

Nov. 2, 1965

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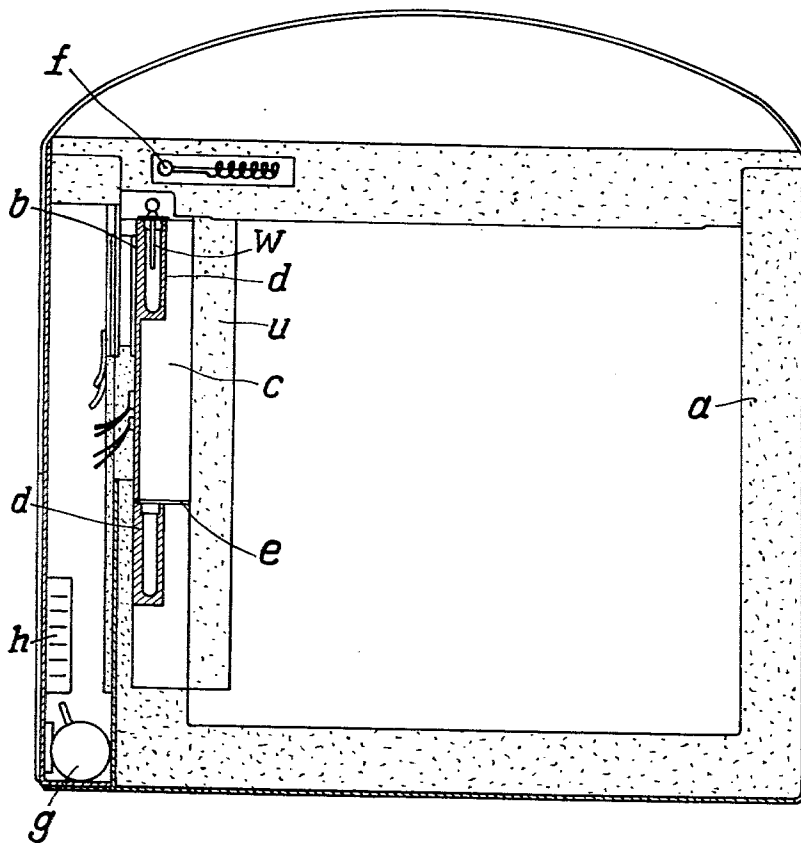
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SATCHEL

Filed Sept. 14, 1964

4 Sheets-Sheet 1

Fig. 1



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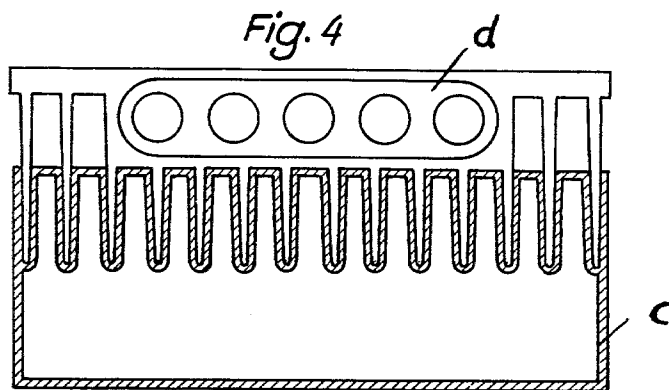
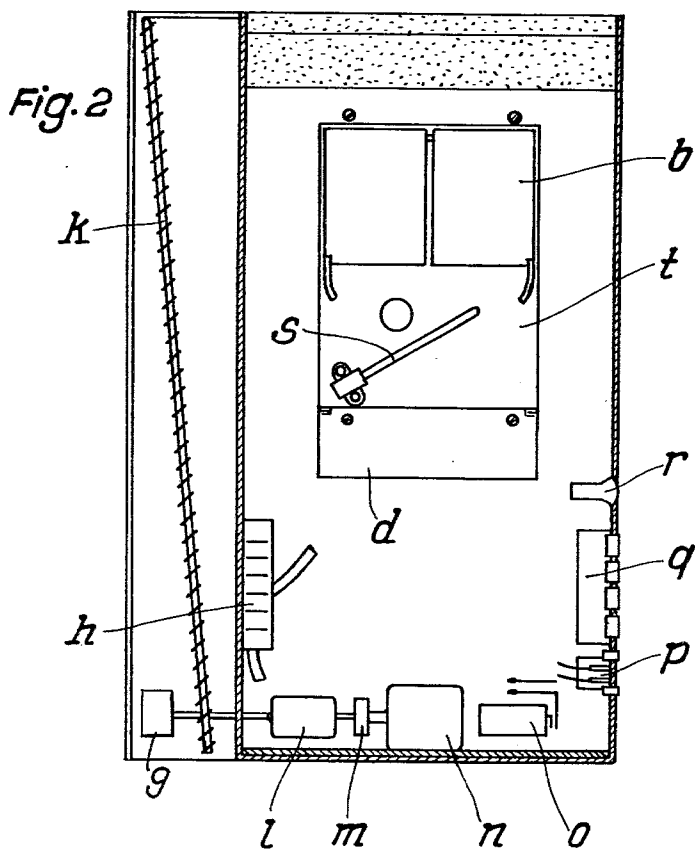
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3,214,922

