June 7, 1966 C. R. PORTER 3,254,797

CHEMICAL DISPENSER

Filed March 4, 1965 2 Sheets-Sheet 1

Fig. 1

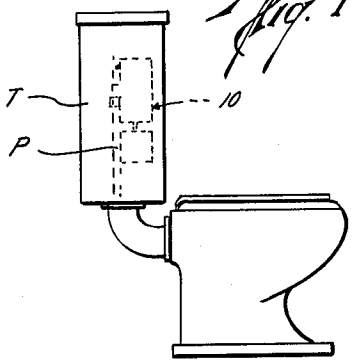


Fig. 2

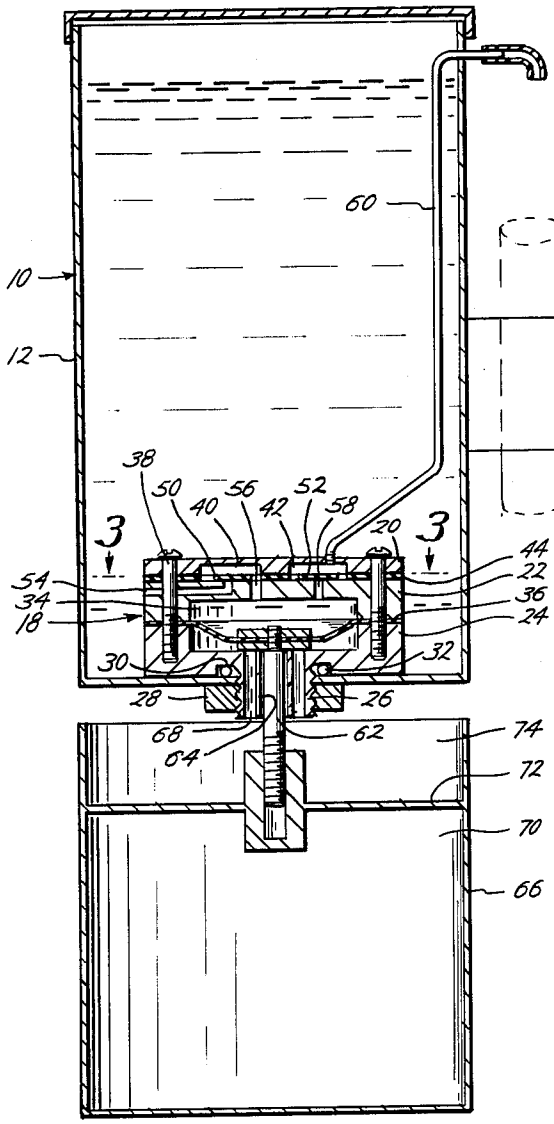
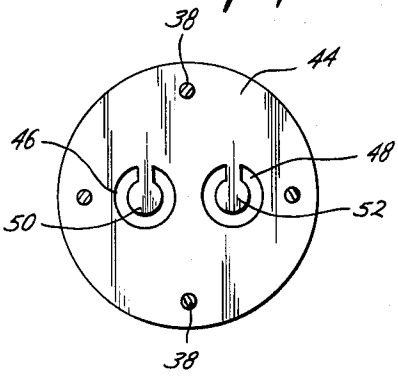


Fig. 3



Charles R. Porter
INVENTOR.

