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Brown et al.

[11] **3,824,357**

[45] **July 16, 1974**

[54] **ELECTRICAL TIMER WITH IMPROVED GEAR-CAM STRUCTURE**

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[22] Filed: **Apr. 16, 1973**

[21] Appl. No.: **351,347**

[52] **U.S. Cl.** ..... **200/38 B,** 200/153 LB, 200/168 R

[51] **Int. Cl.** **H01h 7/08,** H01h 43/10

[58] **Field of Search** .... 200/27 R, 27 B, 30 R, 30 A, 200/31 R, 31 A, 38 R, 38 B, 38 BA, 38 C, 38 CA, 153 L, 153 LA, 153 LB, 166 J, 168 R, 168 K

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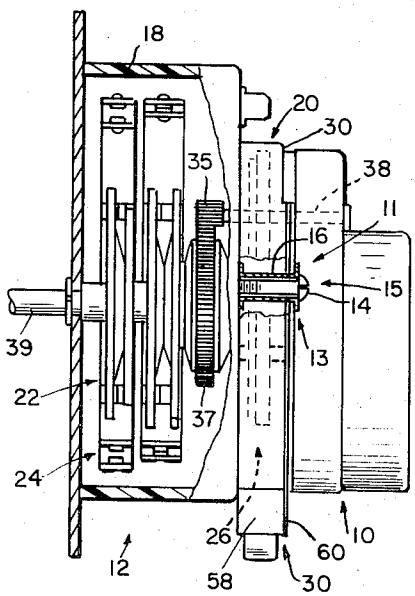
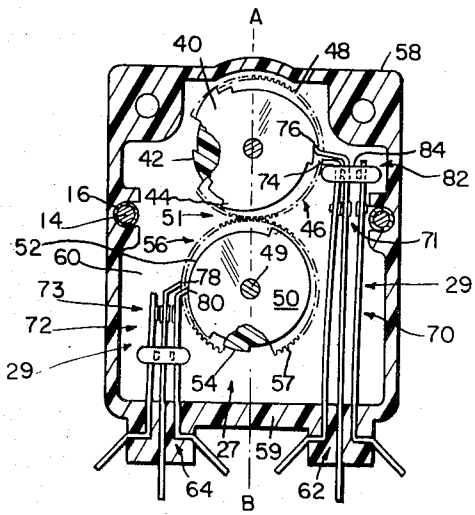
Attorney, Agent, or Firm—Charles W. Hoffmann; Robert F. Meyer

[57] **ABSTRACT**

A timing means, a substantially-thin second timing means, and a motor are combined in such a manner that one is sandwiched in between the other two.