SATCHEL

Filed Sept. 14, 1964

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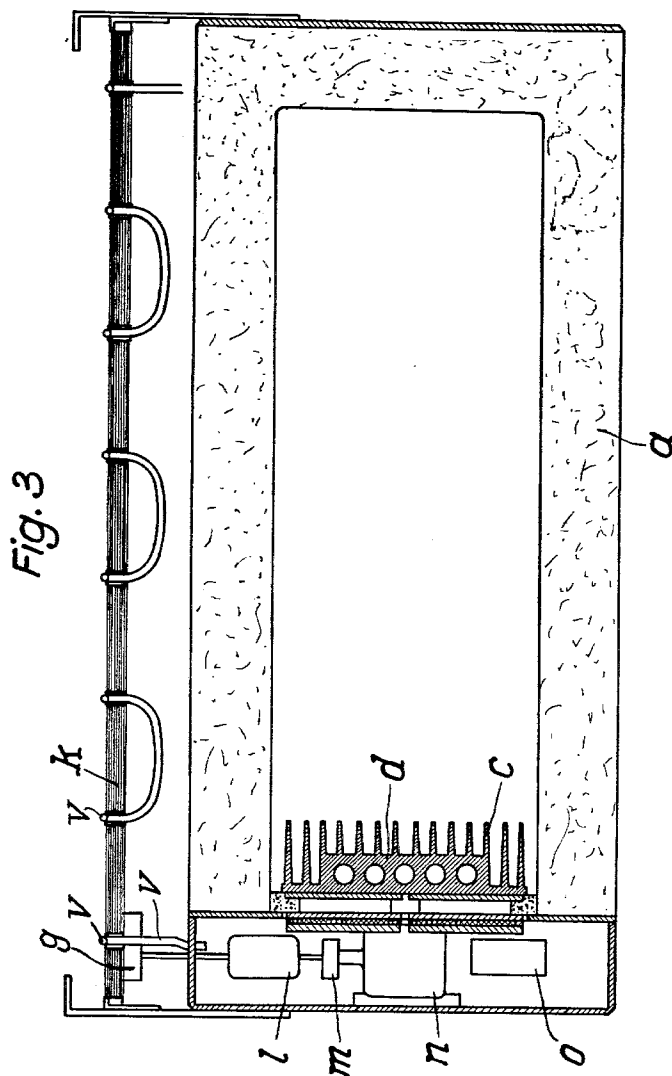
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3,214,922