BY Charles E. Lightfoot
ATTORNEY

June 7, 1966 C. R. PORTER 3,254,797

CHEMICAL DISPENSER

Filed March 4, 1965 2 Sheets-Sheet 2

Fig. 5

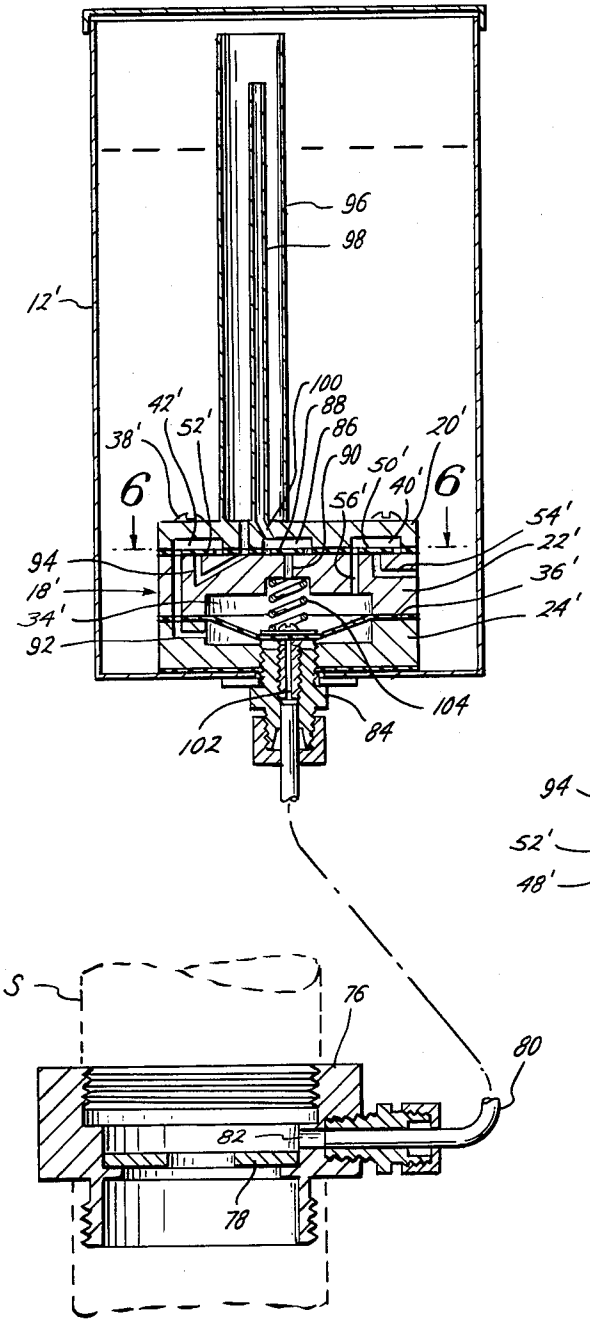


Fig. 4

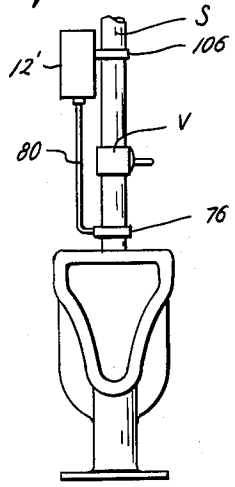
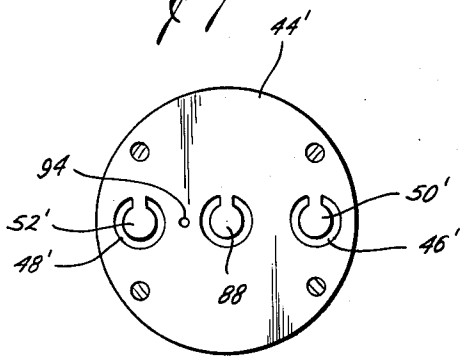


Fig. 6



Charles R. Porter
INVENTOR.

BY Charles E. Lightfoot
ATTORNEY

United States Patent Office

3,254,797

Patented June 7, 1966

3,254,797

CHEMICAL DISPENSER

Charles R. Porter, 231 Palmyra, Houston, Tex.

Filed Mar. 4, 1965, Ser. No. 437,159
6 Claims. (Cl. 222—57)

This invention relates to dispensers for liquid materials and more particularly to a device for delivering a liquid which is to be dispensed in predetermined amounts in response to the operation of a fluid supply system.

The invention is capable of numerous applications for the dispensing of chemicals, or the like, in the treatment of fluids, such as oil, emulsions, or other liquids in a supply or distribution system for such materials, and finds particular utility in connection with domestic water supply system in which a deodorizing or other treating materials is to be introduced into the water in response to the flow of water in the system.

The invention has for an important object the provision of a supply container and dispensing apparatus for use in connection with flushing systems provided with flush tanks or flush valves for dispensing liquid deodorants or other treating materials into the water as the water flows in the system.

Another object of the invention is to provide dispensing apparatus for the delivery of predetermined amounts of treating material into a flushing system in response to the amount of water which is supplied by the system.

A further object of the invention is the provision of dispensing apparatus which is operated by fluid pressure in response to the flow of fluid in a flushing system to dispense a predetermined amount of treating material upon each operation of the system.