29 Claims, 7 Drawing Figures





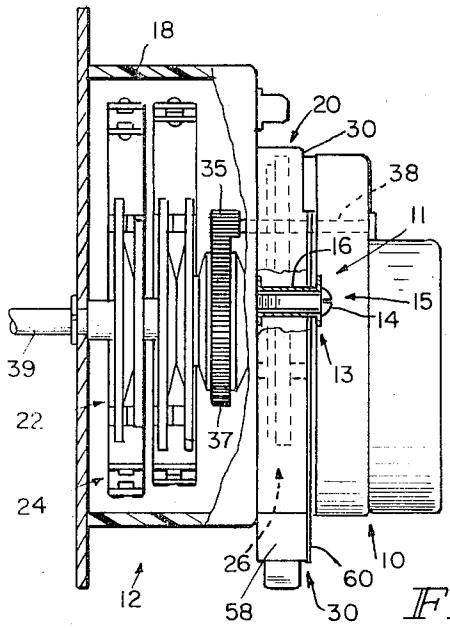


FIG. 1

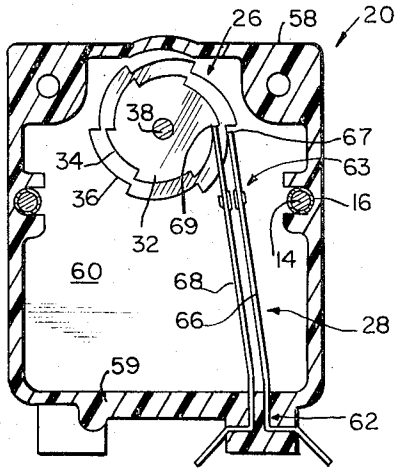


FIG. 2

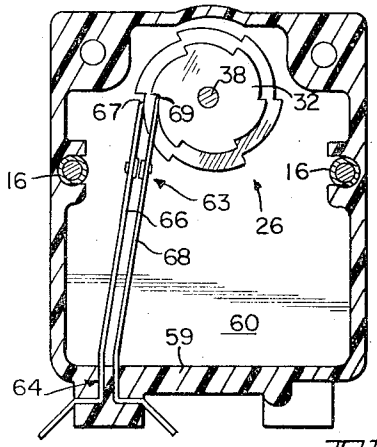


FIG. 3

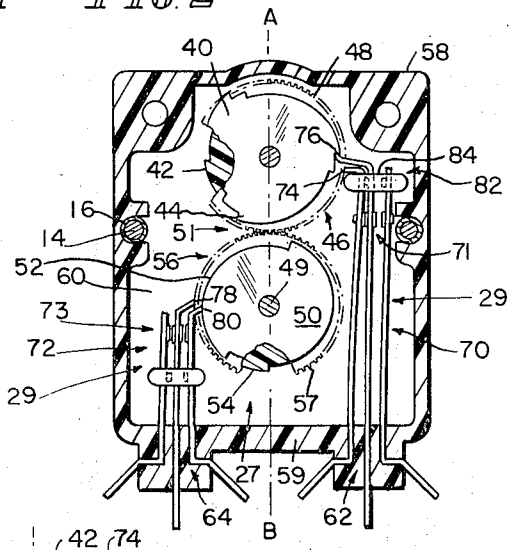


FIG. 4

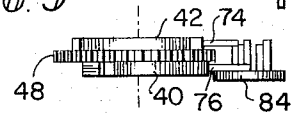


FIG. 7

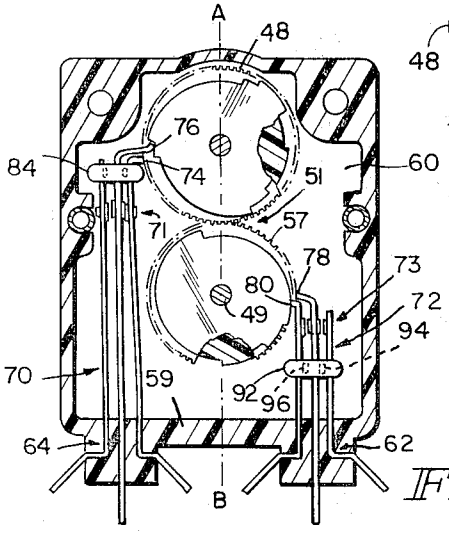


FIG. 5

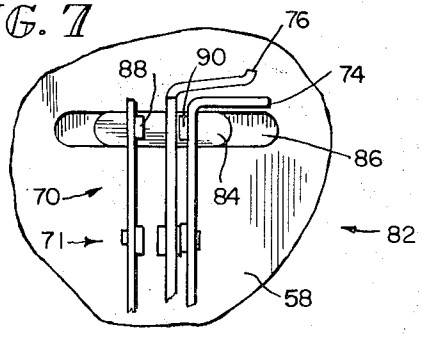


FIG. 6

ELECTRICAL TIMER WITH IMPROVED GEAR-CAM STRUCTURE

Generally speaking, the present invention relates to a combination comprising a synchronous motor; a first timing means including a first switching means responsive to a first cam means and an enclosure enveloping both switching and cam means; a substantially-thin second timing means including a second switching means responsive to a second cam means and a second enclosure enveloping both second switching and second cam means; and an attachment means to connect the motor, first timing means, and second timing means together.

A typical application of this combination is in a domestic automatic clothers dryer. In this embodiment, the primary timing means is a dryer timer. The substantially-thin second timing means is attached to a dryer timer and a motor. The resulting package comprises two timers driven by the same motor, in a space slightly larger than the space normally occupied by a motor and dryer timer alone. The second timing means may be added to accomplish an additional timed switching feature not available or atainable in the primary timer alone. In the example of the clothes dryer, the second timing means may be added to produce short pulses of switching to periodically start and stop the dryer drum rotation after the normal drying cycle. The purpose of this example of switching is to keep permanent press clothes intermittently moving around during the cool-down time to discourage wrinkle formation.

