Aug. 4, 1970 A. L. GOOD 3,523,201

VACUUM OPERATED PIEZOELECTRIC IGNITION MEANS AND ACTUATOR THEREFOR

Filed Jan. 15, 1968 2 Sheets-Sheet 1

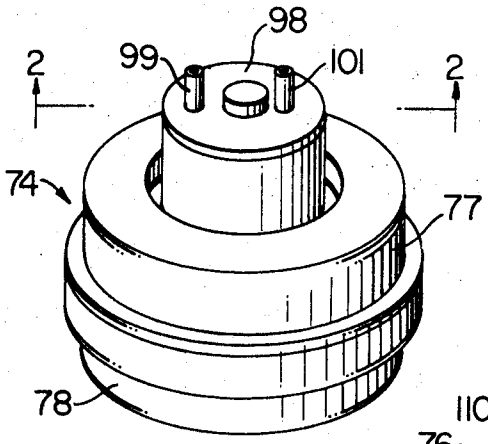

FIG. 1

FIG. 2

INVENTOR
ARTHUR L. GOOD

BY Cauder & Cauder

HIS ATTORNEYS

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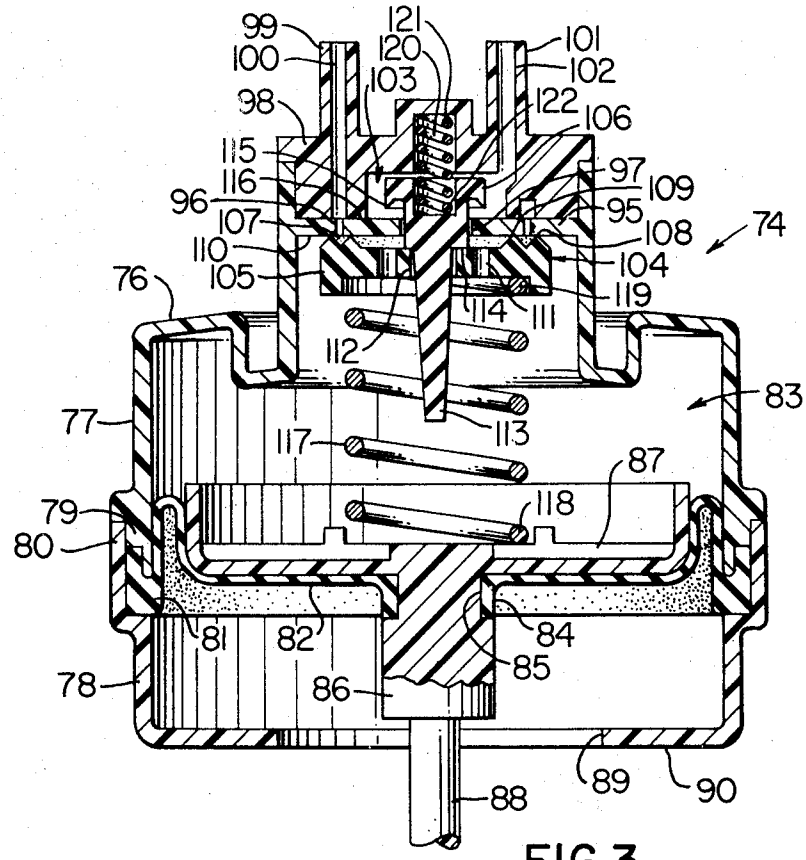