Another object of the invention is the provision in a flushing system having a flush tank in which a float actuated valve is employed to regulate the replenishment of water in the tank, of dispensing apparatus which is adapted to be operated by the rise and fall of the water level in the tank to dispense treating material into the water.

A further object of the invention is to provide dispensing apparatus of the kind mentioned embodying flexible diaphragm means which is operated in response to the flow of water in a water supply system to dispense a treating material into the water.

Another object of the invention is the provision in dispensing apparatus of the type referred to of pressure responsive valve mechanism which is of simple design and rugged construction and which may be economically manufactured.

The above objects of the invention as well as numerous obvious advantages of the same will be apparent from the following detailed description constituting a specification of the invention when considered in conjunction with the annexed drawings, wherein:

FIGURE 1 is a side elevational view, on a reduced scale, of a toilet bowl and flush tank showing a preferred embodiment of the invention as applied thereto, the dispensing apparatus being shown in dotted lines;

FIGURE 2 is a vertical, central, cross-sectional view, on an enlarged scale, of the dispensing apparatus illustrated in FIGURE 1, showing details of construction and arrangement of the parts thereof;

FIGURE 3 is a cross-sectional view, taken along the line 3—3 of FIGURE 2, looking in the direction of the arrows, and showing the structure of the valve mechanism of the dispensing apparatus of the invention;

FIGURE 4 is a front elevational view, on a reduced scale, of a flushing system in which a flush valve is employed instead of a flush tank, showing a somewhat modified form of the invention applied to such a system;

FIGURE 5 is a view similar to that of FIGURE 2, showing details of structure and arrangement of parts of the dispensing apparatus of FIGURE 4 and the means by which the same is applied to the flush valve system; and

FIGURE 6 is a cross-sectional view, taken along the line 6—6 of FIGURE 5, showing details of construction of the valve of the valve mechanism of the dispensing apparatus of FIGURE 5.

Referring now to the drawings in greater detail, the invention is illustrated in FIGURES 1, 2 and 3 in connection with a flushing system of the usual type, having a flush tank T, which is connected to a domestic water supply system, and which has the usual overflow pipe P therein, which forms a part of the equipment of such a flushing system. The dispenser of the invention is adapted to be positioned inside of the flush tank, as generally indicated at **10** in FIGURE 1 and includes a container **12** for liquids, which may be formed of any suitable material such as metal, plastic, or the like, and which is attached to a bracket **14** having a set screw **16**, by which the container may be secured to the overflow pipe P, as best seen in FIGURE 2.

Within the container a diaphragm and valve housing, generally indicated at **18** is positioned on the bottom of the container, which housing may conveniently be constructed in a number of parts, such as those designated **20**, **22** and **24**, the lowermost part **24** being formed with a downwardly extending tubular portion **26**, which is externally threaded to be extended through a bottom opening in the container, and upon which a nut **28** is threadable, into engagement with the outside bottom surface of the container to securely hold the diaphragm and valve housing in place. The lowermost part **24** also has an annular cavity **30**, surrounding the downward extension **26** and in which suitable seal forming means such as the O-ring **32** is disposed to form a fluid tight seal between the lowermost part and the inner surface of the container about the bottom opening.

The parts **22** and **24** of the housing are shaped to form an internal cavity **34**, across the interior of which a flexible diaphragm **36** extends, the diaphragm being secured between the parts **22** and **24**, when the parts are assembled. The part **20** is positioned on the part **22** and secured thereto by means of screw bolts **38**, which are threadably extended through aligned openings in the parts **20** and **22** and threadably extended into the part **24** to hold the housing together.

The part **20** has an inlet cavity **40** and a discharge cavity **42**, and a disk shaped valve forming member **44** is positioned between the parts **20** and **22**, which valve member has cut out portions **46** and **28**, to provide flaps or tabs **50** and **52**, respectively, located in the inlet and discharge cavities **40** and **42**. The valve forming member **44** is preferably formed of a relatively flexible material, such as sheet plastic, which may be easily cut to form the valves **50** and **42**, which will be positioned in the cavities **40** and **42**, respectively, when the device is assembled, the valve **50** serving as an inlet valve and the valve **52** serving as a discharge valve. The part **22** has an inlet passageway **54**, whose inlet end is open to the interior of the container **12**, and whose outlet end opens into the cavity **40** beneath the inlet valve **50** and a passageway **56** which leads from the cavity **40** into the diaphragm cavity **34** above the diaphragm therein. From the diaphragm cavity **34** about the diaphragm **36**, a passageway **58** in the part **22** leads into the discharge cavity **42** beneath the discharge valve **52**.