One embodiment of the second timing means utilizes two cam members disposed side-by-side instead of the conventional in-line arrangement of cams. This side-by-side embodiment is thinner in a dimension taken parallel to the cam axes than an in-line version employing the same number of cam members. In many appliances in which this combination might be used, the depth of the space alloted for a timer switch is limited, and therefore, the thin size of the second timing means is very desirable.

Accordingly a feature of the present invention is to provide a combination of a substantially-thin timing means, another timing means, and a motor, one of which is sandwiched between the other two. Another feature of the present invention is to provide a substantially-thin timing means, including one cam member in combination with a motor and another timing means, one of which is sandwiched between the other two. Another feature of the present invention is to provide a substantially-thin timing means, including two cam members operating side-by-side on parallel shafts, in combination with a motor and another timing means, one of which is sandwiched in between the other two. Still another feature of the present invention is to provide a substantially-thin timing means substantially enveloped by an enclosure that provides support, location, and entrapment of switch members. Yet another feature of the present invention is to provide a substantially-thin timing means wherein electrical switching members are located in one of a plurality of alternate locations in an enclosure and are responsive to at least one of two cam members. Another feature of the invention is to provide a thin timing means including a contact-spacing means separating two of a plurality of contact-carrying blades a predetermined distance apart to achieve improved switching characteristics. Another

feature of the present invention is to provide a thin timing means that is neat and compact in size. Another feature of the present invention is to provide a thin timing means that is simple and economical to produce.

These and other features of the invention will become apparent from the following description taken in conjunction with the accompanying drawing wherein:

FIG. **1** is an elevation view of an embodiment of the invention.

FIG. **2** is a front view of an embodiment of the second timing means utilizing a primary cam and a set of contacting carrying blades.

FIG. **3** is a front view of the same embodiment as shown in FIG. **2** with the cam flipped over and the contact-carrying blades in an alternate location.

FIG. **4** is a front view of an embodiment of the second timing means utilizing two cams and two sets of contacting-carrying blades.

FIG. **5** is a front view of the same embodiment shown in FIG. **4** with the cams flipped over and the sets of contact-carrying blades interchanged.

FIG. **6** is a rear view of a slider engaging a set of contact-carrying blades.

FIG. **7** is a view showing the cooperation of the cams with its contact carrying blades.

Referring now to the drawing, a motor **10**, a first timing means **12** and a substantially-thin second timing means **20** are connected together by an attachment means **11**. In the embodiment shown in FIG. **1**, substantially-thin second timing means **20** is sandwiched in between motor **10** and first timing means **12**. Attachment means **11** comprises a motor attachment means **13** and a timer attachment means **15**. Motor attachment means **13** comprises a plurality of hollow rivets **16** inserted through holes in the motor **10** and substantially-thin second timing means **20** are headed over, thereby securing the two together. Timer attachment means **15** comprises screws **14** piloted through the rivets **16** and threaded into a first enclosure **18** of first timing means **12**, thereby securing first timing means **12** to motor **10** and second timing means **20**.

First timing means **12** includes a first cam means **22**, a first electrical switching means **24** and first enclosure **18**. Substantially-thin second timing means **20** includes a second cam means **26**, a second switching means **28** and a second enclosure **30**.

In the embodiment shown in FIGS. **2** and **3**, second cam means **26** includes a primary cam member **32** comprising two cam tracks **34** and **36**. Primary cam member **32** is carried on an output shaft **38** extending from motor **10**. A pinion **35**, also carried on output shaft **38**, engages a drive gear **37** on a cam carrying shaft **39** in first timing means **12**. First cam means **22** is carried on cam shaft **39**.