FIG. 3

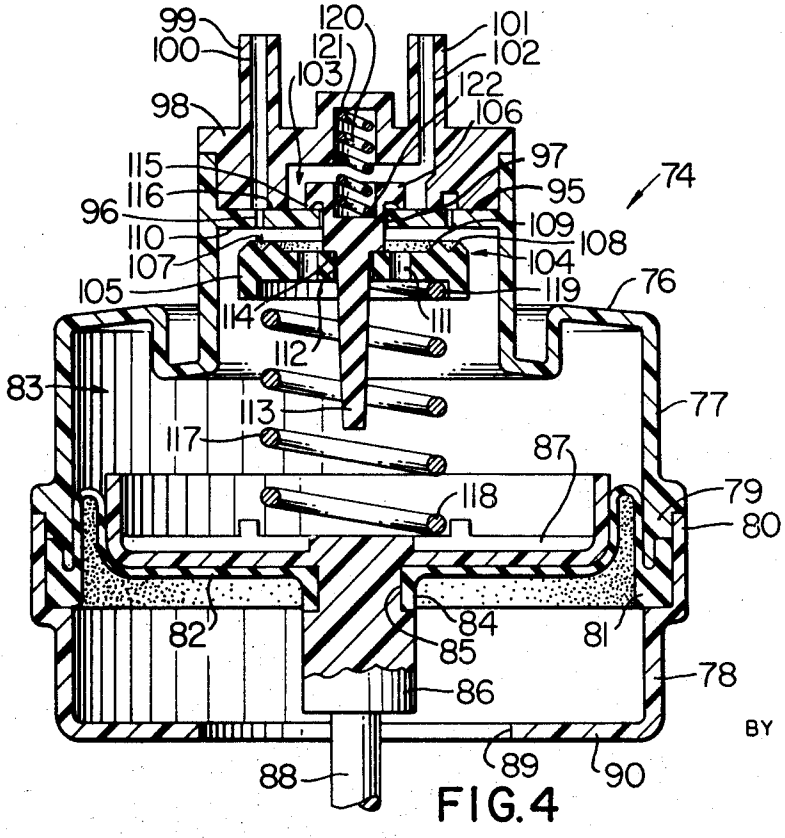

FIG. 4

INVENTOR
ARTHUR L. GOOD

BY Cauley & Cauley

HIS ATTORNEYS

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3,523,201

VACUUM OPERATED PIEZOELECTRIC IGNITION MEANS AND ACTUATOR THEREFOR

Arthur L. Good, Elkhart, Ind., assignor to Robertshaw Controls Company, Richmond, Va., a corporation of Delaware

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Int. Cl. H01v 7/00
U.S. Cl. 310—8.7 10 Claims

ABSTRACT OF THE DISCLOSURE

This disclosure relates to a vacuum operated ignition means for the pilot burner means of a cooking apparatus or the like, the ignition means including piezoelectric crystal means that have the stresses therein altered to cause sparking at the pilot burner means when the vacuum operated actautor of the ignition means is cycled between its actuated and deactuated positions. The vacuum operated actuator automatically cycles itself between its actuated and deactuated positions as long as a vacuum source is being interconnected thereto by a selector means.

This invention relates to a pneumatically operated ignition means for burner means of a cooking apparatus or the like as well as to an improved pneumatically operated actuator therefor or the like.

It is well known that many cooking apparatus of the fuel burning variety have individual pilot burner means for each main burner thereof whether the main burner is disposed in the oven or on top of the cooking apparatus, the pilot burners being continuously burning pilot burners and when adversely put out because of air current or the like, the same must be reignited by the housewife or the like utilizing matches and the like.

However, according to the teachings of the invention set forth in the copending patent application, Ser. No. 670,307, filed Sept. 25, 1967, and assigned to the same assignee to whom this application is assigned, ignition means are provided for such pilot burner means wherein the housewife or the like can initiate the actuation of the ignition means completely remote from the pilot burner means while igniting the pilot burner means in a simple and effective manner.

In particular, the ignition means of the afore-mentioned copending patent application includes piezoelectric crystal means that when actuated by the housewife or the like will have the stresses therein altered in such a manner that the same will cause sparking at the pilot burner means to ignite the same.

One feature of this invention is to provide improved means for causing the altering of the stresses in such crystal means or the like by utilizing a pneumatically operated actuator means.

In particular, the pneumatically operated actuator means of this invention is so constructed and arranged in a manner hereinafter illustrated and described that the same is adapted to automatically cycle itself between its deactuated position and its actuated position as long as the housewife or the like directs a pneumatic source to the actuator so that the cycling actuator will continuously cause the altering of stresses in the piezoelectric crystal means for the ignition sparking at the pilot burner means.

Accordingly, it is an object of this invention to provide an improved ignition means for a cooking apparatus or the like, the ignition means of this invention having one or more of the novel features set forth above or hereinafter shown or described.

