May 6, 1947. C. C. COULSON 2,420,124

MOTOR-COMPRESSOR UNIT

Filed Nov. 27, 1944 4 Sheets-Sheet 1

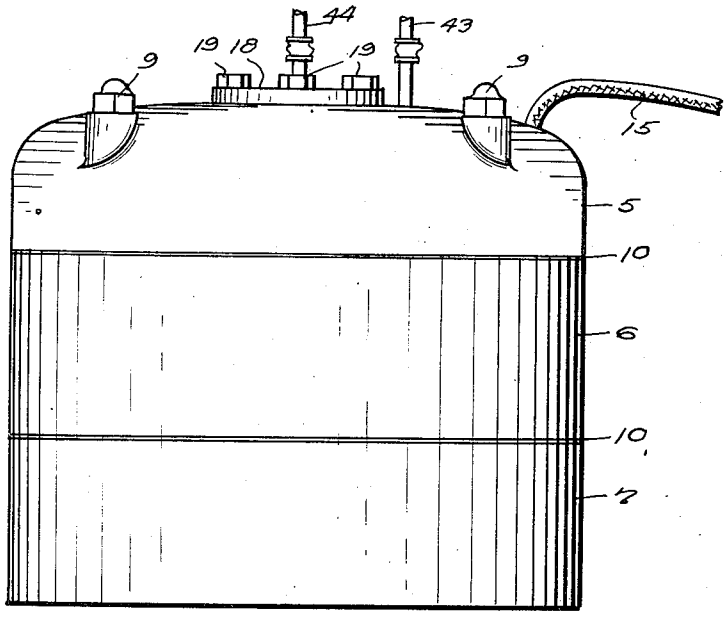


Fig. 1.

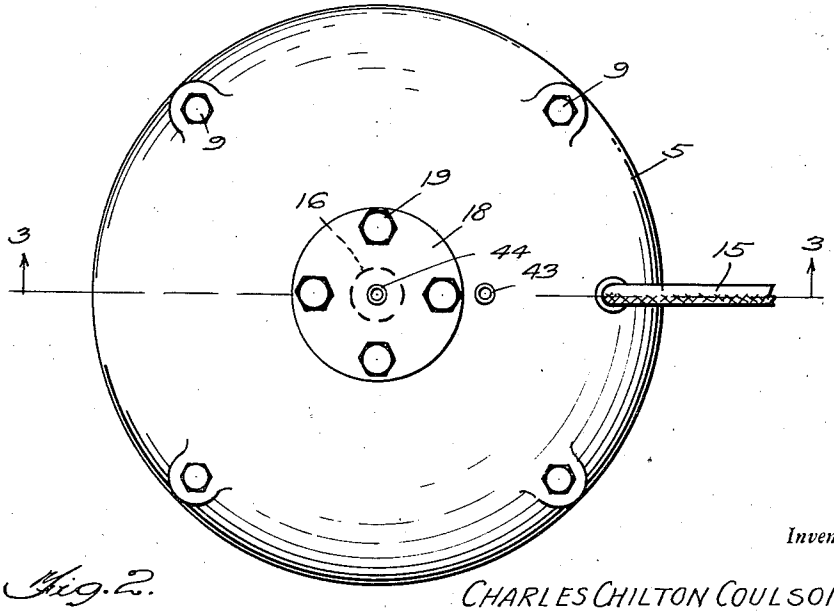


Fig. 2.