In the embodiment shown in FIGS. **4**, **5** and **7**, second cam means **27** includes a primary cam member **40** comprising two cam tracks **42** and **44** and a cam separation means **46**. Cam separation means **46** comprises a gear **48** sandwiched in between the two cam tracks **42** and **44**. Second cam means **27** further includes a secondary cam member **50** comprising two cam tracks **52** and **54** and a cam separation means **56**. Secondary cam member **50** is carried on a second shaft **49** which is rotatably journaled in cup-shaped housing **58**. Cam separation means **56** comprises a gear **57** sandwiched in be-

tween the two cam tracks **52** and **54.** A coupling means **51** comprises gear **48** in engagement with gear **57.**

Second enclosure **30** comprises a cup-shaped housing **58** and a cover **60.** Second enclosure **30** includes a ratio of thickness-to-perimeter distance of from 1/20 to 1/40 wherein the thickness is taken in a direction substantially parallel to the longitudinal axis of output shaft **38,** and the perimeter is measured around the second enclosure in a plane substantially perpendicular to the longitudinal axis of the output shaft **38.** The cup-shaped housing **58** includes a first set of substantially narrow slots **62** disposed in a wall **59** of the cup-shaped housing as shown in FIG. **2.** A second set of substantially narrow slots **64** is shown disposed in an alternate location in wall **59** in FIG. **3.** Each set of slots **62** and **64** contains a plurality of slots, and the sets are located one on either side of a line through the centers of primary cam member **40** and secondary cam member **50.**

Second electrical switching means **28** includes a plurality of contact-carrying blades **66** and **68** which are inserted in one of the sets of slots **62** and **64** shown in the embodiment illustrated in FIGS. **2** and **3.** Cam follower tips **67** and **69** are disposed on the distal ends of blades **66** and **68** respectively. Electrical contacts **63** appear on blades **66** and **68** also. Cover **60** of second enclosure **30** entraps the plurality of contact-carrying blades **66** and **68** in one of the sets of slots **62** and **64.**

Second electrical switching means **29** includes a long set **70** and a short set **72** of contact-carrying blades, each set being inserted in one of the sets of slots **62** and **64** in the embodiment shown in FIGS. **4** and **5.** The long set **70** is responsive to primary cam member **40,** and the short set **72** is responsive to secondary cam member **50.** Cam follower tips **74** and **76** are disposed on the distal ends of two of the long set of contact-carrying blades **70,** and cam follower tips **78** and **80** are disposed on the distal ends of two of the short set of contact-carrying blades **72.** A first set of contacts **71** is carried by the long set of contact-carrying blades **70,** and a second set of contacts **73** is carried by the short set of contact-carrying blades **72.** Cover **60** of second enclosure **30** entraps the long set and short set of contact-carrying blades **70** and **72** in the sets of slots **62** and **64.**

In the embodiment shown in FIGS. **4** and **5,** the set of slots **62** is located on one side of a line A-B through the centers of primary cam member **40** and secondary cam member **50,** and set of slots **64** is located on the other side of line A-B.

A contact spacing means **82** comprises a slider **84** freely translatable along one of a plurality of slider guides **86** which are disposed on the inside of cup-shaped housing **58.** Slider **84** includes lugs **88** and **90** which engage the long set of contact-carrying blades **70.** Slider **92** includes lugs **94** and **96** which engage the short set of contact-carrying blades **72.** The long and short sets of contact-carrying blades **70** and **72** restrain sliders **84** and **92** each in contact with a slider guide **86.**

In operation, motor **10** causes output shaft **38** to rotate. Pinion **35** turns drive gear **37,** and first cam means **22,** carried on cam-carrying shaft **39,** is therefore rotated. Also rotated by output shaft **38** is second cam means **26** and **27.**

In the embodiment of the invention shown in FIGS. **2** and **3,** second cam means **26** comprises a primary cam member **32.** As primary cam member **32** rotates past cam follower tips **69** and **67** respectively, contacts **63** make and break according to profiles on cam tracks **34** and **36.**

In the embodiment of the invention shown in FIGS. **4** and **5,** second cam means **27** comprises primary cam member **40** and secondary cam member **50.** As primary cam member **40** rotates past cam follower tips **74** and **76,** the long set of contact-carrying blades **70** respond to the profiles of cam tracks **42** and **44** causing electrical contacts **71** to open and close.

Gear **48** drives gear **57** on secondary cam member **50.** This causes cam tracks **52** and **54** to rotate past the cam follower tips **78** and **80.** The short set of contact-carrying blades **72** respond to the profiles of cam tracks **52** and **54** causing electrical contacts **73** to open and close.