Another object of this invention is to provide an improved pneumatically operated actuator for such an ignition means or the like.

Other objects, uses and advantages of this invention are apparent from a reading of this description which proceeds with reference to the accompanying drawings forming a part thereof and wherein:

FIG. 1 is a perspective view of the improved pneumatically operated actuator means of this invention.

FIG. 2 is an enlarged, schematic, cross-sectional view taken substantially on line 2—2 of FIG. 1 and illustrates the actuator of this invention for actuating a piezoelectric crystal ignition means for a cooking apparatus or the like.

FIG. 3 is a fragmentary view similar to FIG. 2 and illustrates the actuator as the actuator is ending its deactuated stroke.

FIG. 4 is a view similar to FIG. 3 and illustrates the actuator as the same is beginning its actuated stroke.

While the various features of this invention are hereinafter described and illustrated as being particularly adaptable for providing ignition means for a cooking apparatus, it is to be understood that the various features of this invention can be utilized singly or in any combination thereof to provide ignition means and/or actuator means for other apparatus as desired.

Therefore, this invention is not to be limited to only the embodiment illustrated in the drawings, because the drawings are merely utilized to illustrate one of the wide variety of uses of this invention.

Referring now to FIG. 2, a cooking apparatus is generally indicated by the reference numeral **10** and has an oven chamber **11** provided with a broil burner **12** and a bake burner **13** illustrated in FIG. 2 as being in tubular form.

The cooking apparatus **10** includes a plurality of top burner means with only two top burner means **15** and **16** being illustrated schematically in FIG. 2.

Individual pilot burner means are provided for the main burners of the cooking apparatus **10** and the broil pilot burner is generally indicated by the reference numeral **19**, the bake pilot burner by the reference numeral **20** and the top pilot burners are generally indicated by the reference numerals **21** and **22** for the respective top burners **15** and **16**. The pilot burners **19, 20, 21** and **22** are illustrated schematically in FIG. 2 and are so constructed and arranged that the same are adapted to ignite fuel issuing from the respective main burner means **12, 13, 15** and **16** as long as the respective pilot burners are burning.

However, should one or more of the pilot burners of the cooking apparatus **10** be extinguished for any reason, spark igniting means of this invention is provided for the apparatus **10** and is generally indicated by the reference numeral **25** in FIG. 2 and will now be described.

The spark igniting means **25** comprises a support or frame member **26** suitably mounted to the frame structure **27** of the cooking apparatus **10** so that a manual actuator means **28** of the igniter means **25** will be exposed in any suitable location on the apparatus **10**, the embodiment of the igniter means **25** illustrated in FIG. 2 having the manual actuator means **28** located on the conventional control panel means of the apparatus **10**.

The support frame **26** has one or more piezoelectric crystal elements carried therein between the opposed ends **30** and **31** thereof with such crystal means being disposed in a recess or cutout **32** of the support frame **26**. In the embodiment of the igniter means **25** illustrated in FIG. **2**, two such piezoelectric crystal elements **33** and **34** are being utilized.

The crystal elements **33** and **34** are disposed in longitudinal stacked and aligned relation with the element **33** having electrical terminal means **35** and **36** at the

opposed ends thereof and the crystal element **34** having electrical terminal means **37** and **38** at the opposed ends thereof. An electrical insulator **39** is disposed between the terminal means **36** and **37** of the crystal elements **33** and **34** to effectively electrically insulate the elements **33** and **34** from each other while electrical insulating means **40** and **41** respectively electrically insulate the other ends of the crystal elements **33** and **34** from the support frame **26** whereby the crystal elements **33** and **34** are not only electrically insulated from each other, but are also electrically insulated from the support frame **26** and, thus, from the frame means **27** of cooking apparatus **10**. If desired, ceramic pressure pads or elements **42** and **43** can be respectively disposed between the insulators **40** and **41** and the respective terminal means **35** and **38** as illustrated.

