** of the body portion, reference is made to FIGURE 5*a* in which there is shown a small die **123***d* provided with an outer peripheral edge **123***e* having a diameter substantially equal to a diameter of the shoulder portion **122***s* of the outer radial edge portion **122** of lid **112** that has been crimped by rollers **124R** described with FIGURE 5. The die **123***d* is provided with an axially extending hollow portion or hub **123***h* in which one end of a shaft **134** is supported. An inner passage **134***a* is provided in the hub **123***h* and this passage is concentric and in a predetermined aligned relationship relative to the radially outer edge **123***e* of the die **123***d*. The passage **134***a* in which the one end of the shaft **134** is supported is provided so that a rotor assembly including the shaft can be accommodated in space within the "tin-can" housing made in accordance with the present invention. It is to be understood that though a dynamoelectric machine rotor is illustrated on the shaft **134**, a rotating mechanism of any other apparatus such as a pump rotor can also be adapted to be mounted within the "tin-can" housing made in accordance with the present invention. Further description as to other rotating mechanism that can be journalled and mounted within the "tin-can" housing is given later. In the view of FIGURE 5*a*, one end of the "tin-can" housing has been crimped and the small die **123***d* provides support for this previously crimped end of the housing. The mandrel **123M** and rollers **124R** are shown in FIGURE 5*a* in positions prior to indexing radially inwardly for crimping the opposite end of the housing. The features of the crimping operation are identical with the features already described and therefore identical reference numerals are used in both FIGURES 5 and 5*a* for illustrating the crimping process so far as the opposite end of the housing is concerned.

FIGURE 6 illustrates another embodiment of the process for making a "tin-can" housing for a rotating mechanism in accordance with the present invention and in this embodiment opposite ends of the housing are crimped simultaneously. Mandrels are provided adjacent to opposite ends of the wrap-around body portions of the "tin-can" housing and these mandrels are identified by reference numerals **223M** and **223***d*. Rollers **224R** are provided and are suitably journalled for permitting independent rotation of the rollers when the mandrels **223M** and **223***d* are driven as indicated by the arrows. In this connection, it is apparent that the rollers **224R** may be driven and the mandrels may rotate independently as desired. The critical locating points so far as the turning operation is concerned are indicated by a numeral **222***s* for a shoulder portion of a peripheral edge **222** of each of the annular members or lids **212** and a shoulder **222S** adjacent to a hub portion of the cover or annular member **212**. As indicated by arrows **224***r* the rollers are adapted to be moved radially inwardly relative to the end peripheral edge **222** substantially in the same plane with and radially in alignment with the location of the shoulder portion **222***s* and shoulder **222S**.

In the illustration of FIGURE 6, the mandrel **223M** differs slightly in configuration relative to the configuration of the mandrel **223***d*. This difference is illustrated because after a shaft carrying a rotating mechanism is installed within wrap-around body portion **214** of the "tin-can" housing, lids or annular members **212** having bearings generally indicated by numerals **250** already inserted therein are mounted onto opposite ends of the shaft for locating the opposite annular members concentrically on the shaft. The mandrel **223***d* does not have a corner portion **223C** complementary to the shoulder **222S** because in effect a radially outwardly extending portion **254** of the bearing means **250** has a peripherally outer surface which registers against an inner peripheral surface of the shoulder **222S** and in effect the shoulder portion **222***s* is still concentrically and radially aligned relative to the shoulder **222S** because the bearing means **250** maintains concentric relationship of the shoulder **222***s* relative to shaft **234** having one end journalled within a hub portion **223***h* of the mandrel **223***d* having an outer peripheral edge portion **223***e* adapted to be positioned radially inside shoulder portion **222***s* of one annular member **212**.

In the view of FIGURE 6, the arrows **224***r* schematically indicate radially inward movement of the rollers relative to outer peripheral edges of the annular members or lids **212** and in FIGURE 6*a*, the arrows **324***r* are directed radially outwardly and indicate schematically that the rollers are removed from a position in engagement with the radially outer peripheral edges **222** of each of the lids after completion of the crimping operation as evidenced by the edges of the annular members and wrap-around body portion tightly bent into engagement with each other. It is to be understood that the crimping operation performed using the two essential locating points provided by the shoulder portion **222***s* and shoulder **222S** can be accomplished using the rollers and mandrels as described and providing relative rotation between the rollers and mandrels for continuously and progressively crimping peripheral edges relative to end portions of the wrap-around body portion into engagement with each other.