Lugs **88** and **90** on slide **84** engage two of the long set of contact-carrying blades **70** to partially space contacts **71** apart during their opening and closing. Lugs **94** and **96** on slider **92** engage two of the short set of contact-carrying blades **72** to partially space contacts **73** apart during their opening and closing.

What is claimed is:

1. In combination, a motor, a first timing means, and a substantially-thin second timing means, one of said motor, first timing means and substantially thin second timing means sandwiched in between the other two, and an attachment means wherein:

a. said motor includes an output shaft extending into said substantially-thin second timing means and said first timing means;

b. said first timing means comprises a first cam means, a first electrical switching means responsive to said first cam means, a first enclosure substantially enveloping both of said first cam means and said first electrical switching means;

c. said substantially-thin second timing means comprises a second cam means, a second switching means responsive to said second cam means, and a second enclosure substantially enveloping both of said second cam means and said second electrical switching means;

d. said attachment means includes a motor attachment means coupling said motor to one of said first and second enclosures and a timer attachment means for coupling said first enclosure to said second enclosure; and

e. said enclosure includes a ratio of thickness-to-perimeter distance of from 1/40 to 1/20, wherein said thickness is taken in a direction substantially parallel to a longitudinal axis of said output shaft, and said perimeter is measured around said second enclosure in a plane substantially perpendicular to said longitudinal axis of said output shaft.

2. The combination according to claim **1** wherein said substantially-thin second timing means is sandwiched in between said motor and said first timing means.

3. The combination according to claim **2** wherein said motor attachment means comprises a plurality of hollow rivets inserted through a plurality of holes in said second enclosure and through a matching plurality of holes in said motor, said rivets headed, thereby securing said second enclosure to said motor.

4. The combination according to claim 3 wherein said timer attachment means comprises a plurality of screws each with a head and shank, the shanks of which are inserted through said hollow headed-over rivets and threaded into said first enclosure, thereby securing said first timing means to said motor and said substantially thin second timing means.

5. The combination according to claim 1 wherein said second cam means in said substantially-thin second timing means comprises one primary cam member.

6. The combination according to claim 5 wherein said primary cam member includes two substantially concentric primary cam tracks.

7. The combination according to claim 6 wherein said primary cam member is substantially concentric with and carried by said output shaft of said motor.

8. The combination according to claim 1 wherein said second enclosure is comprised of a cup-shaped housing and a cover closing said cup-shaped housing.

9. The combination according to claim 8 wherein a wall of said cup-shaped housing includes a plurality of substantially narrow slots.

10. The combination according to claim 9 wherein said substantially narrow slots are grouped in a first and second set of slots in one of said walls, each set having a plurality of slots.

11. The combination according to claim 10 wherein said second switching means includes a plurality of contact-carrying blades disposed in one of said first and second sets of slots in said cup-shaped housing.

12. The combination according to claim 11 wherein said cover entraps said plurality of contact-carrying blades in said first and second sets of slots of said second housing.

13. The combination according to claim 11 wherein at least one of said contact-carrying blades includes a cam follower tip disposed on the distal end thereof, said follower tip engaging said second cam means.

14. The combination according to claim 13 wherein said second cam means comprises a primary cam member including two cam tracks each of which is engaged by one of said cam follower tips.

15. The combination according to claim 1 wherein said second switching means includes a plurality of contact-carrying blades and a contact spacing means maintaining two of said contact-carrying blades in spaced relation to each other.

16. The combination according to claim 15 wherein said contact spacing means includes at least one slider freely translatable along one of a plurality of slider guides.

17. The combination according to claim 16 wherein said plurality of contact-carrying blades restrain said slider in contact with one of said slider guides.

18. The combination according to claim 1 wherein said second cam means in said substantially-thin second timing means comprises a primary cam member and a secondary cam member, wherein said primary cam is carried on said output shaft, and said secondary cam is carried on a second shaft rotatably journaled in said second enclosure.

19. The combination according to claim 18 wherein each of said primary and secondary cam members includes two substantially concentric cam tracks and a gear.

20. The combination according to claim 19 wherein each of said primary and secondary cam members includes a cam track separation means.

21. The combination according to claim 20 wherein said cam track separation means comprises said gear.

22. The combination according to claim 19 wherein said secondary cam member is rotatably coupled to said primary cam member by a coupling means.