Inventor

CHARLES CHILTON COULSON,

By Clarence A. O'Brien and Harvey B. Jackson

Attorneys

May 6, 1947. C. C. COULSON 2,420,124

MOTOR-COMPRESSOR UNIT

Filed Nov. 27, 1944 4 Sheets-Sheet 2

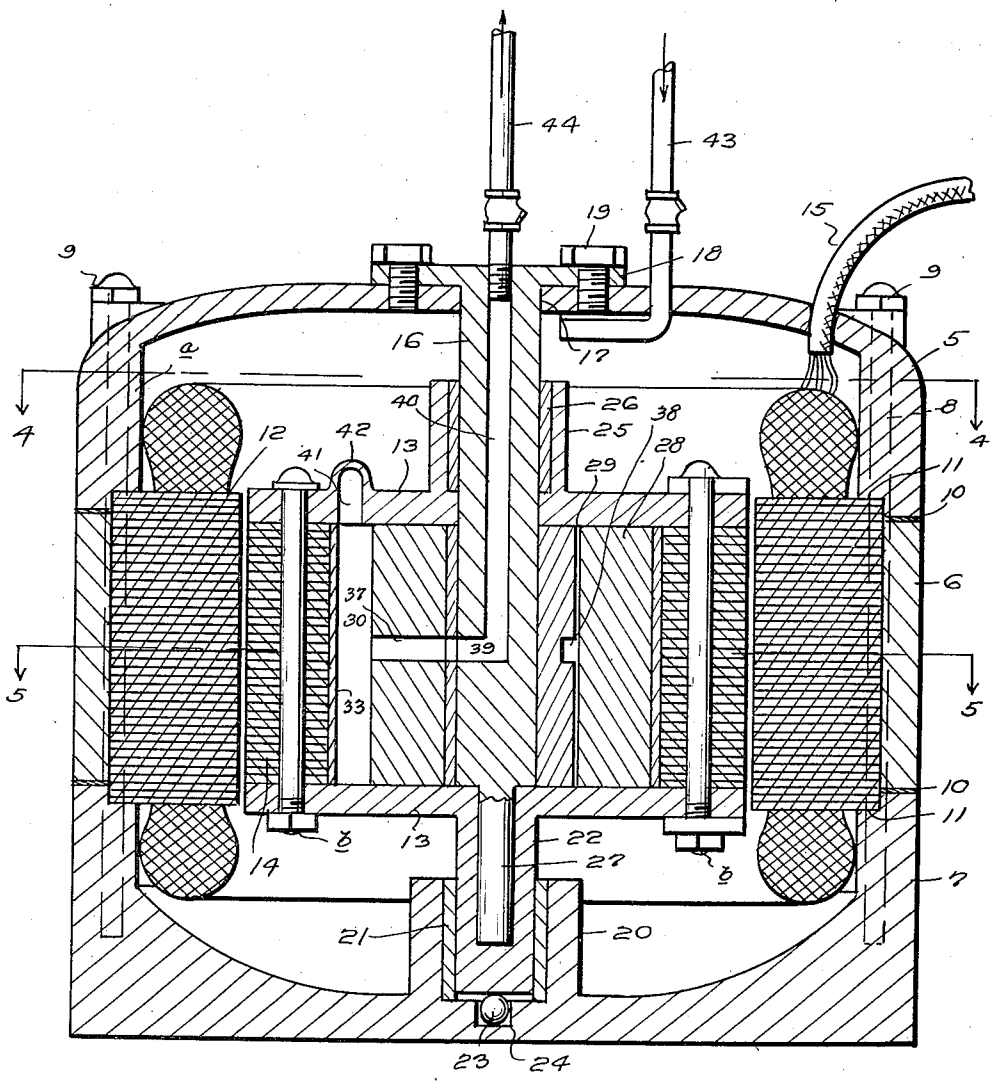


Fig. 3.

