July 22, 1952 L. BOKSER 2,603,794

ELECTRIC EYE FOR AUTOMATICALLY OPERATING FLUSHING VALVES

Filed Jan. 21, 1949 2 SHEETS—SHEET 1

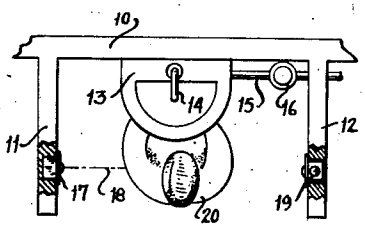

FIG. 1

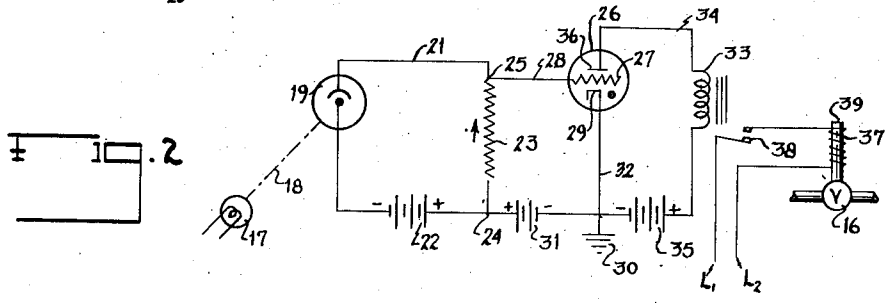

FIG. 2

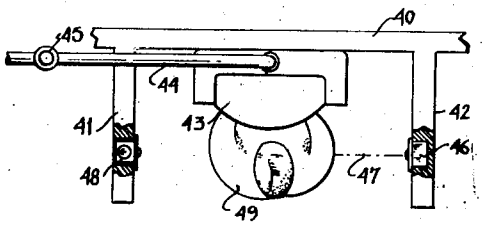

FIG. 3

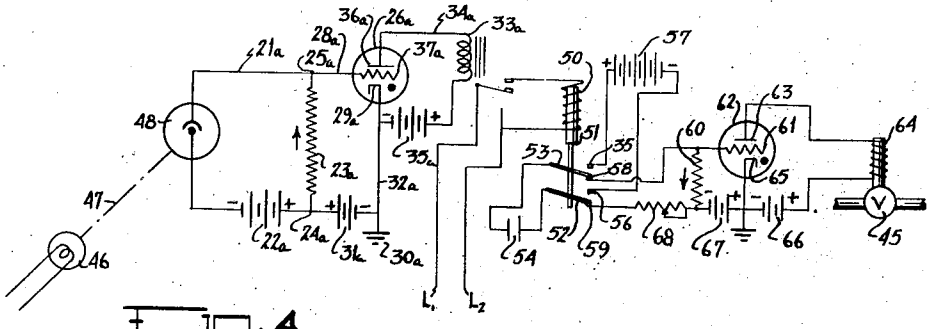

FIG. 4

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ELECTRIC EYE FOR AUTOMATICALLY OPERATING FLUSHING VALVES

Filed Jan. 21, 1949 2 SHEETS—SHEET 2

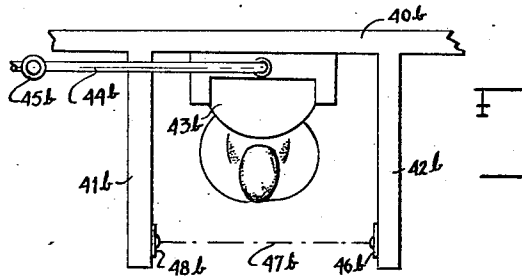

FIG. 5

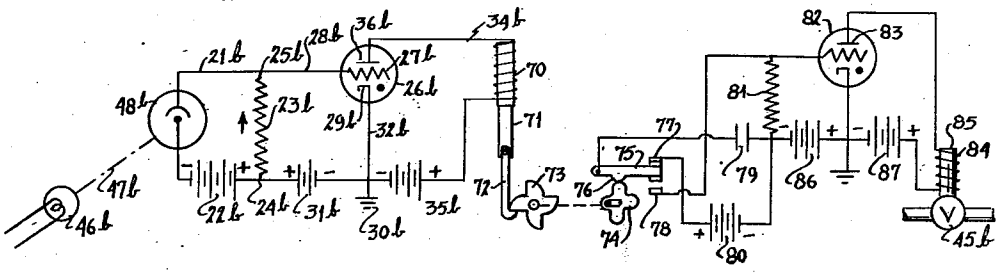

FIG. 6

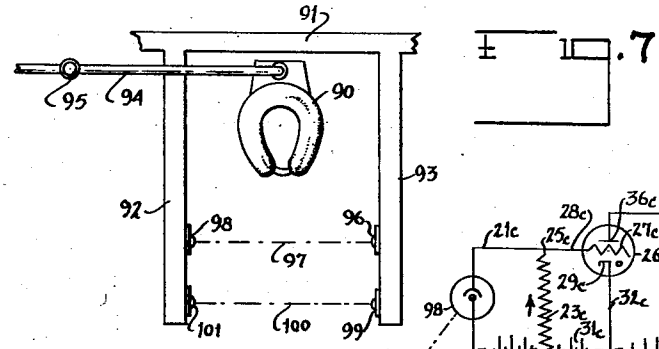

FIG. 7

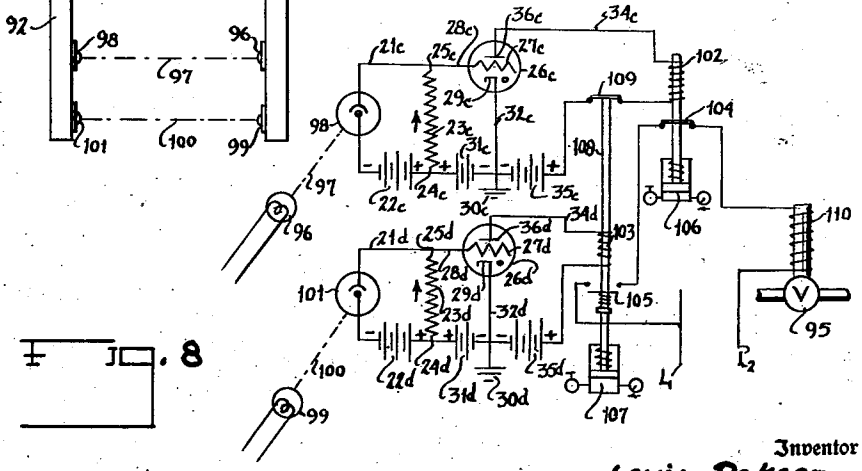

FIG. 8

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Patented July 22, 1952

2,603,794

UNITED STATES PATENT OFFICE

2,603,794

ELECTRIC EYE FOR AUTOMATICALLY OPERATING FLUSHING VALVES

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Application January 21, 1949, Serial No. 71,913

2 Claims. (Cl. 4—101)

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The present invention has to do with the automatic operation of a flushing valve and is concerned primarily with an electric eye for causing such automatic operation.

At the present time, hand basins, urinals and toilets are installed in various public places for use by the public. A hand basin ordinarily includes a valve which is manually operable to either turn the water on or off. Urinals and toilets generally include a flushing valve which must be manually operated to cause the flushing thereof.

Many members of the public are reluctant to place their hands on the water valves of a hand basin or the flush valves of a toilet or urinal because of the very nature of the place wherein they are installed and the fact that other people have touched them previously. They are simply afraid of becoming contaminated or picking up almost any kind of germ.

There is another class of people who are very careless. They will walk away from a hand basin leaving the water running or they will walk away from a urinal or toilet without flushing it. In either case, the ultimate result is highly unsatisfactory.

In the case of urinals and toilets, attempt has been made to overcome these difficulties by providing either foot operated flush valves or automatic intermittent flushing which takes place at periodic intervals. The foot valves have not been proven to be satisfactory because it makes no provision for the careless and lazy person and even emphasizes the tendency to walk away without flushing the urinal or toilet. In the case of the automatic flushing at periodic intervals, considerable water is wasted as there is a large amount of unnecessary flushing and there is of course unnecessary wear.

With the foregoing conditions in mind, the present invention has in view as its foremost objective the provision of a valve for controlling the flow of water which is automatically operated by an electric eye or light beam.

