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T. T. WOODSON

2,527,239

LUBRICATING SYSTEM FOR CLOTHES-WASHING MACHINES

Original Filed Aug. 25, 1944

2 Sheets-Sheet 1

Fig. 1.

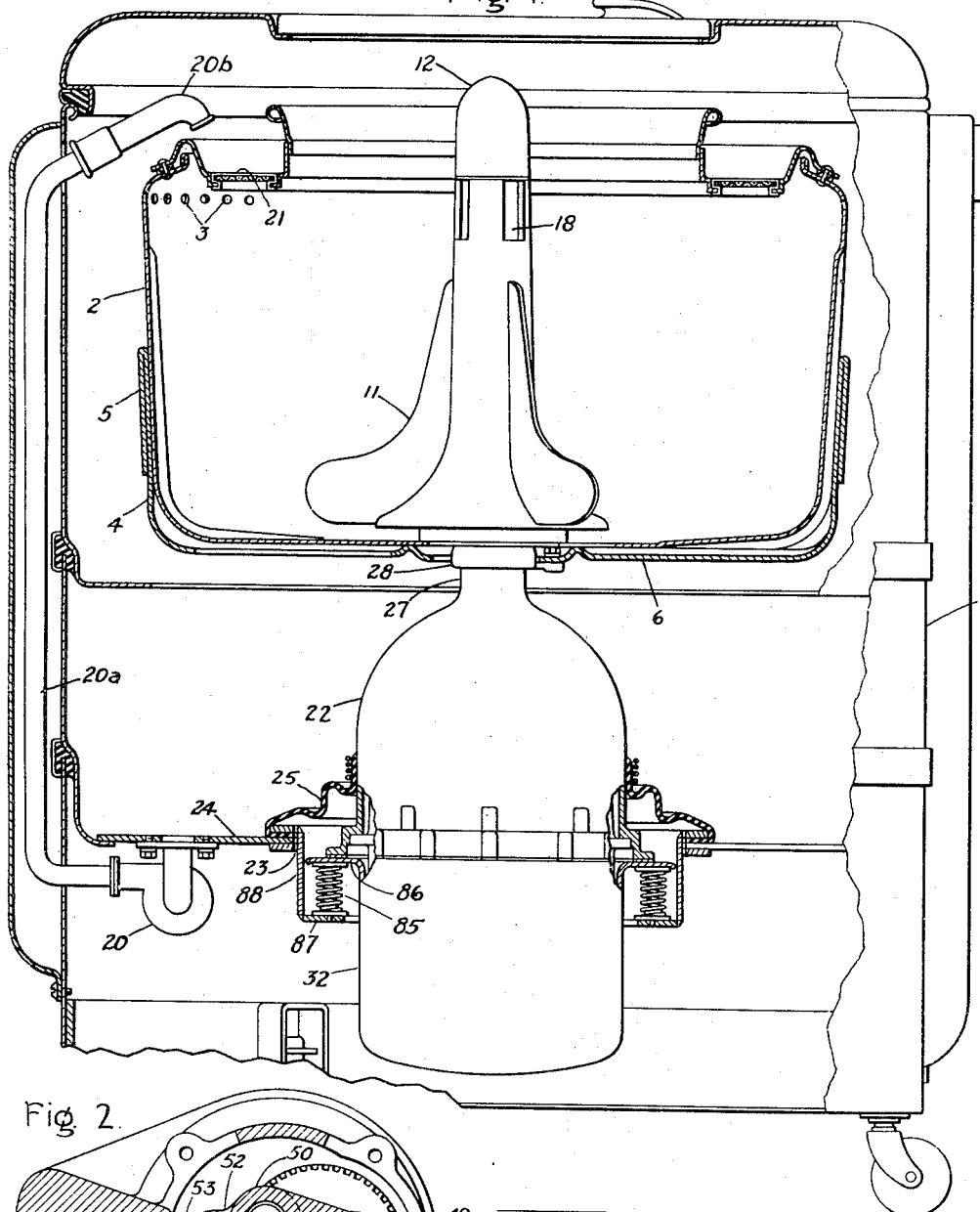
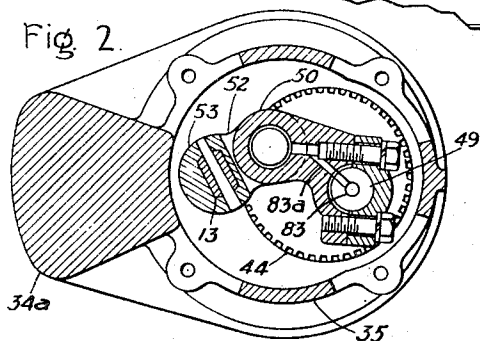