Inventor

CHARLES CHILTON COULSON,

By Clarence A. O'Brien and Harvey B. Jacobson

Attorneys

May 6, 1947. C. C. COULSON 2,420,124

MOTOR-COMPRESSOR UNIT

Filed Nov. 27, 1944 4 Sheets-Sheet 3

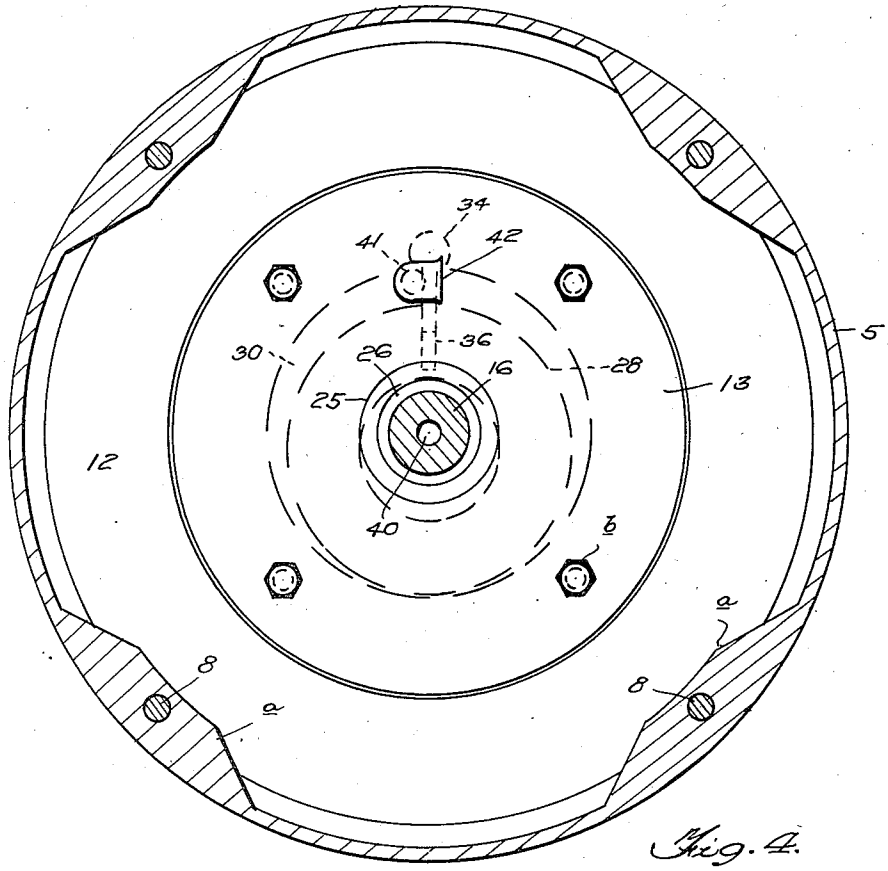


Fig. 4.

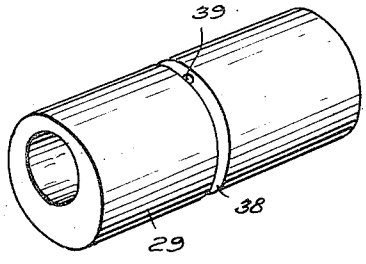


Fig. 6.

Inventor

CHARLES CHILTON COULSON,

By Clarence A. O'Brien and Harvey B. Jacobson

Attorneys

May 6, 1947. C. C. COULSON 2,420,124

MOTOR-COMPRESSOR UNIT

Filed Nov. 27, 1944 4 Sheets-Sheet 4

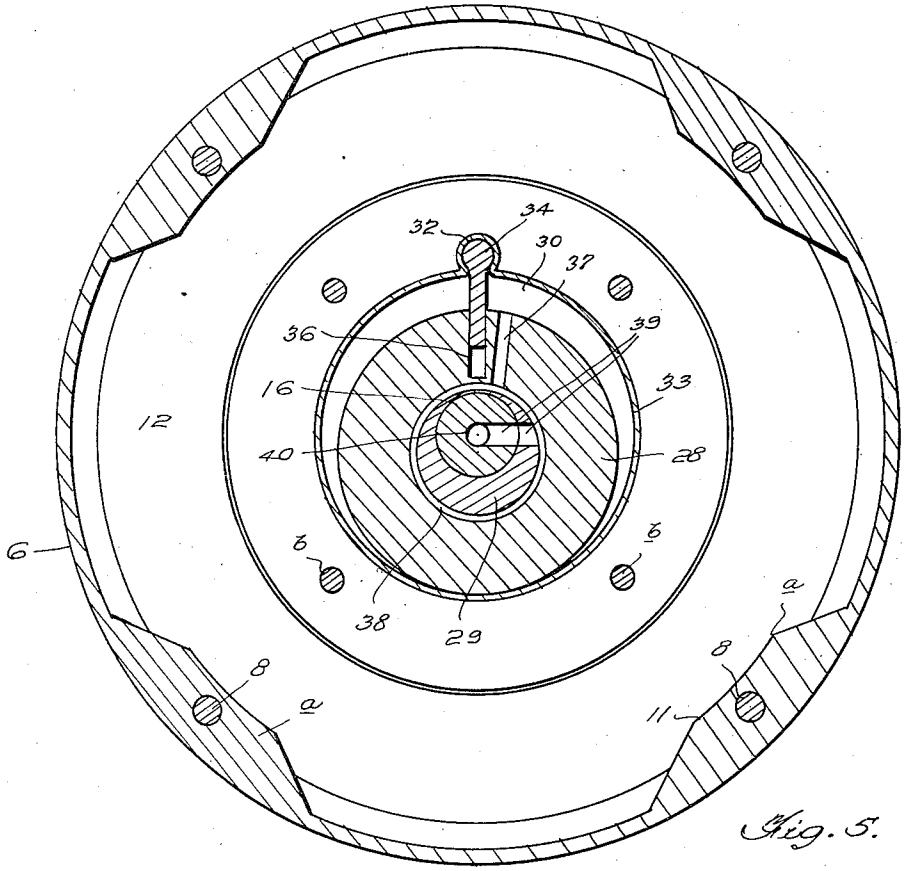


Fig. 5.

