

Sept. 25, 1951

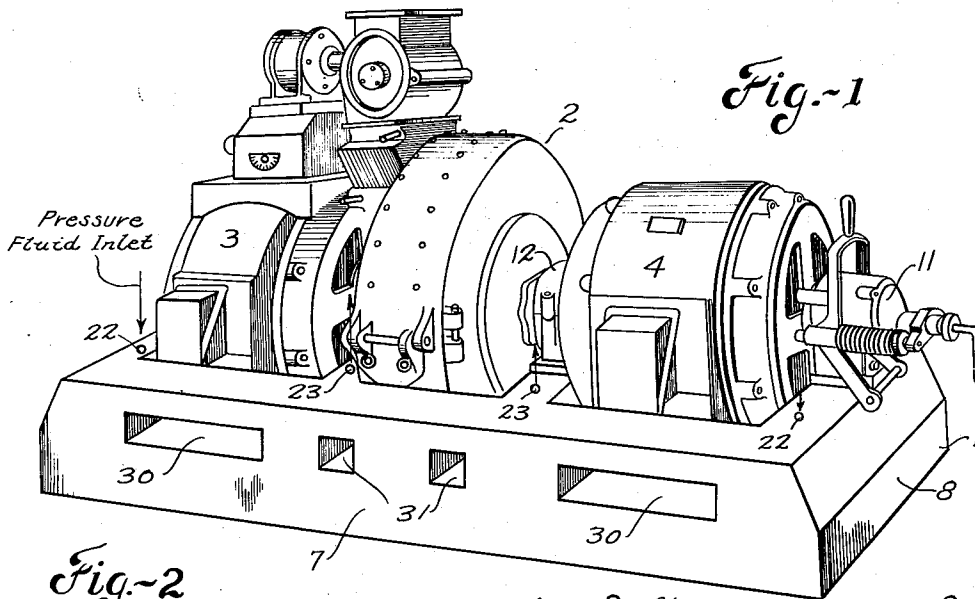
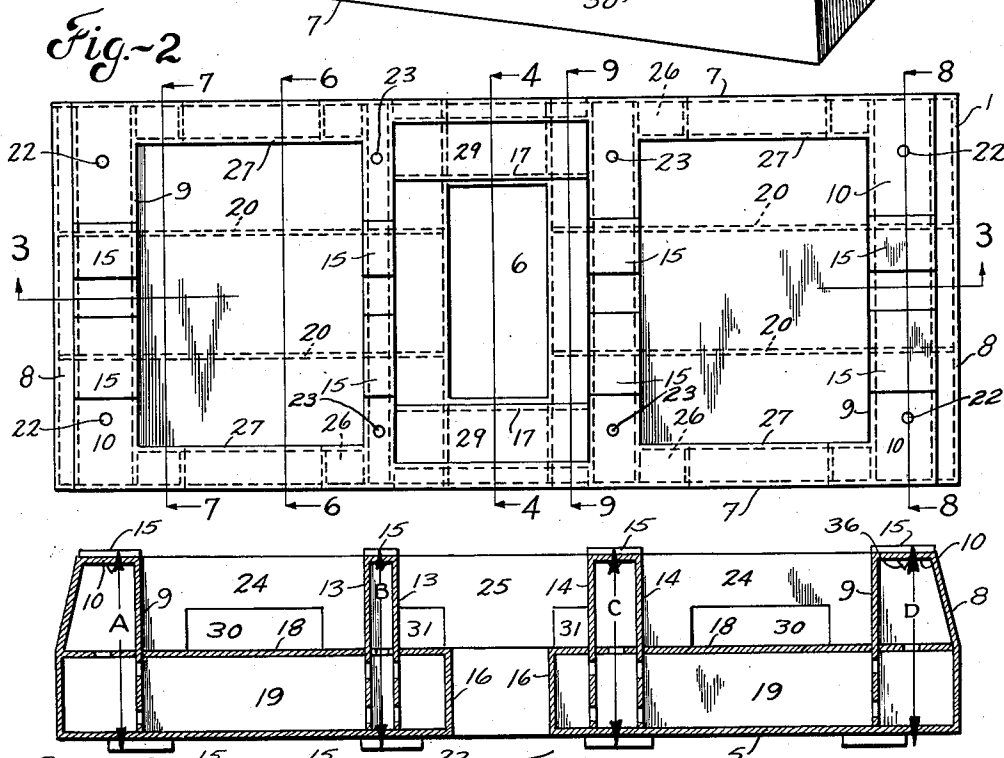
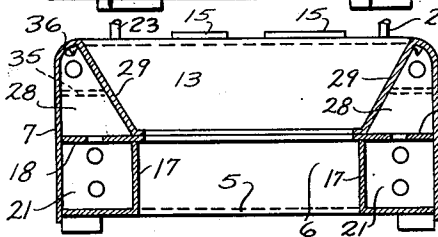
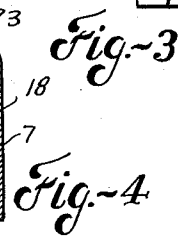
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2,568,783