The views of FIGURES 6 and 6*a* illustrate the "tin-can" housing being made for a dynamoelectric machine having a rotor and stator as described with FIGURE 2 and having specific improvements in the wrap-around body portion **314** and in the lids or annular end members **312**.

The structures illustrated in FIGURES 2, 5*a*, and 6 show openings **25**, **125**, and **225**, respectively, for ventilating purposes as the openings are provided extending axially and parallel to the shafts on which the rotors are mounted. The lids or annular members **312** illustrated in FIGURE 6*a* are each provided with openings **325** similar to openings **25**, **125**, and **225** but differing in that each of the openings **325** is formed by bending louvers or flange portions **325***f* axially and longitudinally inwardly relative to the "tin-can" housing with free ends **325***e* of these louver portions or flanges **325***f* projecting to a location adjacent to a radially inner end of fan blades **338** formed integrally with an end ring **336** of a cast squirrel cage winding provided with a lamination assembly **332** forming a rotor carried by shaft **334**.

One of the improvements in the wrap-around body portion **314** illustrated in FIGURE 6*a* lies in an inwardly protruding pair of flanges or shoulders **314***s* located on opposite sides of stator lamination assembly **330**. The purpose of these flanges or shoulders **314***s* is to provide means for locking the stator **330** against axial or longitudinal movement or displacement within wrap-around body portion **314**. The stator lamination assembly **330** has a width substantially equal to the distance between the pair of shoulders **314***s* and the stator assembly **330** is locked firmly into engagement between this pair of shoulders **314***s* as the wrap-around body portion is formed into an arcuate or cylindrical shape out of thin sheet metal in accordance with the present invention. Thus the stator is locked into a position wherein windings **328** provided in slots of the stator lamination assembly are maintained in a predetermined spaced relationship relative to annular members **312** and relative to the openings **325** formed by the louver structure or flange **325***f*. A free edge **325***e* of each of the flanges **325***f* is substantially in radial alignment relative to opposite longitudinal ends of the windings **328** provided in the stator lamination assembly. Thus the windings **328** are terminated substantially in radial alignment with the free ends **325***e* of the louvers and a space **341** for passage of cooling air is provided having a width substantially equal to the distance for which the flanges are bent inwardly to one side of the lids.

Also illustrated in the view of FIGURE 6*a* is a modified structure of bearing means generally indicated by numeral **350**. The bearing means **350** have a cylindrical portion **352** comparable to cylindrical portion **52** described with FIGURE 2. Also the bearing means **350** have a radially outwardly extending flange portion **354** providing an annular outer surface engageable against an inner periphery of flange **222S**. The bearing means **350** now further provide a longitudinally extending oil control ring portion **350R** located substantially half-way radially along outwardly extending flange portion **354** and extending longitudinally and axially in an opposite direction from that of the cylindrical portion **352**. The purpose of the oil control ring portion **350R** is to assure retention of lubricant provided within the bearing packing and within thee sintered metal bearing itself and the ring portion **350R** provides a radial barrier against escape of lubricating fluid away from the shaft **334** surrounding washers **358**.

FIGURE 6*b* is a fragmentary view illustrating another embodiment of cooperating structure between a wrap-around body portion **414** and a lid or annular member **412**. In this embodiment, the lids **412** are stamped to provide concentric locking joints comparable to the flange or shoulder portion **222***s* and flange or shoulder **222S** but a radially outer peripheral edge of each annular member or lid **412** is crimped individually into a bead segment **412B** which is adapted to be locked behind complementary bead segment **414B** of the wrap-around body portion **414**. The advantage of the structure illustrated in FIGURE 6*b* lies in the fact that the bead segment **412B** is removable from locking engagement relative to the bead segment **414B** by using a tool such as a screw driver

or other suitable means for disengaging the bead portions relative to each other. Thus the concentricity of the "tin-can" housing is established prior to assembly of the annular members or lids **412** relative to the wrap-around body portion **414** while a shoulder portion **422***s* is provided with a predetermined concentric spacing relative to a shoulder comparable to the shoulder **222S** engaged by bearing means **350** as illustrated in FIGURE 6*a*.