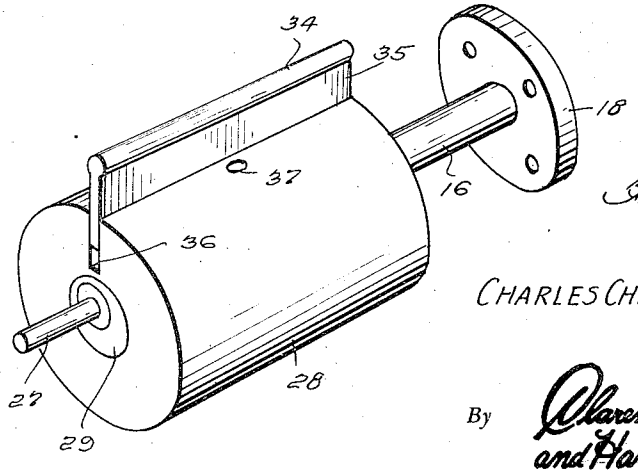


Fig. 7.

Inventor

CHARLES CHILTON COULSON,

By Clarence A. O'Brien and Harvey B. Jacobson

Attorneys

Patented May 6, 1947

2,420,124

UNITED STATES PATENT OFFICE

2,420,124

MOTOR-COMPRESSOR UNIT

Charles Chilton Coulson, Mobile, Ala.

Application November 27, 1944, Serial No. 565,394

3 Claims. (Cl. 230—139)

1

This invention relates to an improved motor-compressor unit, and has more particular reference to a combined rotary electric motor and rotary gas compressor which is of compact and unitary construction.

An important object of the invention is to provide a unit of the above kind in which the armature of the motor forms part of the rotary cylinder of the compressor.

Another object of the invention is to provide a unit of the above character in which the compressor includes a rotary eccentric piston and a radial vane or abutment slidably engaged in the piston and carried by the combined armature and compressor cylinder so as to provide a driving connection between the latter and said piston that permits radial movement of the piston relative to the combined armature and compressor cylinder as the latter rotates.

Another important object of the present invention is to provide a unit of the above kind in which the parts are mounted within a hermetically sealed casing so as to provide a comparatively compact, small and efficient unit particularly adapted for use in connection with the refrigerating systems of electrical household and like refrigerators.

Still another object of the invention is to provide a unit of the above kind which is characterized by a compact and well balanced construction capable of operating efficiently over an extended period of time without requiring attention or repair, and in which the lubriating qualities of the gas being compressed are utilized for lubricating the wearing surfaces of the unit by admitting the gas to be compressed within the casing of the unit.

Other objects and features of the invention will become apparent from the following description when considered in connection with the accompanying drawings, and the invention consists in the novel form, combination and arrangement of parts hereinafter more fully described, shown in the drawings and claimed.

In the drawings, wherein like reference characters indicate corresponding parts throughout the several views:

Figure 1 is an elevational view of a combined motor and compressor unit constructed in accordance with the present invention.

Figure 2 is a top plan view thereof.

Figure 3 is a central vertical section taken substantially on line 3—3 of Figure 2.

Figure 4 is a horizontal section taken substantially on line 4—4 of Figure 3.

2

Figure 5 is a horizontal section taken substantially on line 5—5 of Figure 3.

Figure 6 is a perspective view of the eccentric member or sleeve forming part of the motor-compressor unit shown in Figures 1 to 5, inclusive, and

Figure 7 is a perspective view showing in assembled relation the main spindle or shaft of the unit, the eccentric member, the rotary piston, and the sliding abutment or vane.