TEMPERATURE CONTROLLED MILL BASE

Filed March 4, 1948

2 Sheets-Sheet 1



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TEMPERATURE CONTROLLED MILL BASE

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2 Sheets-Sheet 2

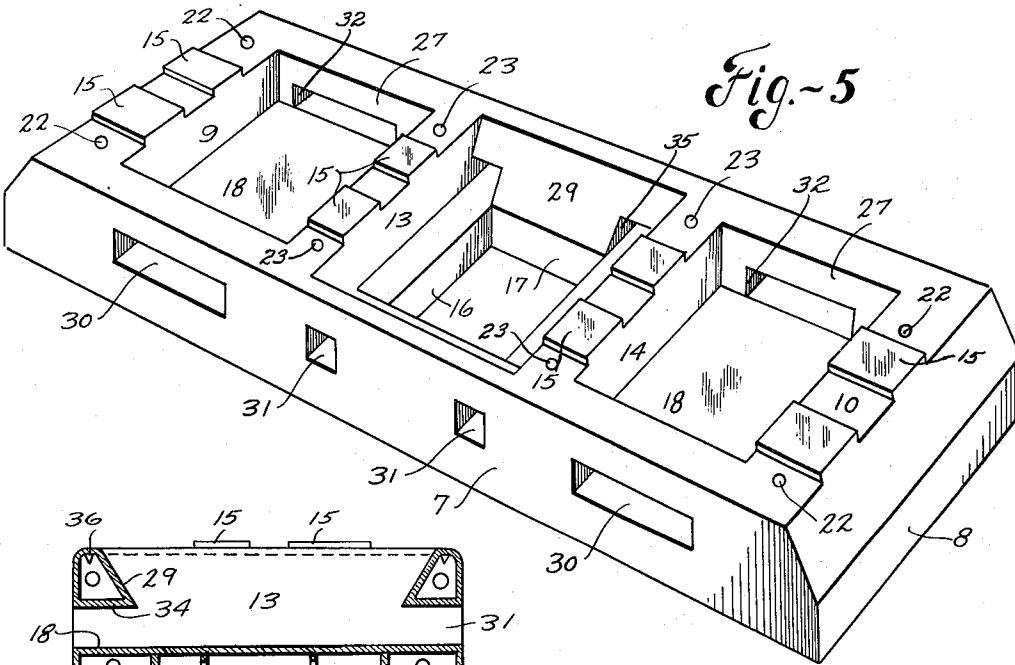
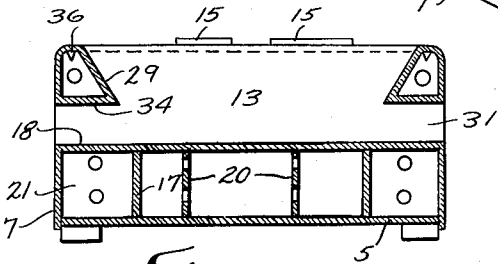