SATCHEL

Filed Sept. 14, 1964

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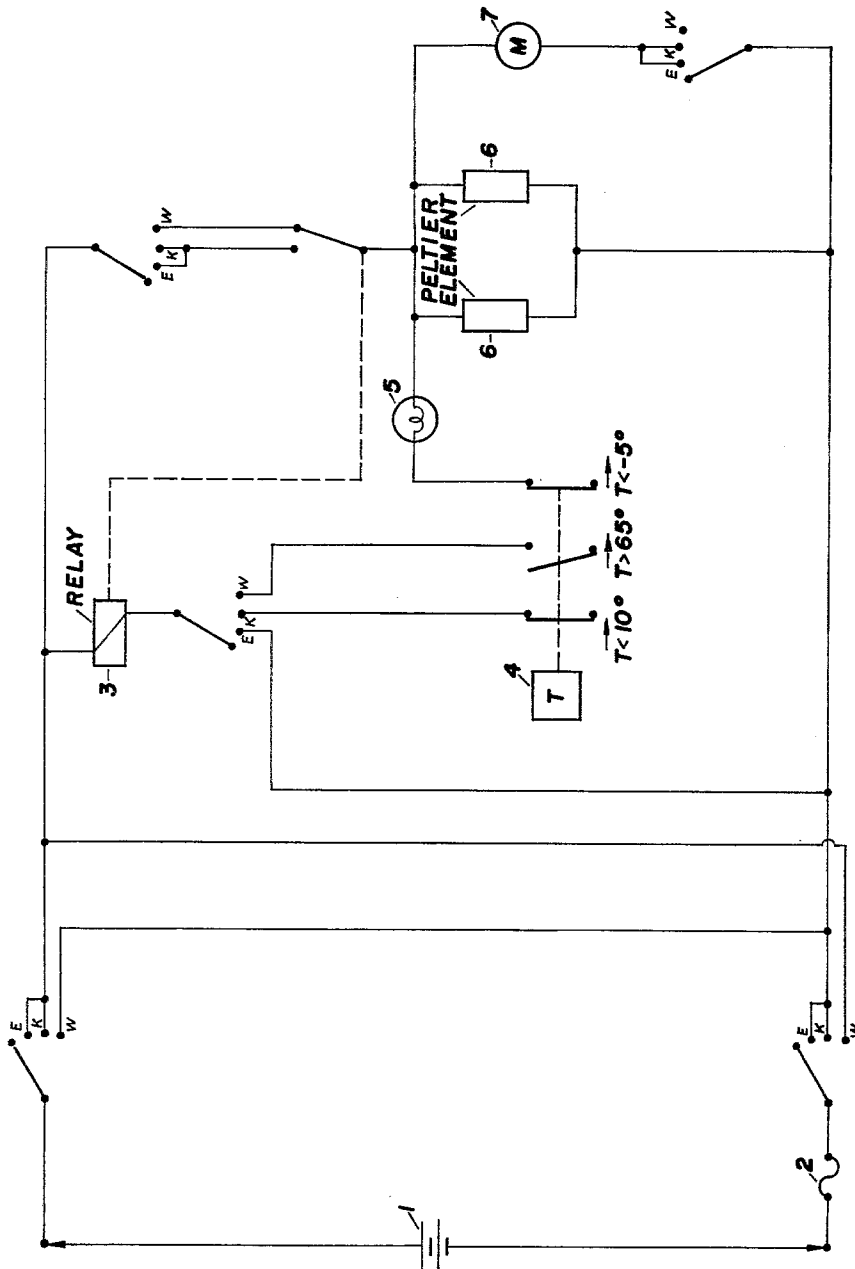
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Filed Sept. 14, 1964

4 Sheets-Sheet 4



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3,214,922
SACHEL

Kurt Koblischek, Berlin, Germany, assignor to Willi Zorn, Trais-Horloff, Kreis Grissen, Germany
Filed Sept. 14, 1964, Ser. No. 396,053
Claims priority, application Germany, Sept. 13, 1963, K 50,814; Dec. 10, 1963, K 51,581; Jan. 16, 1964, K 51,855

13 Claims. (Cl. 62—3)

The present invention relates to a satchel in which heat or cold can be generated by means of a so-called Peltier battery, i.e., a battery operating on the principle of the Peltier effect, which relates to the production or absorption of heat at the juncture of two metals on the passage of a current. Heat generated by the passage of current in one direction will be absorbed if the current is reversed.

While the Peltier effect as such has been known for many years, the only practical use to which it has been put is in refrigerators which are connected to an outside power source, e.g., conventional house current, and in battery-powered portable refrigerators whose temperatures are no lower than somewhat above the freezing point of water. The reason for this is, presumably, that a Peltier battery will always produce an excess of heat, so that separate means are required for carrying away this excess heat if the "cold" side of the battery is to produce the lowest possible temperature. In the case of permanently installed refrigerators, this excess heat can be carried away by providing a suitable cooling system, generally one which uses tap water, while a blower can be used in the case of portable refrigerators.