Referring in detail to the drawings, the present motor-compressor unit is illustrated as embodying a hermetically sealed casing composed of upper, intermediate and lower sections 5, 6 and 7, respectively, said sections being drawn and secured together in contiguous relation by means of a plurality of bolts 8 that may be secured to the lower section 7 and extended through the sections 5 and 6 with nuts 9 threaded on their upper projecting ends. Gaskets may be employed between the sections, as at 10, to effect airtight joints between them when tightly drawn together. At uniformly spaced points, the sections 5 and 7 are provided with internal thickened portions *a* through which the bolts 8 extend, and which provide opposed shoulders 11 between which is clamped marginal portions of an annular laminated motor field member 12. The field is thus effectively supported between the top and bottom of the casing and held stationary with the latter.

The unit further includes a rotary gas compressor that embodies a combined armature and compressor cylinder, which cylinder includes end or top and bottom discs 13 whose marginal portions are bolted at *b* to and against the sides of a laminated armature member 14 which is arranged to revolve within and in close proximity to the field member 12. The laminated field and armature members are suitably wired so as to provide an electric motor of the induction type, current being supplied to the field through wires of a cable 15 that preferably extends into the casing through the top of the latter.

A supporting shaft or spindle 16 is provided centrally of the casing and snugly extends through an opening provided at 17 in the top wall of casing section 5. The upper end of shaft or spindle 16 may be provided with an external annular flange 18 that is bolted to the casing section 5, as at 19, so that the shaft or spindle is securely mounted in place and held stationary with the casing. The lower section 7 of the casing has a central bearing socket 20 within which is fitted a bearing sleeve 21 that rotatably re-

ceives a central depending hollow shaft 22 formed on the lower disc 13. A thrust ball bearing 23 is seated in a recess 24 centrally of the bottom of the bearing socket 20 and contacts the lower end of the shaft 22 so as to provide a thrust bearing therefor. A cylindrical hub 25 is formed on and projects centrally and upwardly from the upper disc 13, and fitted in this hub is a bearing sleeve 26 carried by the shaft or spindle 16. The combined armature and compressor cylinder is thus effectively supported and journaled in position within the casing and concentrically of the field member 12, the lower end of shaft 16 being reduced, as at 27, and rotatably receiving the hollow shaft 22.

The compressor further includes a tubular cylindrical rotary piston 28 that rotatably fits an eccentric member or sleeve 29 carried by and preferably made separate from and secured on the shaft or spindle 16 between the discs 13. A crescent-shaped compression chamber 30 is thus had at all times between the armature and compressor cylinder and the piston 28, as shown in Figure 5. The armature member 14 is provided in its inner periphery, with a transverse or vertical groove 31 which snugly receives a circular outwardly offset portion 32 of a liner sleeve 33 fitted and secured within the armature member 14. This liner sleeve 33 provides a smooth unbroken surface for engagement with the piston 28, and pivoted within the offset portion 32 of the sleeve 33 is the thickened rounded outer edge portion 34 of an abutment or vane 35 that is slidably received in a radial slot 36 provided in the piston 28. The vane 35 is thus allowed slight angular movement relative to the combined armature and compressor cylinder as may be necessary to avoid binding when the unit is in operation. The vane 35 provides a driving connection between the combined armature and compressor cylinder and the piston 28 so that the same will rotate in unison, the field of the motor, as well as the shaft or spindle 16 and its eccentric member 29, remaining stationary. It is to be understood, however, that the piston 28 is not tightly clamped between the plates 13, but is permitted to move radially relative to said plates 13 although having flat and snug contact with the latter. At one side of the slot 36, the piston 28 is provided with a substantially radial passage 37 that extends entirely through the same and communicates with the bore thereof. In the same plane as the passage 37, the eccentric member 29 is provided with a circumferential groove 38 that extends substantially entirely around said eccentric member and substantially constantly communicates with the passage 37. A port or opening 39 extends through the eccentric member 29 and shaft 16 and opens into the groove 38 near one end of the latter. The inner end of the port or passage 39 communicates with an axial passage 40 provided in the shaft 16 and opening through the upper end of the latter. The upper disc 13 is provided with an inlet port 41 therethrough that is arranged to admit the gas to be compressed into the chamber 30 between the sleeve 33 and piston 28. A scoop 42 is provided on the outside of the upper disc 13 and over the port 41, said scoop opening at one end in the direction of rotation of the combined armature and compressor cylinder so as to scoop the gas and direct it into and through the port 41 when the unit is in operation. The gas is admitted into the upper portion of the casing by means of a pipe 43, and a discharge pipe 44 is connected

to the upper end of shaft 16 in communication with its axial passage 40.