An outlet pipe **60** is connected at its lower end in communication with the interior of the discharge cavity **42** above the discharge valve **52**, and is extended through the wall of the container, with its outlet end positioned exteriorly thereof in position to discharge liquid into the upper end of the overflow pipe P, or to some other location where the treating liquid is to be dispensed.

The diaphragm 36 is attached centrally to a shaft 62, which is slidably extended downwardly through a central opening 64 in the extension 26 of the part 24 and attached at its lower end to a hollow float 66, which is positioned to rise and fall with the supply of water in the flush tank, whereby the diaphragm 36 will be flexed upwardly when the water is replaced in the tank and downwardly when the water in the tank is discharged therefrom. Additional passageways, such as that shown at 68, may be provided in the extension 26, through which fluid may flow into and out of the diaphragm cavity 34 beneath the diaphragm 36.

The float 60 may be formed of any suitable material, such as plastic, and is preferably provided with a closed lower chamber 70, whose upper wall 72 forms the bottom of an upwardly opening tray-like portion 74, at the top of the float. This tray-like portion 74 will be filled with water, when the dispenser is mounted in the flush tank on the overflow pipe P, so that when the water is discharged from the flush tank the float will be weighted to assure downward movement of the diaphragm 36 as the water flows out of the flush tank. The float will, however, be of sufficient size so that the float will move upwardly as the water is replenished in the tank to flex the diaphragm upwardly.

In making use of the dispensing system, constructed as described above, the dispenser is attached to the overflow pipe P, as shown in FIGURE 2, with the float 66 positioned so that the top of the float will be beneath the water in the tank when the tank is fully replenished, thus assuring that the tray 74 will always be filled with water. Upon a flushing operation of the system the water will flow out of the tank, allowing the float to move downwardly to flex the diaphragm 36 downwardly, whereupon the inlet valve 50 will be opened to allow liquid in the container to flow in through passageway 34, cavity 40 and passageway 56, to fill the diaphragm cavity above the diaphragm. As the water in the tank T is replaced after each flushing operation the float will be lifted to flex the diaphragm 36 upwardly to discharge liquid from the cavity 34 above the diaphragm out through the outlet pipe 60, through the passageway 58 and cavity 42, thus discharging treated liquid into the overflow pipe P.

The upper surface of the part 22 forms a seat for each of the valves 50 and 52, and due to the fact that the valve forming member 44 may be of relatively light sheet material, such as plastic, the valve structure may be very economically made, and may be easily replaced when necessary.

A somewhat different form of the invention is illustrated in FIGURES 4, 5 and 6, wherein the dispenser is adapted for use with a flushing system in which a flush valve V, of usual construction is mounted in a water supply line S through which water is supplied to the system when the valve is opened, the valve being usually of the type which closes automatically within a short time after it is opened manually.

In this form of the invention the treating liquid is dispensed by an increase in the pressure of fluid furnished to the dispenser from the supply line S by means of a fitting 76 connected to the supply line and within which an orifice plate 78 is disposed. A pressure supply and liquid dispensing line 80 is connected at its lower end to the fitting 76, and opens into the supply line through a passageway 82 in the fitting in communication with the interior thereof immediately above the diaphragm plate 78.

In this form of the invention the container 12' has a central opening in its bottom wall, through which a fitting 84 is threadably extended into the lower part 24' of a diaphragm and valve housing generally indicated at 18', to securely attach the housing to the bottom of the container. The diaphragm and valve housing 18' is of similar construction to the valve and diaphragm housing 18, previously described, the parts 22' and 24' being shaped

to form a diaphragm cavity 34' in the housing, across which a flexible diaphragm 36' extends, the marginal portion of the diaphragm being clamped between the parts 22' and 24' when the parts of the housing are secured together, as by means of the screws 28'. The upper part 20' of the housing is formed with three valve cavities, 40', 42' and 86, the cavity 40' being an inlet cavity and the cavity 42' being a discharge cavity.