Fig.~9

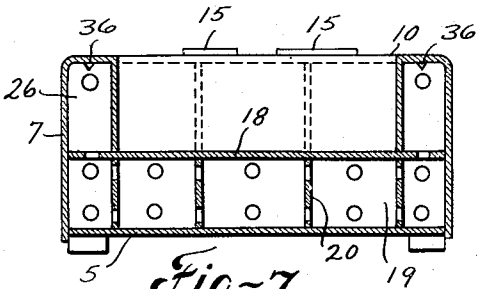


Fig.~7

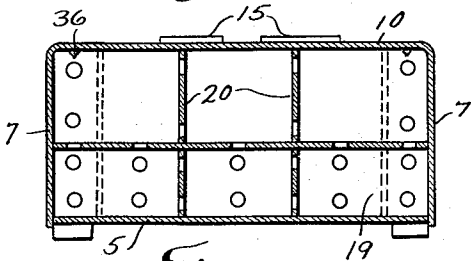


Fig.~8

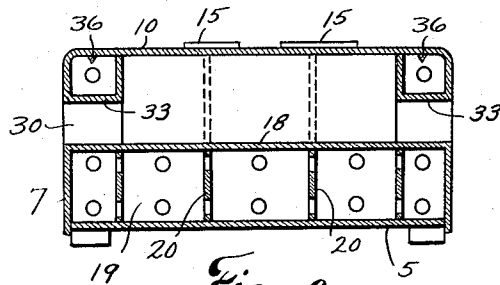


Fig.~6

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UNITED STATES PATENT OFFICE

2,568,783

TEMPERATURE CONTROLLED MILL BASE

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Application March 4, 1948, Serial No. 13,012

6 Claims. (Cl. 241—285)

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This invention relates to milling equipment, and more particularly to a means of maintaining an equalized temperature throughout the supporting base and adjacent parts of a mill, particularly attrition mills used in the refining of various types of pulp.

In many applications for such mills it is desirable to refine the pulp at temperatures above ambient, with the result that the central portion of the mill assembly and the base adjacent the milling chamber becomes overheated, causing unequal expansion thereof. In refiners of the double disc type the best refining action is obtained when the discs are maintained in absolute parallelism, yet this is impossible when the supporting base expands unevenly.

Thus, the object of the present invention is to simplify the construction as well as the means and mode of operation of temperature controlled mills, whereby they may not only be economically manufactured, but will be more efficient and accurate in use, adaptable to a wide variety of milling operations, having relatively few parts and unlikely to get out of repair.

A further object of the invention is to produce a mill in which the milling plates will retain their original parallel settings.

A further object of the invention is to provide in a mill base bearing supports having substantially equal temperatures.

A further object of the invention is to provide a mill in which localized high temperature areas are eliminated, the heat being transferred therefrom and distributed substantially equally throughout the mill.

A further object of the invention is to provide a base for such mills through which a heat-exchange medium may freely circulate.

A further object of the invention is to provide in a mill of the character described, means for bringing the circulating heat exchange medium into intimate contact with the bearing mountings.

A further object of the invention is to provide a mill having the advantageous structural features, the inherent meritorious characteristics and the mode of operation herein mentioned.

With the above primary and other incidental objects in view as will more fully appear in the specification, the invention intended to be protected by Letters Patent consists of the features of construction, the parts and combinations thereof, and the mode of operation, as hereinafter described or illustrated in the accompanying drawings, or their equivalents.

Referring to the accompanying drawings, 55

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wherein is shown the preferred but obviously not the only embodiment of the invention,

Fig. 1 is a perspective view of a double disc refining mill embodying the present invention;

Fig. 2 is a top plan view of the base for such a mill;

Fig. 3 is a longitudinal sectional view on line 3—3 of Fig. 2;

Fig. 4 is a transverse sectional view on line 4—4 of Fig. 2;

Fig. 5 is a perspective view of the base embodying the subject matter of the present invention.

Fig. 6 is a sectional view on line 6—6 of Fig. 2;

Fig. 7 is a sectional view on line 7—7 of Fig. 2;

Figs. 8 and 9 are sectional views on lines 8—8 and 9—9, respectively, of Fig. 2.

Like parts are indicated by similar characters of reference throughout the several views.

In a pulp refiner of the double disc type, the best refining action is obtained only when the refining discs are parallel. To obtain parallelism the bearings must be in a common axial plane so that the center lines of the shafts will coincide in a common axis. To do this the distances A, B, C and D (Fig. 3) must be made equal, and must remain so during mill operation.

In many applications, however, it is desirable to refine the pulp at temperatures above ambient, causing the central portion of the machine and the portion of the base adjacent thereto to become heated with resultant expansion thereof. When this occurs, the dimensions B and C exceed dimensions A and D, causing the milling discs to separate slightly at the top and to contract at the bottom. This distortion not only destroys the efficiency of the mill, but also adversely affects the quality of the processed pulp.