Fig. 2.



Inventor:
Thomas T. Woodson,
by *Alfred V. Bobst.*
His Attorney.

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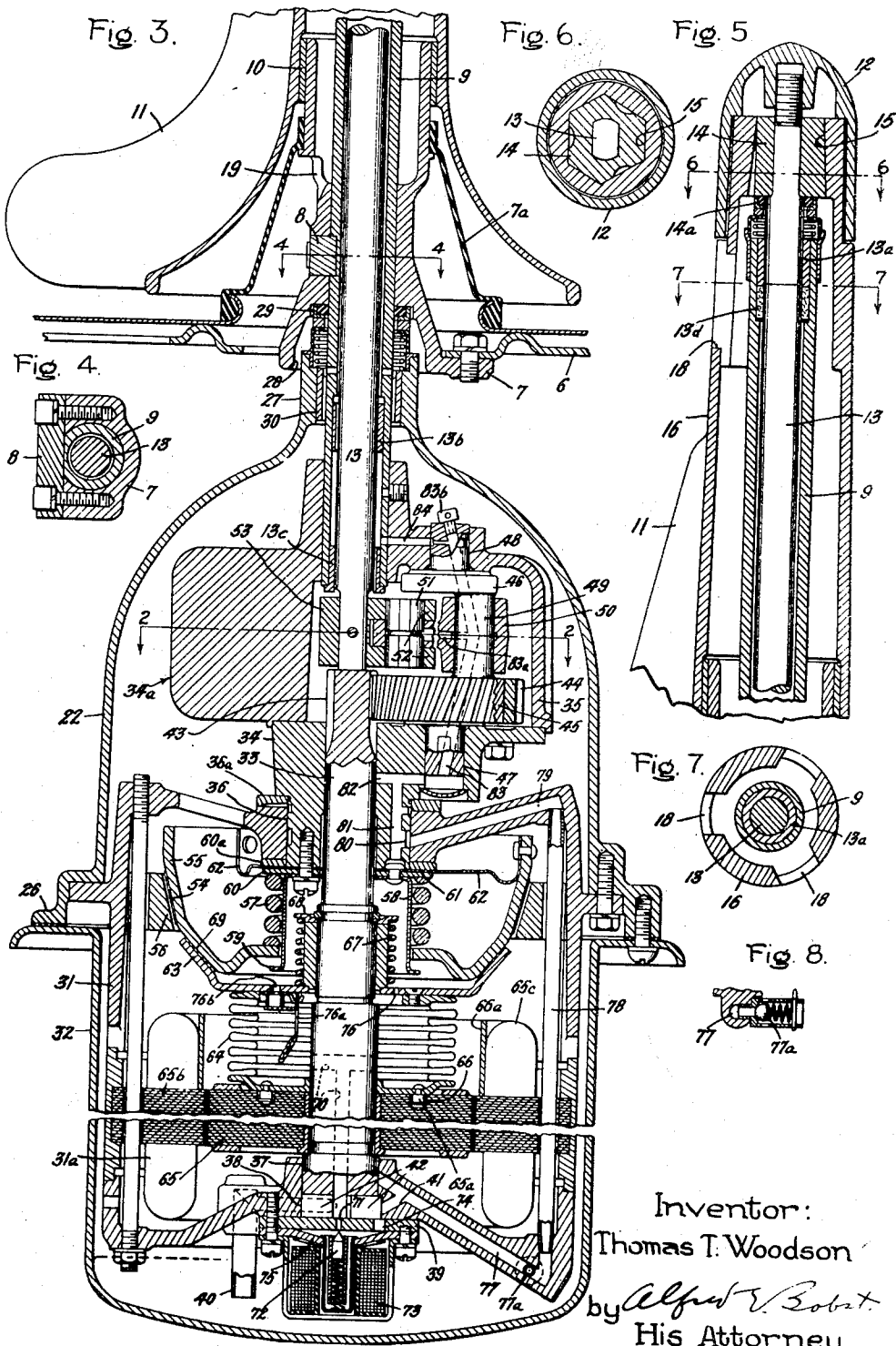
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2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE

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LUBRICATING SYSTEM FOR CLOTHES-
WASHING MACHINES

Thomas T. Woodson, Fairfield, Conn., assignor to
General Electric Company, a corporation of
New York

Original application August 25, 1944, Serial No.
551,096. Divided and this application Novem-
ber 23, 1945, Serial No. 630,439

1 Claim. (Cl. 68—23)

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This application is a division of my applica-
tion Serial No. 551,096, filed August 25, 1944.

The invention relates to clothes washing ma-
chines and especially to such machines wherein
the operating mechanism is enclosed in a sealed
casing containing a supply of oil which is used
for lubricating the mechanism, as operating fluid
for certain parts of the mechanism or for both
purposes.

The object of the invention is to provide an
improved lubricating and lubricant cooling ar-
rangement in a machine of this type and for a
consideration of what I believe to be novel and
my invention, attention is directed to the fol-
lowing specification and to the claim appended
thereto.

In the accompanying drawing, Fig. 1 is a sec-
tional elevation of a washing machine embodying
my invention; Fig. 2 is a sectional view taken on
line 2—2, Fig. 3; Fig. 3 is an enlarged sectional
elevation of one form of driving mechanism; Fig.
4 is a sectional view on line 4—4 of Fig. 3; Fig.
5 is an enlarged view of the upper end of the agi-
tator; Fig. 6 is a section taken on line 6—6 of
Fig. 5; Fig. 7 is a section taken on line 7—7 of
Fig. 5; and Fig. 8 is a detail of the pressure relief
valve in the oil line.

Referring to the drawing, there is shown a
washing machine having an outer casing or tub
1 in the upper part of which is located a spinner
basket 2 having centrifugal discharge openings
3 at the region of greatest diameter which dur-
ing washing are at or slightly above the liquid
level. The spinner basket is non-rotatably seated
in a carrier 4 having annular walls 5 surround-
ing the basket and serving as a balance ring and
having radial arms 6 bolted to a hub 7 (Fig. 3)
fixed by a clamp 8 (Fig. 4) to a tubular shaft 9
for supporting and driving the spinner basket.
The space between the basket and the hub is
sealed by a rubber sleeve 7a (Fig. 3) having its
upper end fixed to the hub and its lower end
fixed to the basket. At the upper end of the
hub is a bearing 10 (Fig. 3) for the lower end
of a bladed agitator 11 fastened by a nut 12 (Fig.
5) to the upper end of a drive shaft 13 journaled
in bearings 13a, 13b, and 13c in the spinner shaft
9. An oil retaining felt ring 13d is associated
with the bearing 13a. The shaft 13 has fixed
thereto an agitator drive nut 14 fitting in a com-
plementary socket 15 in the agitator hub. A shaft
seal 14a is provided between the upper ends of
the spinner and agitator shafts 9 and 13.