In the illustration of FIGURE 6*a* the wrap-around body portion **314** is not provided with radially outwardly extending louvers but a cross sectional view taken along line 8—8 illustrates the lamination assembly **330** in a side view and also illustrates louvers for ventilating purposes differing from the passages **65** illustrates and described with FIGURES 2 and 3. Specifically, the structure shown in FIGURE 8 provides radially outwardly extending louver portions or flanges **366***a* and **366***b* directed to provide openings **365***a* and **365***b* in opposite directions relative to each other.

A fragmentary developed view of FIGURE 7 illustrates the wrap-around body portion **314** providing the louver portions **366***a* and **366***b* and a fragmentary section view taken along line **7***a*—**7***a* of FIGURE 7 illustrates how the openings **365***a* and **365***b* extend in opposite directions as the openings are formed by stamping louver portions **366***a* and **366***b* outwardly relative to the wrap-around body portion **314**. Preferably the louvers begin in opposite directions at a top median portion **366***m* of the wrap-around body portion **314** shown in FIGURE 8 and openings **365A** and **365B** are formed adjacent to a bottom median portion **365M** such that the openings **365A** and **365B** face each other. Adjacent to the bottom median portion **365M** a locating edge **314E** is crimped or bent or otherwise suitably attached to an opposite end **314***e* of the wrap-around body portion **314** for securing opposite ends of the wrap-around body portion to each other.

The lamination assembly **330** is preferably formed by using a plurality of substantially rectangular shaped laminations having arcuate portions **330***a* and flat portions **330***f*. The arcuate portions **330***a* are provided with a curvature substantially that of an inner periphery of the wrap-around body portion **314** and continuous ribs or inwardly extending grooves beads or shoulders **314***s* shown and described with FIGURE 6*a* are engageable laterally against edges of outer laminations along the arcuate portions **330***a*. Thus each of the laminations when aligned relative to adjacent laminations provides a stator lamination assembly having a substantially arcuate peripheral edge portion engageable relative to the inner periphery of the wrap-around body portion **314** yet providing flat edge portions **330***f* leaving a semi-arcuate space **330F** in each quadrant of the substantially cylindrical "tin-can" housing in accordance with the present invention. The purpose of the space **330F** in each quadrant is to enhance ventilation and flow of cooling air relative to the lamination assembly **330**. This results in an improved cooling of the lamination assembly in which windings **328** are provided and space such as **330F** is of particular advantage when used with the louver portions **366***a* and **366***b* extending radially outwardly in opposite directions as already mentioned. Flat sides such as edge portions **330***f* also permit slipping a stator lamination assembly past flanged vents **65**—**66** into the cylinder of FIG. 2 by rotation of the stator assembly axially to lock between flanges if desired.

In FIG. 9 there is an illustration schematically representing mounting of a dynamoelectric machine having a "tin-can" housing in accordance with the present invention and for purposes of illustration a skirt portion **500** of an appliance such as a washing machine is outlined in a fragmentary view. This skirt portion **500** is substantially cylindrical in shape and provides vertical support for the appliance which may be portable due to use of castors or rollers **550R** in a well-known manner. In any event, the skirt portion **500** is elevated a limited amount due to

use of the rollers 500R or other leg-like supports and there is a limitation to the ventilation underneath the skirt portion 500 due to a minimum space between a lower edge of the skirt portion and the ground or floor on which the rollers or legs rest. It is well-known that heated air has a tendency to rise away from the ground and therefore the louver structure 366*a* and 366*b* is particularly well adapted for dissipating heat from inside the "tin-can" housing in accordance with the present invention. As mentioned earlier, the louver portions 366*a*, and 366*b* begin at a top median portion 366*m* and extend radially outwardly in opposite directions as illustrated in FIG. 8. Thus heated air arising within the "tin-can" housing is dissipated and directed to flow radially outwardly and downwardly as indicated schematically by arrows 366D and 366*d* shown in FIGURE 9. A phantom outline 510 of a dynamoelectric machine having a "tin-can" housing in accordance with the present invention is provided in a suitable mounting location underneath the skirt portion 500 of the appliance. Due to the use of the radially outwardly and oppositely extending louver portions shown in the drawings in FIGURES 7*a* and 8, heated air is directed downwardly into space toward a bottom edge of the skirt portion 500 where the heated air is readily dispersed from underneath the skirt portion 500.