The present invention completely eliminates this difficulty with its resultant disadvantages and inefficiencies by providing means for maintaining a substantially equal temperature throughout the entire base of the mill. The localized high temperature area adjacent the milling chamber is thereby eliminated, resulting in maintenance of the original dimensions A, B, C and D throughout operation of the mill.

Referring to the drawing, there is shown a hollow base 1, upon which the mill 2 and the driving motors 3 and 4 are supported. The base 1 comprises a rectangular bottom plate 5 having a central opening 6 therein which is substantially directly beneath the milling chamber 2. Secured about the periphery of the base 5 and in upstanding relation therewith are side mem-

bers 7 and end members 8, which together with the bottom 5 form a tank-like body.

In inwardly spaced relation with the end members 8 are a pair of upstanding plates 9 which extend transversely of the bottom 5 from one side member 7 to the other, to which side members they are secured. The plates 9, together with the end members 8, form when closed by a cover plate 10 bearing supports for the outboard bearings 11 of the motors 3 and 4.

Inboard bearings 12 of the motors 3 and 4 are supported upon similar bearing supports formed by spaced pairs of upstanding plates 13 and 14 located in outwardly spaced relation relative to the central opening 6 in the bottom plate 5. Like the plates 9 the plates 13 and 14 extend transversely of the bottom plate 5 from one side member 7 to the other to which they are fixedly secured.

Mounted on the top of each bearing support are a pair of pads 15 to which the motor shaft bearings 11 and 12 are secured.

Adjacent the transverse margins of the central opening 6 in the bottom 5 are a pair of upstanding plates 16 extending from one side member 7 to the other and secured thereto. These plates extend upwardly from the bottom 5 about one-half the height of the side and end members 7 and 8. Longitudinally extending plates 17 of substantially the same height as the plates 16 bound the longitudinal margins of the opening 6, and are secured to the inner plate of the pairs of plates 13 and 14 of the inboard bearing supports.

A series of individual plates are secured to the side and end member 7-8, and the upstanding plates 9, 13, 14, 16 and 17. Such assembly forms in effect a further horizontally disposed plate 18 dividing the bearing supports into two separate chambers, and serving as a cover or closure member for a pair of reservoirs 19 formed in conjunction with the bottom 5. The reservoirs 19 are further sub-divided into three equal sections by the vertically disposed longitudinally extending plates 20.

The reservoirs 19 at each end of the base are interconnected by conduits 21 formed intermediate the side members 7 and plates 17 (Fig. 4) through which water or other coolant may freely flow.

The upper level, i. e., the portion of the base above the plate 18 is water jacketed, although recesses 24 and 25 are provided for the motors 3-4 and the mill 2 respectively. The inboard and outboard bearing supports of each pair are interconnected along the side margins of the base by conduits 26 formed by upstanding plates 27 which extend upwardly from the plate 18 to the top surface of the base, and are spaced inwardly relative to the side members 7.

The pairs of bearing supports are interconnected through the center section, immediately above the conduits 21 by substantially triangular conduits 28 formed by the inclined plates 29 interconnecting the plate 18 and the top of the base.

A series of two-inch holes are provided in all interior partitions or plates, through which the water or other coolant may freely circulate from compartment to compartment in its travel from the intake to the discharge openings. This circulation of coolant takes place not only in the lower section of the base, but also in the upper tier or compartments, including the bearing sup-

ports, the entire interior area of which is filled by freely flowing coolant.

Not only does the present base provide for the circulation of a fluid coolant within and through the multiple compartments thereof, but means are also provided for the free circulation of air about the motors 3-4 and the milling unit 2 within the recesses 24 and 25. To this end there are provided in the side wall sections of the base a series of ventilating openings 30 communicating with the motor recesses 24 and a further series of ventilating openings 31 communicating with the mill chamber recess 25.

The ventilators 30 are formed by transverse vertical and horizontal partitions 32 and 33 transversely inserted intermediate the side wall members 7 and the relatively spaced plates 27. These partitions together with the plate 18 form the openings 30 extending transversely through the conduits 26. Through these openings atmospheric air may freely circulate about the motor housings which extend downwardly within the recesses 24. In this manner operation generated heat within the recesses is effectively carried away by convection.