The dispenser includes a valve forming member 44', similar to the valve member 44 previously described, being formed with three flap valves 50', 52' and 88, of which the valve 50' is an inlet valve, and the valve 52' is a discharge valve. The part 22' of the housing has an inlet passageway 54', similar to the passageway 54 and for a like purpose, opening at its outer end into the interior of the container 12' and its inner end into the cavity 40' beneath the intake valve 50'. The passageway 56' is also formed in the part 22' leading from the cavity 40' into the diaphragm cavity 34' above the diaphragm. A passageway 90 is provided in the part 22' leading from the cavity 86 beneath the valve 88 into the diaphragm chamber 34' above the diaphragm.

From beneath the diaphragm a passageway 92 leads from the diaphragm cavity 34' through the parts 24' and 22' into the discharge cavity 42', and a passageway 94 leads from the discharge cavity 42' beneath the valve 52' through the part 20' into the lower end of an upstanding pipe 96 extending upwardly from the housing in the container 12', and whose upper end is open. Within the pipe 96 an inner pipe 98 extends upwardly from the housing, the lower end of the inner pipe being in communication with the cavity 86, above the valve 88, through a passageway 100 in the upper part 20', the upper end of the inner pipe 98 being open. The diaphragm 36' has a central downwardly extending shaft 102 attached thereto, which is slidably extended downwardly in the fitting 84, and which is shaped to allow the outflow of liquid from the cavity 34' beneath the diaphragm, through the fitting 84. The upper end of the dispending line 80 is connected to the fitting 84, in communication with the interior of the cavity 34' beneath the diaphragm 36'. The diaphragm 36' is yieldingly urged downwardly in the diaphragm cavity, by means of a coil spring 104.

In making use of the form of the dispenser illustrated in FIGURES 4, 5 and 6 the container 12' may be suitably attached to the supply pipe S, as by means of a bracket or clamp 106, as shown in FIGURE 4, with the dispensing pipe 80 extending downwardly to the fitting 76. The container may then be filled with the treating liquid to a level somewhat below the upper end of the outer pipe 96.

With the dispenser thus mounted on the flushing system upon actuation of the flush valve V water under pressure will enter the dispensing pipe 80 to flow upwardly into the diaphragm cavity 34' beneath the diaphragm 36' to flex the diaphragm upwardly, whereupon liquid in the cavity above the diaphragm which has entered the same from the container 12 will be pumped upwardly through passageway 90, cavity 86 and passageway 100 into the inner pipe 98. This liquid will eventually overflow the inner pipe into the outer pipe 96, from whence the fluid may flow downwardly through passageway 94, cavity 42' and passageway 92 into the diaphragm cavity beneath the diaphragm 36'. As the flush valve is repeatedly operated the treating liquid in the container will thus be supplied to the outer pipe 96, from which the fluid will then enter the diaphragm cavity beneath the diaphragm, so that upon each downward flexing movement of the diaphragm a charge of the treating liquid will be supplied to the water flowing through the supply line S.

It will be apparent that as soon as the flush valve V is opened there will be an increase in the pressure of the fluid flowing through the supply line, immediately above the orifice plate 78, and this pressure will be effective through the dispensing line 80 to move the diaphragm upwardly, and as soon as the valve V closes the pressure in

the supply line at the fitting **76** will be reduced, so that the spring **104** will flex the diaphragm downwardly to feed liquid from the container back into the dispensing line **80** from whence it may enter the supply line to mix with the water therein after the flushing operation.

It will thus be seen that the invention provides dispensing apparatus for liquids which is of simple design and rugged construction, and by which predetermined quantities of treating liquids may be supplied to flow lines or to other locations as may be desired.

The invention is disclosed herein in connection with certain specific embodiments of the same which are described in connection with particular uses to which the apparatus is applied, but it is to be understood that these are intended by way of illustration only, and that various changes may be made in the construction and arrangement of the parts, and the apparatus may be adapted for the dispensing of various kinds of liquids to be used for any desired purpose, within the spirit of the invention and the scope of the appended claims.

Having thus clearly shown and described the invention, what is claimed as new and desired to secure by Letters Patent is:

1. Apparatus for dispensing a liquid into a fluid flow system having a water supply tank into which water is admitted to replenish the water in the tank and from which the water is allowed to flow during operation of the system, comprising a container for a liquid to be dispensed, a hollow housing in the container formed with a diaphragm chamber, a flexible diaphragm in the housing dividing the chamber, means for admitting liquid from the container into said chamber on one side of the diaphragm upon flexing of the diaphragm in one direction and for allowing an outflow of the liquid therefrom into the tank upon flexing of the diaphragm in the other direction and means for flexing the diaphragm in said one direction in response to the outflow of water from the tank and in the other direction upon replenishment of the water in the tank.