In the agitator hub 16 at or slightly below the
wash water level in the spinner basket are drain

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passages 18 leading to the space between the
spinner shaft 9 and the agitator hub 16. The
water draining through these passages flows
through the space between the shaft 9 and the
agitator hub and through passages 19 in the car-
rier hub 7 to the bottom of the outer casing 1
whence it is pumped onto an annular filter 21
(Fig. 1) on the rim of the spinner basket by a
circulating pump 20. The pump has its inlet
connected to the lowermost part of the casing
1 and its discharge connected to a conduit 20a
having a nozzle 20b directed onto the filter. The
pump is operated during washing so the wash
water is continually withdrawn from the spinner
basket through the passages 18 and 19 (and pos-
sibly openings 3) and returned to the basket
through the filter 21. The continuous circula-
tion and filtering of the water removes lint and
other particles and keeps the wash water clean.
The amount of wash water flowing through the
passages 18 and 19 automatically adjusts itself
to the capacity of the pump 20 by slight varia-
tion of the wash water level. If the pump flow
should become restricted, the wash water level
would fall only slightly below the lower edges
of the openings 18 which is only slightly less than
the desired water level for washing. A suitable
drain pump (not shown) may be connected with
casing 1.

The concentric spinner and agitator drive
shafts 9 and 13 are driven by mechanism enclosed
within a sealed casing 22 having its upper end
projecting through opening 23 in the bottom plate
24 of the outer casing. The space between the
casing 22 and the plate 24 is sealed by a flexible
annular rubber ring 25 having its inner edge
clamped to the casing 22 and its outer edge
clamped to the plate 24. The ring 25 is flexible
to prevent the transmission of vibration to the
outer casing. The upper end of the casing 22,
which is above the maximum water level in the
outer casing 1, is provided with a reduced hub
27 (Fig. 3) which projects within a skirt 28 at
the lower end of the hub 7 and is provided with
a seal 29 and a sleeve bearing 30 for the spinner
shaft 9. During both washing and centrifugal
drying the upper part of the gear casing 22 is
cooled by the wash water. During washing, the
wash water falls onto the upper end of the gear
casing from the passages 19. During centrifugal
drying, the wash water discharged through the
centrifugal discharge openings 3 falls into the
bottom of the outer casing and partially sub-
merges the upper end of the gear casing.

The driving motor 31a for the machine is

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carried in a frame 31 bolted to the under side of a flange 26 at the lower edge of the gear casing 22 and enclosed by a shell 32 (also bolted to the flange 26) which forms the motor cover. The motor shaft 33 is journaled at its upper end in the lower half 34 of a rotatable frame 34a. The lower half 34 of the frame is journaled in a bearing 36 in the motor frame 31. The upper half 35 is fixed to the spinner shaft 8. The weight of the spinner basket and contents and of the frame 34a is carried on a thrust washer 36a at the upper end of the bearing 36. The lower end of the motor shaft 33 is journaled in a bearing 37 in the frame 31. The lower end of the bearing 37 is provided with an eccentric bore 38 closed by a plate 39 and forming the housing of a vane type rotary oil pump. The oil pump housing is connected with a sump at the bottom of the shell 32 by a suction intake 40 and is provided with a pressure discharge passage 41. The rotor of the pump consists of the extreme lower end of the motor shaft 33 which is slotted to receive vanes 42 which are held by centrifugal force against the bore 38. Integral with the upper end of the motor shaft 33 is a pinion 43 meshing with a gear 44 shrunk on a hub 45 of a crank shaft 46 journaled in bearings 47 and 48 in the lower and upper parts 34, 35 of the rotatable frame 34a. The crank arm 49 of the crank shaft is connected by a connecting rod 50 to a pin 51 fixed between the forked ends 52 of an arm 53 pinned on the lower end of the agitator shaft 13.

During washing, the frame 34a is held stationary by a conical brake surface 54 on a cup-shaped member 55 surrounding the motor shaft, which surface 54 is urged against a complementary brake surface 56 on the motor frame 31 by a coil spring 57 surrounding a cup 58 bolted to the lower frame member 34. The member 55 loosely surrounds the cup 58 so as to permit alignment of the brake surfaces 54 and 56, and the axial movement thereof is limited by a flange 59 on the cup 58. The lower end of the spring 57 is seated on the bottom of the member 55 and the upper end of the spring is seated on a thrust washer 60 clamped between the cup 58 and the lower frame member 34. The thrust is transmitted to the frame 31 through a thrust washer 60a at the lower end of the bearing 36. The braking or accelerating torque is transmitted through a structure comprising a hub 61 riveted to the washer 60 and the cup 58 and having curved axially flexible radially extending spring arms 62 fixed to the member 55. When the brake surfaces are in engagement, the frame 34a (and the spinner basket 2 which is fixed thereto) is brought to rest and the relative rotation of the motor shaft 33 with respect to the frame 34a causes oscillation of the agitator at a speed of the order of 350 oscillations per minute and through an arc of the order of 60 degrees in the present construction where the motor is a 6-pole induction motor having a full load speed of about 1150 R. P. M. The speed and stroke of the agitator obviously depend upon the motor speed and the oscillating mechanism carried in the frame.