FIGURE 9*a* illustrates another use of a "tin-can" housing made in accordance with the present invention and specifically, a fluid pump rotor 600 mounted on a shaft 634 is mounted relative to an annular member or lid 612 provided with a shoulder 622S relative to which there is mounted an outer peripheral surface of a radially outwardly extending flange 654 of a bearing means 650. A radially outer peripheral edge 622 of the annular member or lid 612 is crimped relative to one end portion 623 of a wrap-around "tin-can" body portion 614 provided for concentrically mounting a pump stator 600S concentrically relative to fluid pump rotor 600. Specific fluid pump rotor and stator structure is not part of the present invention and therefore only a schematic illustration of the pump rotor and stator is made in FIGURE 9*a*. However, the lid or annular member 612 is provided with openings 625 which can serve as outlet passages for discharge of any fluid forced under pressure by the cooperation of the pump rotor relative to the pump stator. Inlet openings 625*i* are provided in an annular member 612*m* snapped into engagement relative to a groove 614*g* provided along an inner radial periphery of the annular wrap-around body portion 614 of the "tin-can" housing in accordance with the present invention. The annular member 612*m* is provided with a radially inner shoulder portion 612*s* on a hub 612*h* adjacent to one portion of shaft 634 and a radially outer edge or peripheral portion 612G of the member 612*m* is adapted to be locked relative to the groove 612*g* such that there is concentric spacing of the shaft 634 relative to the wrap-around body portion 614 of the "tin-can" housing in accordance with the present invention.

As illustrated in FIGURE 9*a*, the wrap-around body portion 614 can be provided with a downwardly extending skirt portion or extension 614*s* adapted to fit about an outer periphery of a standpipe or conduit 614C relative to which the pump in the "tin-can" housing is mounted. The pump can be driven by a belt 634B fitted around a pulley 634P provided on one end of the shaft 634 and around pulleys 634*p* attached to a shaft 640*s* of an electric motor generally indicated by numeral 640 which can be provided for driving the pump. It is to be understood that means other than the electric motor 640 can be used for powering the pump having the "tin-can" housing in accordance with the present invention. Also to be understood is that the "tin-can" housing 614 can be adapted to fit onto other conduits or shapes of pipes for carrying fluid which is to be pumped from within the conduit to a location outside of the conduit. A die cast annular intermediate cover can be provided in place of a stamped member 625 shown in FIGURE 9*a*.

For a disclosure concerning formation of a wrap-around body portion such as 14, 114, 214, etc., reference can be made to a U.S. Patent 1,452,143—Burke, issued April 17, 1923. Burke, particularly in FIGURES 7 and 8, shows formation of an annular wrap-around member made of sheet metal heavier than that for use in accordance with the present invention. A U.S. Patent 1,717,590—Walter, issued June 18, 1929, discloses a method and apparatus for forming a bead relative to a can.

In FIGURE 8 there is a representation of a demountable or removable switch means generally indicated by numeral 80. The switch means 80 includes a housing 80*h* with a base from which terminals project and these terminals or prongs are adapted to be insertable relative to male or female connectors 80*c* which are mounted in insulating bodies 80*i* adapted to be locked into engagement relative to edges surrounding openings provided through the wrap-around body portion of the "tin-can" housing. The insulating bodies 80*i* have a flange portion 80*f* abutting against one side of the "tin-can" body portion and resilient laterally deflectable projections or tangs 80*p* engage an opposite side of the "tin-can" body portion. Another view of the switch means 80 and push-on terminal mounting means such as 80*i* is provided in FIGURE 5*a* of the drawings. In FIGURE 5*a* it is apparent that the switch and terminal mounting means are located on one side of the lamination assembly. One type of switching means 80 usable with the present invention is disclosed in copending applications belonging to the assignee of the present invention including S.N. 752,893—Shewmon, et al. filed August 4, 1958 (abandoned) as well as S.N. 752,711—Shewmon, et al. filed August 4, 1958, now Patent 2,944,126 issued July 5, 1960. As shown in FIGURE 8, line voltage can be supplied to the windings by way of a pair of terminal or connector mounting means including bodies 80*i* and connectors 80*c*. Suitable wires connect the windings with the connectors 80*c*.