2. Apparatus for dispensing a liquid into a fluid flow system having a water supply tank into which water is admitted to replenish the water in the tank and from which the water is allowed to flow during operation of the system, comprising a container for a liquid to be dispensed, a hollow housing in the container formed with a diaphragm chamber, a flexible diaphragm in the housing dividing the chamber, means for admitting liquid from the container into said chamber on one side of the diaphragm upon flexing of the diaphragm in one direction and for allowing an outflow of the liquid therefrom into the tank upon flexing of the diaphragm in the other direction, float means in the tank positioned to rise and fall with the level of the water in the tank and means forming a connection between said diaphragm and float means to cause the diaphragm to flex in said one direction in response to a fall in the level of water in the tank and in the other direction in response to a rise in such level.

3. Apparatus for dispensing a liquid into a fluid supply line in response to the flow of fluid therethrough comprising a hollow housing formed with a diaphragm chamber, a flexible diaphragm in the housing dividing the chamber, means for allowing an inflow of liquid to be dispensed into said chamber on one side of the diaphragm upon flexing of the diaphragm in one direction and an outflow of such liquid therefrom into said supply line upon flexing of the diaphragm in the other direction and means for flexing the diaphragm in said one direction in response to the flow of fluid in the supply line and in the other direction in response to the cessation of such fluid flow.

4. Apparatus for dispensing a liquid into a fluid supply line in response to the flow of fluid therethrough comprising a hollow housing formed with a diaphragm chamber, a flexible diaphragm in the housing dividing the chamber, means for allowing an inflow of liquid to be dispensed into said chamber on one side of the diaphragm upon flexing of the diaphragm in one direction and an outflow of such liquid therefrom into said supply line upon flexing of the diaphragm in the other direction, means for admitting fluid from the supply line into said chamber on said one side of the diaphragm to cause the diaphragm to flex in said one direction in response to the flow of fluid in the supply line and means for causing the diaphragm to flex in the other direction upon cessation of the flow of fluid in the supply line.

5. Apparatus for dispensing a liquid into a fluid supply line comprising a hollow housing formed with a diaphragm chamber, a flexible diaphragm in the housing dividing the chamber, means for admitting a liquid to be dispensed into said chamber on one side of the diaphragm upon flexing of the diaphragm in one direction, means for allowing an outflow of such liquid from the chamber on said one side of the diaphragm into the chamber on the other side of the diaphragm upon flexing of the diaphragm in the other direction and means connecting the chamber on said other side of the diaphragm in communication with said supply line to allow the inflow of fluid therefrom into the chamber to flex the diaphragm in said one direction in response to the flow of fluid in the supply line, and means for flexing the diaphragm in said other direction upon cessation of the flow of fluid in said supply line to cause an outflow of such fluid and liquid to be dispensed from said chamber into the supply line.

6. Apparatus for dispensing a liquid into a fluid supply line comprising a container for a liquid to be dispensed, a hollow housing in the container formed with a diaphragm chamber, a flexible diaphragm in the housing dividing said chamber, means for admitting liquid from the container into said chamber on one side of the diaphragm upon flexing of the diaphragm in one direction, an upright pipe in the container whose upper end opens into the container above the level of the liquid therein and from whose lower end liquid may flow into the chamber on the other side of the diaphragm upon flexing of the diaphragm in the other direction, means for causing an outflow of liquid from the chamber on said one side of the diaphragm into said pipe upon flexing of the diaphragm in said other direction, means connecting the chamber on said other side of the diaphragm in communication with said supply line and through which fluid may flow from the supply line into the chamber to cause the diaphragm to flex in said one direction in response to the flow of fluid in the supply line and from the chamber into the supply line upon the cessation of the flow of fluid in the supply line and means for flexing the diaphragm in said other direction in response to such cessation of flow.

References Cited by the Examiner

UNITED STATES PATENTS

2,536,475	2/1951	Thomas	103—70

FOREIGN PATENTS

23,093	10/1906	Great Britain.
26,648	12/1907	Great Britain.

LOUIS J. DEMBO, *Primary Examiner.*

HADD S. LANE, *Examiner.*