During centrifugal drying, the spinner basket 2 is clutched directly to the motor shaft 33 by a conical clutch member 63 slidably surrounding the motor shaft and fixed to the upper end of a bellows 64 surrounding the motor shaft and keyed to the rotor 65 of the motor 31a by projections 65a on the bellows fitting in sockets 66

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in the rotor. The bellows is biased to the collapsed position by a coil spring 67 arranged between the clutch member 63 and a washer 68 on the motor shaft.

The bellows is extended to move the clutch member 63 against a complementary clutch surface 69 on the member 55 (and to lift the member 55 clear of the brake surface 56) by oil pressure admitted through passages 70 in the motor shaft and through a port 71 in the plate 39. The port 71 is normally closed by a spring biased plunger 72 of a solenoid valve 73 mounted on the under side of the plate 39. Oil from the pump discharge 41 is conducted through a port 74 in the plate 39 to a chamber formed between a dish member 75 and the under side of the plate 39.

When the solenoid valve is energized, the plunger 72 is moved downward, opening the port 71 and admitting oil under pressure through the passages 70 to the interior of the bellows and raising the clutch member 63 into engagement with the clutch surface 69 (disengaging brake surfaces 54 and 56) and establishing a friction drive from the motor through the spring arms 62 and the frame 34a to the spinner basket. While the spinner basket is being accelerated the clutch surfaces slip and there is relative rotation between the motor shaft 33 and the frame 34a which causes oscillation of the agitator at a decreasing rate as the spinner basket approaches the motor shaft speed. As the clutch slippage approaches zero, the coefficient of friction increases and the clutch surfaces lock, placing a transient load on the motor which slightly lessens the motor speed. Thereafter the spinner basket runs at motor shaft speed which increases to the point on the motor speed torque curve at which the friction and windage load equals the motor power. Throughout centrifugal drying, oil is supplied to the bellows and leaks from bleeder openings 76. When the solenoid valve is deenergized, the oil supply to the bellows is cut off by the closing of the port 71 and the bellows returns to the collapsed position in which the brake surfaces are engaged and the clutch surfaces are disengaged. To prevent expansion of the bellows until the motor is up to speed, a centrifugal valve 76a is provided which is moved outward by centrifugal force to close a bleeder opening 76b large enough to prevent the building-up of a bellows operating pressure until the motor is up to speed. The valve is gravity-biased to the open position.

In addition to supplying the hydraulic control for the washing and drying operations, the oil pressure is used to pressure lubricate the bearings and the oil from the bearings heated by friction losses in the mechanism and by the losses in the motor is thrown from the bearings over the inside of the casing for cooling purposes. The lower shaft bearing 37 is fed from one end of a passage 77, the other end of which is connected through passages 78 and 79 to the bearings 36, 36a for the lower frame member 34. A pressure relief valve 77a (Fig. 8) may be used if desired to limit the oil pressure. Leading from an annular groove 80 in the frame member 34 is a vertical passage 81 having its lower end closed and its upper end connected to a transverse passage 82 leading between the upper motor shaft bearing and the lower crank shaft bearing 47. Drilled passages 83 in the crank shaft feed the upper crank shaft bearing 48 and through branch passages 83a (Fig. 2) also feed the bearings at each end of

the connecting rod 50. Oil for cooling purposes is sprayed from a fitting 83b at the upper end of the passage 83. Throughout the interior of the casing there is during rotation of the motor an oil mist which settles on the inner surface of the casing of the motor and other parts of the mechanism. The oil trickles through suitable drain passages (not shown in detail) to the bottom of the casing. Oil settling on the rotor 65 is thrown outward by centrifugal force so there is only an oil mist in the air gap of the motor. A dam 66a is provided on the stator 65b which holds oil in contact with the stator windings 65c which trickles through the stator winding slots (not shown). From the upper crank shaft bearing 48 a passage 84 conducts oil to the agitator shaft bearings 13a, 13b, and 13c and to the spinner shaft bearing 30.