It is the object of the present invention to provide a satchel connectible to a battery or to an outside current source, which satchel is as light as possible so as to be readily portable, and which is capable of producing temperatures ranging from the low temperature needed to produce ice cubes and to the relatively high temperature needed to heat food to the point at which hot dishes are customarily served.

With the above object in view, the present invention resides, mainly, in a Peltier-type heating and cooling satchel which is connectible to a power-pack or to a current mains, and which comprises means forming an insulated housing, there being arranged at the upper half of the housing a Peltier battery which incorporates a plurality of Peltier elements, each having a first contact region which changes its temperature in one direction when a direct current flows through and a second contact region which changes its temperature in the other direction when this direct current flows. The one region of each Peltier element is directed toward the interior of the housing and the second contact region of each Peltier element is directed toward the outside of the housing. The satchel includes an ice cube tray which is made of a material that is a good conductor of heat, this ice cube tray being provided with partitions and with external ribs, and being in contact with the first contact regions of the Peltier elements. A container, also made of a material which is a good conductor of heat, is provided, this container being adapted to receive a substance to be heated and being placeable over the ice cube tray including the external ribs thereof. A heat exchanger is connected to the second contact regions of the Peltier elements, this heat exchanger incorporating a grid of large surface area and a coolant conduit system. Circulating means communicate with the coolant conduit system, and incorporate a pump and an electric motor for driving the pump. A ventilator serves to enhance the heat exchange between the grid and the ambient atmosphere.

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Additional objects and advantages of the present invention will become apparent upon consideration of the following description when taken in conjunction with the accompanying drawings in which:

5 FIGURE 1 is a vertical section of a satchel according to the present invention.

FIGURE 2 is a side elevational view, partly in section, of the satchel of FIGURE 1.

10 FIGURE 3 is a plan view, partly in section, of the satchel of FIGURES 1 and 2.

FIGURE 4 is a plan view, partly in section and on an enlarged scale, showing the structure of the ice cube tray.

FIGURE 5 is a circuit diagram of a satchel according to the present invention.

15 Referring now to the drawings, FIGURE 1 shows the satchel as having a housing *a* made of a plastic material having good insulating characteristics. Also shown is a Peltier battery *b*, at whose right side—i.e., the side which, in FIGURE 1, is shown as being directed toward the interior of the satchel—is arranged a metal container *c*, there being two smaller metal, internally positioned, ice cube tray type containers *d*, arranged above and below the container *c*, for producing ice cubes. The lower one of the ice cube trays *d* is mounted for movement to and fro along a suspension-track type rail *e*. In order to accelerate the formation of ice cubes, the compartment within which the ice cube trays are arranged is closed off by a cover *u* which is likewise made of a material having good heat insulating characteristics. Also shown, schematically, is a small ventilator *g* as well as a plug board *h* and an immersion heater *f*.

FIGURE 2 shows the satchel as including a small fractional horse power motor *l*, a small rotary pump *m* driven by motor *l*, a water reservoir *n*, a relay *o* for automatically switching the Peltier battery *b* on and off, a four-pole pull-type connector *p*, a four-pole switch *q* which may be fashioned as a push button type switch or as a rotary switch for operating the satchel, and a control lamp *r* for indicating as to whether the satchel is switched on. The satchel further includes a bimetallic switch *s* which is set so as automatically to turn off the current when a temperature of, for example, between 65 and 70° C. is reached. The heat exchange surface of the container in contact with the contact regions of the elements of the Peltier battery *b* is shown at *t*.

20 An external heat exchange grid *k* of large surface area is shown, schematically, at the left of FIGURE 2.

FIGURE 3 shows the ice cube tray *d*, as well as the heat exchange surfaces of the container *c*. FIGURE 3 also shows the heat exchange grid *k*, including the coolant coils *v* for carrying off heat from the grid *k*. The reference characters *a*, *l*, *m*, *n*, *o*, identify the same parts as in FIGURES 1 and 2.