The ventilators 31 are formed by transversely extending horizontal and vertical partitions 34 and 35 intermediate the inclined partitions 29 and the side wall members 7. The partitions 34 and 35, together with the plate 18, form the openings 31 which extend through the conduits 28. Operation generated heat within the milling chamber recess 25 is effectively dissipated by the free circulation of air therethrough.

The ventilators 30-31 are not essential to the efficient operation of the present mill base, but do assist in reducing the amount of cooling influence necessary within the base. Without such ventilating means a larger quantity of coolant must be circulated, the base, however, being fully capable of handling the larger flow of coolant so as to effectively minimize distortion therein caused by uneven distribution of heat throughout its area.

V-shaped notches 36 are provided adjacent the top of the several partitions in the base to prevent the formation of air pockets within the compartments. Air in the base is forced to the top of the compartments upon the filling thereof with coolant, and can freely pass from one compartment to another through the notches 36 until it is discharged from the interior of the base through one of the outlets 23. Thus, there is no possibility of an air pocket immediately adjacent the under surface of the bearing pads 15 and utmost efficiency of the coolant is insured.

In operation the base member is completely filled with water or other coolant from a source of supply under pressure, (not shown) through intake pipes 22 arranged in pairs in the top surface of the outboard bearing supports. The coolant circulates freely through the various compartments of the base, flowing toward the central portion thereof from which it is discharged through the outlets 23 arranged in pairs in the top surface of the inboard bearing supports. Discharge of the coolant at the center of the base does not however impair the circulation thereof through the central conduits 21-28 since the level of discharge is above the level of the conduits. Thus, a thorough intermixing of the coolant between the two ends of the base is insured, while providing for even circulation therein by the use of multiple inlets and outlets.

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After the base is filled with coolant the flow thereof is regulated in accordance with the amount of heat produced during operation of the mill.

Sufficient coolant is passed through the base to carry away excessive operation generated heat regardless of where such excessive heat may be applied. In this way, localized areas of excessive heat are completely eliminated, the coolant maintaining the entire base at a substantially even temperature throughout. With the present temperature equalized base, the refining discs remain in their original parallel relationship regardless of the temperature of the pulp supplied thereto, and the refining action of the apparatus is thereby greatly improved.

From the above description it will be apparent that there is thus provided a device of the character described possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail construction and arrangement of parts without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute the invention has been described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific features shown, but that the means and mode of construction herein disclosed comprise the preferred form of several modes of putting the invention into effect, and the invention is therefore claimed in any of its forms or modifications within the legitimate and valid scope of the appended claims.

Having thus described my invention, I claim:

1. A base for a double disc type mill having a milling chamber and individual power supply means for each milling disc therein, characterized by a pair of recesses in the top of said base within which each of the individual power supply means are partially enclosed, a third recess centrally disposed relative to the base within which the milling chamber is partially enclosed, a series of liquid tight compartments surrounding each of the recesses, a pair of liquid tight tanks underlying each of the pair of recesses, a plurality of perforate baffles within the tanks and compartments dividing the tanks and compartments into a series of interconnected sections, means for inducing a continuous flow of liquid through the series of interconnected sections and compartments, bearing mounts for the individual power supply means supported on the compartments intermediate the series of recesses, and ventilating openings extending transversely through the compartments forming the series of recesses through which atmospheric air is free to circulate in intimate relation with the power supply means and the milling chamber, the construction and arrangement being such that the existence of localized areas of excessive heat is minimized by the continuous flow of liquid through the interconnected series of compartments in surrounding relation with the mill and its power supply means.