More in detail, the invention has as an object the provision of a valve which controls the flow of water and the operation of which is in turn controlled by a light beam so that when the beam is interrupted, the valve is opened and the flow of water started. When the interruption is removed and the beam completed, the valve is closed and the flow of water stopped. An arrangement such as this is particularly adapted for use in conjunction with a hand basin whereby a person by merely coming into the necessary

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proximity to the basin initiates the flow of water and by leaving that proximity discontinues the flow of water.

Particular objects, features, and advantages of the invention are tied up with the provision of the necessary electrical circuit which is affected by a light beam in the manner aforesaid.

Still another more detailed object of the invention is the provision of a flush valve that is particularly adapted for use with a urinal and the operation of which is controlled by an electric eye or light beam. In a preferred embodiment interruption or breaking of the beam has no effect on the valve, but when the beam is completed after the interruption the flush valve is turned on for a predetermined time interval.

Particular objects and advantages of the invention are associated with the provision of an electric circuit which is controlled by a light beam to achieve this operation.

Under certain conditions urinals are positioned in fairly deep stalls. Such an arrangement permits the establishment of a light beam at an appreciable distance from the urinal. With such an arrangement it is desirable that alternate interruptions of the beam cause operation of the flushing valve that is associated with the urinal. Thus, when a person enters a stall in which the urinal is located the beam is broken and completed, but this has no effect on the flush valve. It is only when the person leaves the stall and the beam is broken and completed for the second time that the flush valve is operated. Particular objects and advantages of the invention are tied up with the provision of an electric circuit which is controlled by a light beam so as to affect a flush valve to cause its operation on alternate interruptions of the beam.

In nearly all public wash rooms, lavatories and similar places, toilets are installed in booths having side walls that are fairly extensive. The present invention has in view as another highly important object the provision of such a toilet including a flush valve together with a pair of light beams that are spaced apart at the entrance of the booth. When these beams are broken in a predetermined sequential order and only in that order, the flush valve is operated. The breaking of the beams in any other order will have no effect on the flush valve. An important phase of the present invention is the provision of an electrical circuit for achieving this end.

Various other more detailed objects and advantages of the invention such as arise in connection with carrying out the above noted ideas

in a practical embodiment will, in part become apparent, and in part be hereinafter stated as the description of the invention proceeds.

The invention therefore comprises a valve which may be of the flush type and which governs the flow of water and which is automatically operated by an electrical circuit which is controlled by an electric eye or light beam.

For a full and more complete understanding of the invention, reference may be had to the following description and accompanying drawings wherein:

Figure 1 is a top plan view somewhat diagrammatic and with parts broken away and shown in section of an installation including a hand basin with the flow of water therein automatically controlled by an electric eye in accordance with the precepts of this invention.

Figure 2 is a wiring diagram of the electrical circuit and light beam which is used in conjunction with the installation of Figure 1.

Figure 3 is a top plan view similar to Figure 1 of a urinal and the accompanying installation, and which is automatically flushed when a light beam is completed after interruption.

Figure 4 is a wiring diagram of the electric circuit employed in conjunction with the installation of Figure 3.

Figure 5 is another top plan view of a urinal which is positioned in a deep stall having extensive sides. The urinal of this figure is flushed on alternate interruptions of the light beam.

Figure 6 is a wiring diagram of the electrical circuit employed in conjunction with the installation of Figure 5.

Figure 7 is another top plan view of a booth in which a toilet is installed and the flush valve of which is controlled by a pair of light beams.

Figure 8 is a wiring diagram of the installation of Figure 7.

Referring now to the drawings where like reference characters denote corresponding parts and first more particularly to Figure 1, a wall of a public wash room is represented at 10. Outstanding from this wall 10 are a pair of partitions 11 and 12 which define a booth in which is located a hand basin 13 which preferably is mounted on the wall 10. Overhanging the hand basin 13 is a spout 14 through which water is adapted to flow from a supply line 15 which includes a valve represented at 16. When the valve 16 is opened, water flows from the spout 14 into the basin 13 and when the valve 16 is closed, the flow of water is discontinued.