As indicated earlier, the stator lamination assembly can be snapped into place relative to the "tin-can" housing from either end thereof. The square configuration of the laminations is such that the "tin-can" body portion of the housing is deformed temporarily for permitting snap-in of the lamination assembly. No snap-in lamination mounting could be effected with round laminations and therefore square laminations are used. The body portion of the "tin-can" housing can be provided without ventilating passages and sealed as a totally enclosed unit if the motor is to be used in an environment where there is a danger of fire or explosion. One example of such a use would be for a motor used in an oil burner housing. An oil burner housing could be provided with a mounting plate adapted to complement a lid end of the "tin-can" housing and mounting bolt apertures can be provided or formed through flanges extending laterally of the oil burner housing mounting plate.

In addition to an advantage of accurate concentricity between stator and rotor parts in the "tin-can" housing, there is a very desirable cooling permitted by use of louvers as illustrated in the views of FIGURES 6*a* and 8. Rows of louvers can be provided on both sides of the stator laminations or only on one side, but with two rows of louvers pointed downwardly and extending in opposite directions, there are two streams of directed air flow parallel at opposite ends and meeting along the flat sides of the laminations.

The "tin-can" housing can be made of corrosion resistant material if necessary. Due to "tin-can" housing structure, there is less copper and iron and the motor runs cooler. Also the use of less metal and louvers in conjunction with a fan assures less heat reserve and quicker cooling. Cost of materials for making a "tin-can" housing is relatively low. The machining operations for making motor housings are minimized. A "tin-

can" housing can be rotated at 1500 r.p.m. for example as end seals are effected by rollers for crimping lids to the annular body portion. An inner register point for concentricity along a central shoulder or hub is established by mandrels provided relative to an outer register point along a shoulder portion adjacent to edge of the lid crimped as described previously. Concentricity can be accurately maintained to within 9/1000 of an inch. Air gap between stator and rotor parts can be kept at a minimum.

While the embodiment of the present invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. An expendable dynamoelectric machine sufficiently inexpensive to produce so as to permit throw-away rather than repair of components, comprising, a plurality of stacked stator laminations carrying wound coils and a laminated rotor having a case squirrel cage winding connected at opposite sides by end rings cast integral with rotor fan blades provided radially inwardly of ends of the stator coils, a "tin-can" housing including a cylindrical body portion directly for supporting the stator laminations concentrically therein, said housing also including end members stamped out of thin sheet metal and fastened by seaming to opposite peripheral ends of said body portion, a hub stamped centrally into each end member including a flange and a lip concentrically located relative to each other, a sintered metal bearing pressed into sealing engagement at opposite ends relative to said flange and lip to form a cavity between said hub and said bearing, and a lubricant impregnated packing of cellulose base material injected in the cavity during engagement of said bearing against said end member.

2. The machine of claim 1 in which said end members have openings spaced longitudinally of said rotor fan blades, the openings having peripheral flanges bent laterally inwardly of said housing to add rigidity to said thin sheet metal end members, said body portion having apertures on at least one side adjacent said stator laminations for ventilation surrounding the wound stator coil ends, said fan blades being located to rotate radially inwardly of the coil ends and serving to facilitate adequate ventilation inside said "tin-can" housing between the openings and apertures.

3. For a dynamoelectric machine, a housing, comprising, a cylindircal body portion formed exclusively only of a "tin-can" sheet metal and having louvers extending and opening for cooling radially outwardly in opposite directions from a radial median location, a pair of axially spaced and continuous ribs provided extending radially inwardly as part of said cylindrical body portion, a substantially rectangular shaped stack of stator laminations with flat side portions and arcuate portions snapped directly into an inner periphery of said cylindrical body portion at a position intermediate of and relative to said continuous ribs, a pair of stamped annular members of "tin-can" sheet metal directly attached to opposite end peripheral edges of said cylindrical body portion, a cast rotor including axially-extending fan blades and journalled by said members, and radially inwardly protruding flanges provided on said stamped annular members and forming louvered openings terminating adjacent to said fan blades carried by the rotor for circulating cooling air through the housing and radially outwardly and downwardly through said body portion louvers.