2. In a double disc type mill having a centrally disposed milling chamber and a pair of motors on opposite sides thereof, a mounting base therefor characterized by means for maintaining the base at a substantially even temperature throughout the area thereof, including a hollow bottom portion, a series of baffles therein dividing the bottom into individual compartments, a se-

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ries of hollow supports extending upwardly therefrom upon which the motors are supported by means of the rotor shaft bearings, a centrally disposed chamber in the base, open at its bottom within which the milling chamber is located intermediate the drive motors, a series of longitudinally extending marginally disposed conduits interconnecting the upstanding bearing supports and forming a partial enclosure about the drive motors and the milling chamber, air circulating means in said conduits through which atmospheric air is introduced for intimate contact with the driving motors and the milling chamber, and means for introducing and uniformly circulating fluid through the several compartments of the bottom portion, the upstanding supports and the marginally disposed conduits, the construction and arrangement being such that the combined effect of the air and fluid circulation in surrounding relation with the milling chamber and the drive motors substantially eliminates the formation of localized areas of excessive operation generated heat.

3. A mill base upon which the mill is supported by means of the shaft bearings, characterized by a series of open top chambers therein within which a milling chamber and a pair of drive motors project, a liquid circulatory system within the base structure including a series of interconnected closed chambers, said closed chambers being so arranged as to form the open top chambers within which the milling apparatus is supported, means for inducing a uniform liquid flow through the interconnected chambers whereby operation generated heat is evenly distributed throughout the base member, and ventilators communicating with the interior of the open top chambers through the side walls thereof through which atmospheric air is freely circulated in intimate contact with the milling apparatus supported therein.

4. In a double disc type mill having a pair of motor driven rotor shafts subject to fluctuating degrees of unalignment due to expansion and contraction of the shaft supports under influence of operation generated heat, means for maintaining the rotor shafts in substantial alignment, comprising a chambered supporting member for the mill and rotor shafts, including a plurality of chambers open to atmosphere within which chambers the mill and drive motors extend, a plurality of fluid tight chambers peripherally surrounding the air chambers, a pair of fluid reservoirs in opposite ends of the chambered support forming the bottom of the motor chambers, perforate baffles in the fluid chambers and reservoirs dividing such chambers into a series of interconnected compartments, and means for inducing a continuous flow of fluid through the series of interconnected compartments.

5. In a double disc type mill having a pair of motor driven rotor shafts subject to fluctuating degrees of unalignment due to expansion and contraction of the shaft supports under influence of operation generated heat, a base therefor, including a pair of fluid reservoirs disposed in spaced longitudinal alignment, a pair of transversely spaced conduits interconnecting the reservoirs along opposite margins thereof, a plurality of interconnected chambers supported upon the top of the reservoirs in both transverse and longitudinally spaced relation forming a pair of rectangular fluid passages having a central opening therein closed at its bottom by the fluid reservoirs to form a recess open to atmosphere,

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an additional pair of conduits disposed in vertically aligned relation with the first pair of conduits, interconnecting the rectangular passages along opposite margins thereof, the construction and arrangement being such that a centrally disposed recess open at its top and bottom is provided for reception of the mill and a plurality of recesses closed at their bottom are provided in longitudinally spaced relation with the central recess for reception of the pair of drive motors.

6. A mill base, comprising a generally rectangular body presenting on its upper surface a plurality of transverse longitudinally spaced apart pads upon which the bearings of the mill apparatus rest, said upper surface intermediate said pads being recessed to receive operating elements of the mill apparatus, partitions in said body defining hollow pedestals underlying and supporting said pads and further defining conduits interconnecting said pedestals and chambers underlying said recesses, and means for circulating heat transfer liquid through said hollow pedestals, said conduits and said chambers.

MAURICE D. WOODRUFF.

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REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
851,607	Du Pont	Apr. 23, 1907
1,061,672	Hodgkinson	May 13, 1913
1,065,332	Newhouse	June 17, 1913
1,072,193	Symons	Sept. 2, 1913
1,111,274	Sorenson	Sept. 22, 1914
1,114,320	Walker	Oct. 20, 1914
1,424,097	Herman	July 25, 1922
1,641,409	Bell	Sept. 6, 1927
1,762,379	Bates	June 10, 1930
1,937,788	Ross	Dec. 5, 1933
2,027,015	Bell	Jan. 7, 1936
2,055,651	Burrell	Sept. 29, 1936
2,068,071	Quehl	Jan. 19, 1937
2,225,797	Plauson	Dec. 24, 1940
2,279,569	Jelinek	Apr. 14, 1942
2,344,240	Firth	Mar. 14, 1944
2,352,206	Kendall	June 27, 1944
2,380,747	Goetze	July 31, 1945
2,402,170	Lund	June 18, 1946