A light source is represented at 17 and is mounted in the partition 11 so that the beam represented by the broken line 18 from the light source passes in front of the hand basin 13 at an appropriate distance therefrom. This beam 18 impinges on a photoelectric cell designated 19 which is mounted in the partition 12.

The figure of a person is represented somewhat diagrammatically at 20 in Figure 1. When this person 20 is in a position to use the hand basin 13, the light beam 18 is interrupted. In accordance with this invention, this interruption opens the valve 16 to cause water to flow out of the spout 14. When the person represented at 20 leaves the position in front of the hand basin 13, the beam 18 is completed and hits the photoelectric cell 19 to close the valve 16.

Referring now more particularly to Figure 2, the electric circuit for achieving this result is therein illustrated and will now be described. It will be noted that the photoelectric cell 19 is included in a closed circuit 21 in which is also included a battery 22 and a resistor 23. The battery 22 is arranged with its terminals in the position represented by the plus and minus signs. The resistor 23 is located between a junction point 24 and a second junction point 25.

A relay tube is represented at 26. This tube 26 includes a grid 27 which is connected to the junction point 25 by a line 28. The tube 26 also includes a cathode 29 which is grounded as represented at 30.

A battery 31 is connected between the junction 24 and a line 32 which connects the cathode 29 with the ground 30. The battery 31 has its terminals arranged in the manner depicted by the plus and minus signs.

A solenoid is represented at 33 and is included in a circuit 34 which also includes another battery 35 having its terminals arranged in the manner indicated by the plus and minus signs. This circuit 34 is connected to the cathode 29 of the tube 26 on one side and the anode of the tube 26 which is represented at 36 on the other side.

A pair of power lines are presented at L1 and L2 respectively. A solenoid 37 is connected across the power lines L1 and L2, and it will be noted the connections include a switch 38 which is operated by the solenoid 33. The solenoid 37 includes a plunger 39 which is operatively connected to the valve 16.

Operation, Figures 1 and 2

So long as the beam 18 falls on the cell 19, current will flow through the resistor 23 in the direction indicated by the arrow. This current is accompanied by a drop in voltage from the junction 24 to the junction 25.

The battery at 31 is of such a magnitude that if no current is flowing through the resistor 23, it will bias the tube 26 to discharge. However, when the beam 18 is falling on cell 19 and current is flowing through resistor 23, the drop in voltage from the junction 25 will offset the bias on tube 26 and prevent the tube from discharging. It will be apparent therefore that as soon as the beam 18 is interrupted the tube 26 will discharge and as soon as the beam is reestablished, the tube will stop discharging.

When the tube 26 discharges it causes current to flow through the circuit 34 and thus through the solenoid 33. This affects the switch 38 to close the latter, whereby the solenoid 37 is energized and the plunger 39 caused to open the valve 16.

When the tube 26 stops discharging, the solenoid 33 is deenergized which opens the switch 38 and in turn deenergizes the solenoid 37. This causes the plunger 37 to be moved to close the valve 16.

First modification

Referring now more particularly to Figures 3 and 4, a wall 40 of a public room which includes urinals is therein illustrated. Outstanding from the wall 40 are a pair of partitions 41 and 42. These partitions define a stall or booth in which is located a urinal 43. Water is conducted to the urinal for flushing purposes by a conduit 44 and controlled by a flush valve represented at 45. A light source is represented at 46 and is mounted in the partition 42 so that it throws a beam of light depicted by the broken line 47 across the front of the urinal in spaced relation thereto. Under normal condi-

tions this light beam 47 impinges on a photoelectric cell 48 mounted in the partition 41.

It is intended that when a user of the urinal 43, such as represented by the figure at 49, approaches the urinal, the light beam 47 is interrupted. On this interruption nothing happens but when the light beam is again completed the flush valve 45 is turned on for a predetermined period of time. This is accomplished by the electrical circuit represented in Figure 4.

The wiring diagram of Figure 4 includes exactly the same elements between the photoelectric cell 48 and the actuated solenoid represented at 50 as are included in the circuit of Figure 2. Hence, each of these elements is given the same reference character which appears in Figure 2 with the addition of the subscript *a*. The solenoid 50 actuates a plunger 51 which is operatively connected to a pair of knife blades 52 and 53. These blades are pivotally mounted and connected across the terminals of a condenser 54. When the solenoid 50 is energized it raises the plunger 51, whereby the blades 52 and 53 move upwardly and their free ends engage contacts 55 and 56, whereby the condenser 54 is connected across the terminals of a source of charging potential, such as the battery represented at 57.