FIGURE 4 shows the ice cube tray *d*, on an enlarged scale, this tray *d* having been shifted into engagement with the heat exchange surface of the larger container *c* in which, with the current flowing in the proper direction, a liquid, as for example, a baby bottle containing milk, juice or a formula, can be heated up to the desired temperature.

FIGURE 5 shows an embodiment of the electrical circuitry of the satchel. There are a 6 volt D.C. source 1, a fuse 2, a relay 3, a contact thermometer 4 for thermostatic adjusting either freezing or cooling or heating temperatures respectively, a control lamp 5, two Peltier element batteries 6, a D.C. motor 7, and several 4-pole switches and connecting wiring. At the switches, E stands for freezing, K for cooling and W for heating.

The satchel can be operated either by being connected to a battery or to a current mains, such as house current.

The Peltier battery can be arranged at the upper half of one side wall, or in the cover for the satchel, this Peltier battery itself being composed of a number of Peltier elements. As described above, the battery is so arranged that those contact regions of the Peltier elements which change their temperature in one direction when a direct current flow through are directed toward the inside of the satchel while those contact regions of the Peltier elements which change their temperature in the other direction are directed toward the outside, i.e., the ambient space.

Also, there is a ventilator or blower, driven by a small fractional horse power motor, for enhancing the heat exchange between the grid and the ambient atmosphere.

When the satchel is to be used for making ice cubes, the cover *u* is placed over the ice cube tray and over the external ribs thereof, thereby to concentrate the heat absorption of the contact surfaces being cooled by the Peltier elements and to avoid a drawing off of heat from the remainder of the interior of the satchel. If no ice cubes are needed, the cover *u* is left off so that heat can be drawn off from anywhere within the entire interior of the satchel.

The arrangement of the parts is such that the interior of the satchel is heat insulated from the other side of the Peltier battery, i.e., the contact regions of the Peltier elements which are heated up, so as to make sure that the interior of the satchel will absorb as little heat as possible from the Peltier elements.

In certain cases, it is of particular advantage to make the position of the Peltier battery adjustable, within predetermined limits, so that those contact surfaces whose cooling or heating effect is not being utilized are separated from the interior of the satchel by a suitable insulating layer.

Also, in order to conserve electricity—which is of particular importance if the satchel is to be operated from a portable power pack incorporating a 6 or 12 v. battery—the bimetallic switch shuts off the currents when the desired temperature has been reached, e.g., the temperature at which ice is formed in the ice cube container. Used in conjunction with such switch is a switching arrangement which allows the ice cube tray to be removed from the contact regions of the Peltier elements after the current has been interrupted, and to place an insulating layer between the ice cube tray and this contact region. In this way, heat is prevented from being returned from the Peltier elements to the ice cube tray.

The automatic switch is also suited to shut off the current when the satchel is used for heating, this being effected by changing the polarity of the current fed to the Peltier elements by means of the change-over switch.

If, after the ice cubes have been made, they are to be removed and are found to stick to the ice cube tray, removal of the ice cubes can be facilitated by briefly reversing the polarity of the current supplied to the Peltier elements, thereby melting the very edges of the ice cubes. To facilitate removal of the ice cubes even more, the individual ice tray compartments can be made to have a conical configuration, and thin rods *w* can be made to dip into the spaces within which the ice cubes are formed. These rods can be used to remove the ice cubes from the ice tray.

If desired, the satchel according to the present invention can be used in conjunction with an immersion heater, by means of which the temperature can be raised above that which can be reached by the Peltier elements. The immersion heater, too, can be operated from a current mains or from a portable power pack.

The second ice cube tray can be mechanically or magnetically coupled to the inwardly directed contact regions of the Peltier battery.

It will be understood that the above description of the present invention is susceptible to various modifications, changes and adaptations, and the same are intended to be comprehended within the meaning and range of equivalents of the appended claims.