In operation, current is supplied to the field of the motor so as to cause rotation of the combined armature and compressor cylinder in a manner well known in the electric motor art in so far as the electrical principle is concerned. The piston 28 is caused to rotate with the combined armature and compressor cylinder and as they turn in unison relative to the field of the motor and the shaft 16 with its eccentric member 29, the piston 28 is shifted radially to move the portion of the piston adjacent its slot 36 toward the field of the motor adjacent the point where the vane 35 is pivoted. As this takes place, the abutment or vane 35 enters further into the slot 36, and the gas which has been drawn into the chamber 30 through the port 41 from the casing of the unit is compressed and forced through ports and passages 37, 39 and 40 out through the pipe 44. As the parts continue to rotate, a reverse action takes place so that another charge of gas is drawn into the chamber 30, and this cycle of operation is repeated as the unit continues to operate.

The present unit is ideally adapted for use in connection with the refrigerating systems of electrical household refrigerators and the like, the pipe 44 being connected with the inlet of the refrigerating coils, and the gas returning through pipe 43 to the casing of the unit for being compressed again after having expanded in the refrigerating system. The unit is exceedingly small and compact so that it will require little space. Also, the lubricating qualities of the gas admitted into the casing of the unit may be utilized for lubricating the wearing parts of the unit. As the construction is simple, well balanced and durable, it will continue to operate satisfactorily over an extended period of time without any repair or attention, thus making the unit especially adaptable for that type in which the casing of the unit is hermetically sealed. The armature of the motor and the piston of the compressor have a common supporting shaft, and a rotating assembly is constructed to provide both the armature of the motor and the cylinder of the compressor. This is a decided improvement over prior constructions which embody separate motor and compressor units, with driving connections between the individual units.

From the foregoing description, it is believed that the construction and operation, as well as the advantages of the present invention, will be readily understood and appreciated by those skilled in the art. It will be evident that the invention is susceptible of modifications and various changes in details of construction illustrated and described such as fairly fall within the spirit and scope of the invention as claimed.

I claim:

1. In a motor-compressor unit, a vertical cylindrical hermetically sealed casing, a horizontal electric motor field secured in said casing adjacent the peripheral wall of the latter, a supporting shaft disposed axially of said casing and said field, the upper end of said shaft extending through the top wall of said casing and having a flange on its upper end secured to said top wall, a bearing socket on the bottom wall of said casing, a combined armature and compressor cylinder arranged within said field and including an annular laminated armature member and top and bottom discs secured against the top and bottom sides of said armature member, said shaft

having an eccentric member abutted at its ends by said discs, said discs being centrally journaled on said shaft above and below the eccentric member, the bottom disc having a central depending hollow stub shaft receiving the lower end of the supporting shaft and received in said bearing socket, radial and thrust bearing elements between said bearing socket and said stub shaft, a tubular cylindrical piston rotatably fitted on the eccentric member within the armature member, and a vane carried by the armature member and slidable in said piston.

2. The construction defined in claim 1, wherein the armature member has a vertical groove in its inner periphery, in combination with a liner sleeve fitted in the armature member and provided with an outwardly offset portion snugly received in said groove, the vane having a rounded outer edge portion pivotally engaged in said offset portion of the liner sleeve.

3. The construction defined in claim 1, wherein the top disc has a transverse inlet port communicating directly with the space between the armature member and the piston, an external scoop on said top disc hooding said inlet port and opening at one end in the direction of rotation of the armature member, said supporting shaft, eccentric member and said piston having communicating passages and ports for the discharge of compressed gas from the compressor cylinder, the passage of said shaft opening through the upper end thereof, and a gas supply pipe opening within the casing at the top of the latter.

CHARLES CHILTON COULSON.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,223,919	Wilson	Apr. 24, 1917
1,482,028	Oswald et al	Jan. 29, 1924
1,704,240	Broom	Mar. 5, 1929
2,324,434	Shore	July 13, 1943
2,331,878	Wentworth	Oct. 19, 1943

FOREIGN PATENTS

Number	Country	Date
398,719	British	Sept. 21, 1933