When the solenoid 50 is deenergized, the armature 51 is moved downwardly causing a corresponding movement of the blades 52 and 53, whereby the free ends thereof disengage the contacts 55 and 56 and become engaged with contacts 58 and 59. This connects the condenser 54 across a biasing resistor 60 which has one end connected with the grid 61 of a tube 62. This tube 62 also includes a plate 63 which is connected in circuit with a solenoid 64.

The tube 62 also includes a cathode 65 which is connected with the solenoid 64 through a battery 66 which has its terminals arranged in a manner represented by the plus and minus signs.

A biasing battery is represented at 67 and is effective to bias the tube 62. This battery 67 is in the circuit in the opposite direction to the biasing battery 22*a*. With this arrangement when the condenser 54 is in discharged condition the tube 62 will normally be biased to cut off and will not discharge.

However, when the condenser 54 is charged and is then connected across the resistor 60, it will cause a current to flow through the resistor in the direction of the arrow and this will offset the negative bias of the battery 67 and cause the tube 62 to discharge.

The particular length of time that the tube 62 will remain discharging after the condenser 54 is connected across its terminals will be determined by the size of the condenser 54, the size of the charging battery 57, and the size of the biasing resistor 60. This time period may be further regulated by the addition of an adjustable resistor shown at 68.

What is accomplished by the circuit of Figure 4 is that when the beam 47 is broken nothing happens. However, when the beam is reestablished after breaking, the flush valve 45 is held open for a predetermined period.

Second modification

In Figure 5, the urinal 43*b* is mounted on the wall 40*b* in the same manner as illustrated in Figure 3. Moreover, it is flushed by water coming from a conduit 44*b* under the influence of a flush valve 45*b*. On either side of the urinal 43*b*

are partitions 41*b* and 42*b* which are appreciably longer than the partitions 41 and 42 of Figure 3. Thus, the beam 47*b* which is thrown from the light source 46*b* on to the photoelectric cell 48*b* is spaced from the urinal 43*b* an appreciable distance.

This means that when a person approaches the urinal 43*b*, the light beam will be broken and completed on entering the booth and again broken and completed on leaving the booth. Thus, the flush valve 45*b* is to be operated only on alternate interruptions of the beam.

Referring now more particularly to Figure 6, the various elements of the circuit from the cell 48*b* up to the solenoid 70 which takes the place of the solenoid 33 of Figure 2 and 33*a* of Figure 4 are the same as in Figures 2 and 4 and are given the same reference characters with the subscript *b*.

The solenoid 70 includes an armature 71 to which is pivotally connected a pawl 72 which engages a rachet 73. Each time the solenoid 70 is energized the rachet 73 is advanced one tooth.

Operatively connected to the rachet 73 is a cam 74 which in turn is in operative engagement with a switch blade 75. The latter includes a projection at 76 so that as the cam 74 is rotated the blade 75 is alternately raised and lowered. In its upper position the blade 75 engages a contact 77 and in its lower position engages a contact 78. When in the upper position, the switch blade 75 connects a condenser 79 across the terminals of a charging battery 80 so that the condenser 79 receives a charge therefrom. When in the lower position, the switch blade 75 connects the condenser 79 across a biasing resistor 81 which is connected to bias a tube 82. The latter includes a plate 83 which is connected in circuit with a solenoid 84 having an armature 85 that is operatively connected to the flush valve 45*b*.

The circuit of Figure 5 also includes a biasing battery at 86 and another battery 87 which is included in the circuit of the solenoid 84.

It is evident that in the circuit of Figure 6 when the beam 47*b* is interrupted and then reestablished the condenser is charged on the first interruption and gives up its charge following the next interruption of the beam. The circuit is thus operative when an individual passes the light beam in one direction to prepare the tripping circuit and when the individual passes in the opposite direction to release the tripping circuit.

Third modification

Figure 7 shows a toilet 90 as mounted in a booth defined by a wall 91 and partitions 92 and 93. Water for flushing the toilet 90 is conducted through a conduit 94 and is controlled by a flush valve 95.