23. The combination according to claim 22 wherein said coupling means comprises said gears of said primary cam member and said secondary cam member in engagement.

24. The combination according to claim 10 wherein said substantially-thin second cam means comprises a primary cam member and a secondary cam member and wherein said electrical switching means includes a long set and a short set of contact-carrying blades, each set disposed in one of said first and said second sets of slots, said short set responsive to said secondary cam member and said long set responsive to said primary cam member.

25. The combination according to claim 24 wherein said cover entraps said plurality of contact-carrying blades in said first and second sets of slots of said cup-shaped housing.

26. The combination according to claim 24 wherein one of said long and short sets of contact-carrying blades is located on one side of a line through the centers of said primary and secondary cam members, and the remaining one of said long and short sets of contact-carrying blades is located on the other side of said line.

27. In combination, a motor, a first timing means, and a substantially-thin second timing means, one of said motor, first timing means and substantially thin second timing means sandwiched in between the other two, and an attachment means wherein:

a. said motor includes an output shaft extending into said substantially-thin second timing means and said first timing means;

b. said first timing means comprises a first cam means, a first electrical switching means responsive to said first cam means, a first enclosure substantially enveloping both of said first cam means and said first electrical switching means;

c. said substantially-thin second timing means comprises a second cam means, a second switching means responsive to said second cam means, and a second enclosure substantially enveloping both of said second cam means and said second electrical switching means, said second cam means comprising a primary cam member and a secondary cam member, wherein said primary cam is carried on said output shaft, and said secondary cam is carried on a second shaft rotatably journaled in said second enclosure; and

d. said attachment means includes a motor attachment means coupling said motor to one of said first and second enclosures and a timer attachment means for coupling said first enclosure to said second enclosure.

28. In combination, a motor, a first timing means, and a substantially thin second timing means sandwiched in between said motor and said first timing means, and an attachment means wherein:

a. said motor includes an output shaft extending into said substantially-thin second timing means and said first timing means;

b. said first timing means comprises a first cam means, a first electrical switching means responsive to said first cam means, a first enclosure substantially enveloping both of said first cam means and said first electrical switching means;

c. said substantially-thin second timing means comprises a second cam means, a second switching means responsive to said second cam means, and a second enclosure substantially enveloping both of said second cam means and said second electrical switching means; and

d. said attachment means includes a motor attachment means coupling said motor to one of said first and second enclosures and a timer attachment means for coupling said first enclosure to said second enclosure, said motor attachment means comprising a plurality of hollow rivets inserted through a plurality of holes in said second enclosure and through a matching plurality of holes in said motor, said rivets headed, thereby securing said second enclosure to said motor.

29. In combination, a motor, a first timing means, and a substantially-thin second timing means, one of said motor, first timing means and substantially thin second timing means sandwiched in between the other two, and an attachment means wherein:

a. said motor includes an output shaft extending into said substantially-thin second timing means and said first timing means;

b. said first timing means comprises a first cam means, a first electrical switching means responsive to said first cam means, a first enclosure substantially enveloping both of said first cam means and said first electrical switching means;

c. said substantially-thin second timing means comprises a second cam means, a second switching means responsive to said second cam means, and a second enclosure substantially enveloping both of said second cam means and said second electrical switching means;

d. said attachment means coupling said motor to one of said first and second enclosures and a timer attachment means for coupling said first enclosure to said second enclosure;

e. said second enclosure comprises a cup-shaped housing and a cover closing same, and substantially narrow slots disposed in a wall of said cup shaped housing grouped in first and second sets, each set having a plurality of slots; and wherein

f. said substantially-thin second cam means comprises a primary cam member and a secondary cam member and wherein said electrical switching means includes a long set and a short set of contact-carrying blades, each set disposed in one of said first and said second sets of slots, said short set responsive to said secondary cam member and said long set responsive to said primary cam member.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3824357 Dated July 16, 1974

Inventor(s) William R. Brown & Noel C. Mullikin

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 2, line 38, delete "are" and substitute therefore ---and---

Signed and sealed this 15th day of April 1975.

(SEAL)
Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents
and Trademarks

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
U.S GOVERNMENT PRINTING OFFICE : 869-930

UNITED STATES PATENT OFFICE
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