4. The housing of claim 3 wherein said stamped annular members have annular beads and said opposite edges of said cylindrical body also have beads adapted to be removably locked into engagement with each other and thereby establishing concentric relationship between the rotor and the stator laminations through journalling of said rotor by said annular members relative to said cylindrical body portion of "tin-can" sheet metal.

5. The housing of claim 3 wherein said cylindrical body portion of "tin-can" sheet metal is fitted with insulating bodies adapted to provide a mounting for terminal means for electrical connection with a source of power as well as a switching means.

6. A dynamoelectric machine sufficiently inexpensive to produce so as to permit throw-away rather than repair of components, comprising, a plurality of stacked stator laminations carrying wound coils in slots thereof, a laminated rotor having a cast squirrel cage winding connected at opposite sides by end rings, rotor fan blades cast integral with the end rings of said rotor squirrel cage and located radially inwardly relative to ends of the stator coils, and a "tin-can" housing rather than a relatively heavy metal frame eliminated and replaced by said housing that consists essentially only of a "tin-can" central cylindrical body portion along an inner periphery of which said stator laminations are held by a light press fit, a pair of substantially identical lid-like annular end members stamped out of thin "tin-can" sheet metal and fastened by seaming directly to both of opposite peripheral ends of said central cylindrical body portion, each of said substantially identical lid-like annular end members including an integral "tin-can" hub portion with an annular flange and a lip concentrically located and longitudinally spaced apart as stamped centrally relative to each end member, an annular sintered metal bearing means pressed directly into sealing engagement at opposite ends relative to said flange and lip to form a cavity between each "tin-can" hub portion and bearing means, and a lubricant-impregnated packing of cellulose-base material injected in each cavity during engagement of said bearing means against each said end member that is seamed to said central cylindrical body portion so as to provide high concentricity of said stator laminations relative to said rotor journalled directly relative to said "tin-can" lid-like members by way of said annular sintered metal bearing means, said central cylindrical body portion having openings located radially outwardly from said stator coil ends and said rotor fan blades, said lid-like annular end members having axial openings substantially in alignment with said rotor fans blades for ventilating purposes.

7. In a dynamoelectric machine sufficiently inexpensive to produce so as to be disposable rather than subjected to costly maintenance of components including a plurality of stacked stator laminations carrying wound coils in slots thereof as well as a laminated rotor having a cast squirrel cage winding connected at opposite sides by end rings, the improvement which comprises a "tin-can" housing rather than a frame of heavy metal eliminated completely for the stator laminations and rotor including only a "tin-can" central cylindrical body portion along an inner periphery of which the stator laminations are held and fitted directly thereto free of any separate fastening means such as screws and the like, a pair of substantially identical lid-like annular end members stamped out of thin "tin-can" sheet metal and fastened by seaming directly to both of opposite peripheral ends of said central cylindrical body portion, a hub portion of "tin-can" metal integral centrally with each of said lid-like members and including an annular flange portion offset to one side from said lid-like member as well as an annular lip portion having a smaller radius than said flange portion, an annular sintered metal bearing means including a radially outwardly projecting annular flange adapted to fit in sealing engagement with said flange portion of said lid-like member and including a cylindrical portion integral with an inner end of said annular flange such that a free end of said cylindrical portion fits in sealing engagement with said annular lip portion so as to form an annular cavity in between each said "tin-can" hub portion and each said sintered metal bearing means,

and a lubricant impregnated packing of cellulose-base material injected into each cavity during engagement of said bearing means against each said "tin-can" end member that is seamed to said "tin-can" central cylindrical body portion so as to provide high concentricity of the stator laminations relative to the rotor journalled only directly relative to said "tin-can" integral hub portion of said lid-like members by way of said sintered metal bearing means.

References Cited in the file of this patent

UNITED STATES PATENTS

1,564,389	Wheeler	Dec. 8, 1925
2,496,507	Watkins	Feb. 7, 1950
2,595,349	Fox	May 6, 1952
2,823,084	Hansen	Feb. 11, 1958

FOREIGN PATENTS

622,891	Great Britain	May 9, 1949
824,367	Germany	Dec. 10, 1951