What is claimed is:

1. A Peltier-type heating and cooling satchel connectible to a power-pack or to a current mains and comprising, in combination:

- (a) means forming an insulated housing;
- (b) a Peltier battery arranged at the upper half of said housing, said battery incorporating a plurality of Peltier elements, each having a first contact region which changes its temperature in one direction when a direct current flows through and a second contact region which changes its temperature in the other direction when said direct current flows, said one region of each Peltier element being directed toward the interior of said housing and said contact region of each Peltier element being directed toward the outside of said housing;
- (c) an ice cube tray made of a material which is a good conductor of heat, said ice cube tray being provided with partitions and with external ribs, said ice cube tray being arranged in said housing and in contact with said first contact regions of said Peltier elements;
- (d) a container made of a material which is a good conductor of heat and being adapted to receive a substance to be heated, said container being placeable over said ice cube tray including said external ribs thereof;
- (e) a heat exchanger connected to said second contact regions of said Peltier elements, said heat exchanger incorporating a grid of large surface area and a coolant conduit system;
- (f) circulating means communicating with said coolant conduit system, said circulating means incorporating a pump and an electric motor for driving the said pump; and
- (g) ventilating means for enhancing heat exchange between said grid and the ambient atmosphere.

2. A satchel as defined in claim 1, further comprising additional heat insulating means for insulating said first contact regions of said Peltier elements from the interior of said housing.

3. A satchel as defined in claim 1, further comprising thermostatic switch means for regulating the temperature in said housing.

4. A satchel as defined in claim 3 wherein said thermostatic switch means comprise a bimetallic switch.

5. A satchel as defined in claim 3, further comprising means for removing said ice cube tray from said first contact regions of said Peltier elements after said thermostatic switch means have switched off the current upon attainment of the desired cooling temperature and for moving a heat insulating layer between said ice cube tray and said first contact regions.

6. A satchel as defined in claim 1 wherein said ice cube tray is configured to form conical ice cubes and is equipped with rods dipping into the spaces within which the ice cubes are formed for facilitating removal of said ice cubes after they have been formed.

7. A satchel as defined in claim 6, further comprising switch means for changing the direction of the direct current through said Peltier elements, thereby to cause said first contact regions to serve, selectively, as means for absorbing heat from within said housing and as means for producing heat within said housing.

8. A satchel as defined in claim 1, further comprising a second ice cube tray arranged in said housing and held against said first contact regions of said Peltier elements.

9. A satchel as defined in claim 8 wherein said second ice cube tray is held in place by a rail.

10. A satchel as defined in claim 8 wherein said second ice cube tray is held in place by magnetic means.

11. In combination with a satchel as defined in claim 1, an immersion heater for use in said container for producing temperatures not attainable by said Peltier elements alone.

12. A satchel as defined in claim 1 wherein said Peltier battery is arranged in a wall of said housing.

13. A Peltier-type heating and cooling satchel connectible to a power-pack or to a current mains and comprising, in combination:

(a) means forming an insulated housing;

(b) a Peltier battery arranged at the upper half of said housing, said battery incorporating a plurality of Peltier elements, each having a first contact region which changes its temperature in one direction when a direct current flows through and a second contact region which changes its temperature in the other direction when said direct current flows, said one region of each Peltier element being directed toward the interior of said housing and said second contact region of each Peltier element being directed toward the outside of said housing;

(c) an ice cube tray made of a material which is a good conductor of heat, said ice cube tray being provided with partitions and with external ribs, said ice cube tray being arranged in said housing and in contact with said first contact regions of said Peltier elements;

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(d) a container made of a material which is a good conductor of heat and being adapted to receive a substance to be heated, said container being placeable over said ice cube tray including said external ribs thereof;

(e) a heat exchanger connected to said second contact regions of said Peltier elements, said heat exchanger incorporating a grid of large surface area; and

(f) ventilating means for enhancing heat exchange between said grid and the ambient atmosphere.

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WILLIAM J. WYE, *Primary Examiner.*

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,214,922

November 2, 1965

Kurt Koblischek

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

In the grant, lines 1 and 2, for "assignor to Willi Zorn, of Trais-Horloff, Kreis Grissen, Germany" read -- assignor to Willi Zorn, of Trais-Horloff/Kreis Giessen, Germany --; in the heading to the printed specification, lines 3 and 4, for "assignor to Willi Zorn, Trais-Horloff, Kreis Grissen, Germany" read -- assignor to Willi Zorn, Trais-Horloff/Kreis Giessen, Germany --.

Signed and sealed this 7th day of June 1966.

(SEAL)

Attest:

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EDWARD J. BRENNER

Commissioner of Patents