Washing is started by closing the motor circuit. Centrifugal drying is started by closing the solenoid valve circuit in addition and is stopped by opening both the motor and solenoid valve circuits. Because the shift to centrifugal drying depends upon oil pressure, the motor must be up to speed before the mechanism can be shifted to centrifugal drying. This prevents heavy starting loads on the motor. Because the mechanism and control are sealed within this enclosing casing 22, 32, a lifetime supply of oil is sealed within the casing so that further attention is unnecessary.

To prevent objectionable vibration during extracting, resilient mountings are provided which permit the basket to rotate about its center of mass and which damp the high amplitude gyrations associated with the critical speed.

In the resilient mounting shown in Fig. 1 the spinner basket and driving mechanism are supported by a plurality of coil springs 85 arranged between the under side of a flange 86 on the lower half 32 of the casing 22 and an inwardly extending flange 87 at the lower end of a cylindrical supporting member 88 supported by the bottom plate 24 of the outer casing and depending through the opening 23. The springs have a stiffness such that the critical speed is of the order of 100 R. P. M., or slightly above the water emptying speed of the spinner basket—the speed at which the free water in the basket (the water not absorbed in the clothes) is centrifugally discharged. Sufficient clearance is provided to permit a lateral movement of the casing 22 without striking the support 88 or the flange 87.

By my invention I provide in a washing machine of the character described a sealed self-contained unitary operating mechanism comprising a pump which supplies oil for both operating and lubricating purposes whenever the oil is effectively cooled to remove heat from the mechanism by means of a cleaning liquid utilized in the normal operation of the machine.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof, but I desire to have it understood that the apparatus shown is only illustrative and that the invention may be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States is:

In a clothes washing machine having a tub, a sealed casing at the bottom of the tub and having a substantial surface area within the tub, a combined washing and drying basket within the tub above the sealed casing, said basket being imperforate except above the normal washing liquid level, means for rotating said basket, oscillatable agitating means in said basket above said casing, said agitating means including a tubular hub extending upwardly within said tub to above said liquid level, and a motor and driving mechanism within said casing for actuating said basket and said agitator, means for effecting heat transfer from said motor and mechanism to said washing liquid, including pressure lubrication means for circulating lubricating oil over the motor and driving mechanism within said casing, a portion of the lubricant therein being continually directed against a wall of the casing portion within the tub to transmit to said casing portion the heat absorbed by the lubricant from the mechanism, and means for causing water to flow from said basket into contact with said portion to absorb heat therefrom, comprising inlet openings through the wall of said tubular agitator hub below the normal liquid level within the tub, a conduit for conducting water flowing through said openings through the bottom of the basket and into the tub space immediately above the casing, and a pump communicating with said tub and discharging into said basket for recirculating water from the tub to the basket.

THOMAS T. WOODSON.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
1,842,154	Dunham	Jan. 19, 1932
2,002,916	Mendenhall et al.	May 28, 1935
2,130,862	Steenstrup	Sept. 20, 1938
2,223,998	Martin et al.	Dec. 3, 1940
2,279,878	Suits et al.	Apr. 14, 1942
2,292,566	Jordan	Aug. 11, 1942
2,346,152	Clark	Apr. 11, 1944

Certificate of Correction

Patent No. 2,527,239

October 24, 1950

THOMAS T. WOODSON

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 6, line 33, after the word "said" insert *casing*;
and that the said Letters Patent should be read as corrected above, so that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 24th day of April, A. D. 1951.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.