The partitions 92 and 93 are sufficiently extensive to accommodate two light beams which are spaced apart. One light source is represented at 96 as throwing a beam 97 on to a photoelectric cell 98. Another light source is represented at 99 as throwing a beam 100 on a photoelectric cell 101. It is intended that when the beams are broken in the order of 97 first and then 100, the flush valve 95 will be turned on. If the beam 100 is first broken followed by interruption of the beam 97 as would occur when a person enters the booth, nothing happens. The wiring diagram of Figure 8 includes a solenoid 102 which corresponds to the solenoid 70 of Figure 6, the solenoid 33*a* of Figure 4 and solenoid 33 of Fig-

ure 1. Between the photoelectric cell **98** and the solenoid **102**, they are exactly the same electrical elements which appear in the corresponding circuits of Figures 2, 4 and 6. These elements are given the same reference characters with the subscript *c*.

The circuit of Figure 8 also includes another complete set of these elements between the photoelectric cell **101** and a solenoid **103** which corresponds to the solenoid **102**. These elements are given the same reference characters with the subscript *d*.

The two circuits between the cell **98** and solenoid **102** on the one hand and cell **101** and solenoid **103** on the other are interlocked by providing a normally closed relay **104** for operation by the relay tube **26c** and which has its blade connected in series with the blade **105** of the solenoid **103**. The latter being connected to the relay tube **26*d***.

A time delay device **106** is operatively associated with the plunger of the solenoid **102** and another time delay device **107** is operatively associated with the armature of the solenoid **103**. It will be noted that this armature for the solenoid **103** which is designated **108** also includes a switch blade **109** which is included in the circuit **34*c*** between the solenoid **102** and battery **35*c***.

Operation, Figures 7 and 8

A person entering the booth in which the toilet **90** is located will, of course, have interrupted both of the beams **100** and **97**. Upon leaving the booth, the beam **97** is first broken. Upon breaking this beam the relay tube **26c** discharges and energizes solenoid **102** to open switch blade **104**, thereby preventing energization of the valve operating solenoid shown at **110**. The time delay device **106** prevents immediate reclosing of the switch blade **104** for a predetermined period. For example, one half to one and one half minutes. If however beam **100** is broken before beam **97** as when entering the stall, then the relay tube **26*d*** operates to energize the solenoid **103** which closes blade **105** and opens blade **109**. The closing of blade **105** completes the circuit to the solenoid **110** and thereby energizes it, and the time delay device **107** will provide for a predetermined period of energization of the valve solenoid **110** if desired.

When the solenoid **103** is energized the blade **109** is open and this prevents energization of the solenoid **102** when the beam **97** is interrupted. It is obvious, therefore, that the circuit of Figure 8 is an arrangement providing spaced beams which if interrupted in one order, produce no result, but if interrupted in the other order, energize the valve solenoid.

While preferred specific embodiments of the invention are hereinbefore set forth, it is to be clearly understood that the invention is not to be limited to the exact devices, circuits, and electrical instrumentalities illustrated and described because various modifications of these details may be provided in putting the invention into practice within the purview of the appended claims.

What is claimed is:

1. In combination, an open booth having an end wall and side walls, a urinal in said booth mounted on said end wall, a flush valve for said urinal, a light source mounted in one of said walls adjacent the free edge thereof, and a photoelectric cell in the other of said walls adjacent to the free edge thereof, said light source throwing a beam onto said photoelectric cell and which beam is spaced an appreciable distance from said urinal, and an electrical circuit in which said photoelectric cell is included and which circuit is operatively connected to said flush valve to cause operation thereof for a predetermined period upon alternate interruptions of said beam.

2. In combination, a urinal including a flush valve, a light source and a photoelectric cell arranged to provide a light beam spaced at appreciable distance in front of said urinal, and an electrical circuit in which said photoelectric cell is included and which circuit is operatively connected to said flush valve to cause opening thereof for a predetermined period upon alternate interruptions of said beam.

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REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
2,438,207	Derby	Mar. 23, 1948

FOREIGN PATENTS

Number	Country	Date
493,200	Great Britain	Oct. 3, 1938
504,185	Great Britain	Apr. 17, 1939