A rocker arm **44** is pivotally or rotatably carried by the support frame **26** and is adapted to rotate relative thereto about a transversely movable axis of rotation generally indicated by the reference numeral **45**, the rocker arm **44** carrying a cam member **46** at the rotatably mounted end **47** thereof to be disposed between the insulator **40** and a flat surface **48** of the support frame **26** at the end **30** thereof to also rotate in unison the rocker arm **44** about the movable axis **45**. The cam member **46** has a flat surface **49** cooperating with the flat surface **48** of the support frame **26** and a true, partial circular surface **50** cooperating with an adjacent flat surface **51** of the insulator **40** whereby when the cam member **46** is disposed in a position having the flat surface **49** disposed against the flat surface **48** of the frame **26**, the elements **40, 42, 33, 39, 34, 43** and **41** are disposed in stacked relation between the opposed ends **30** and **31** of the support frame **26** and will not alter the stresses in the crystal elements **33** and **34** to generate a potential difference at the respective terminal means **35, 36** and **37, 38** until the cam element **46** is rotated about the axis **45** to either axially squeeze the elements **33** and **34** between the opposed ends thereof or relieve such squeezing action.

In particular, when the rocker arm **44** is rotated in a counterclockwise direction in a manner hereinafter described, the cam element **46** will rotate about its axis **45** in a counterclockwise direction so that the corner **52**, formed by the juncture of the flat surface **49** thereof and the circular surface **50** thereof, will bear against the flat surface **48** of the support frame **26** and cause the axis **45** to move upwardly and to the right in FIG. 2 to increase the effective length of the cam member **46** between the surface **48** of the support frame **26** and the surface **51** of the insulator **40** to impose a substantially longitudinal compressive and squeezing action on the elements **33** and **34** between the ends **30** and **31** of the support frame **26** so that the stresses in the crystals **33** and **34** are sufficiently altered to cause the same to create a potential difference at the respective pairs of terminals **35, 36** and **37, 38** to be utilized in a manner hereinafter described. When such compression or squeezing action on the crystal means **33** and **34** are subsequently relieved by the rocker arm **44** moving in clockwise direction in FIG. 2 to place the flat surface **49** of the cam **46** against the flat surface **48** of the frame **26**, the cam member **46** will effectively decrease the effective cam length of the cam member **46** between the surfaces **48** and **51** to thereby again alter the stresses in the crystal elements **33** and **34** as the same longitudinally expand from their previous squeezed condition to also generate a potential difference at the respective pairs of terminals **35, 36** and **37, 38**.

During such rotation of the cam element **46**, the stack of elements **40, 42, 33, 39, 34, 43** and **41** tends to rock as a unit to the right as the cam element **46** is rotated in a counterclockwise direction and tends to rock to the left when the cam element **46** is rotated in a clockwise direction back to the non-squeezing position whereby the insulator **41** can be provided with an arcuate surface **53** that bears against a flat surface **54** of the support frame **26** to permit such rocking of the stack of elements between the opposed ends **30** and **31** of the support frame **26**.

A first pair of electrodes **55** and **56** are mounted to the frame means **27** of the apparatus **10** adjacent the respective pilot burners **21** and **22** and in spaced relation from the pilot burners **21** and **22** so as to define spark gaps **57** and **58** adjacent the fuel outlet means **59** and **60** of the pilot burners **21** and **22**. The electrodes **55** and **56** are electrically insulated from the frame means **27** of the apparatus **10** and are electrically interconnected to the teminals **35** and **36** by suitable leads **61** and **62**.

Similarly, another pair of electrodes **63** and **64** are carried by the apparatus **10** and are disposed in spaced relation from the pilot burners **19** and **20** to define spark gaps **65** and **66** adjacent the fuel outlet ends **67** and **68** of the respective pilot burner means **19** and **20**. The electrodes **63** and **64** are also electrically insulated from the frame means **27** of the apparatus **10** and are respectively interconnected to the terminal means **37** and **38** by leads **69** and **70**.

The pilot burner means **21, 22, 19** and **20** are electrically conductive and are, in effect, connected to a ground potential by being electrically interconnected to the frame means **27** of the apparatus **10** and such ground potential of the pilot burners is generally indicated by the reference numerals **71** and **72** in FIG. 2, the frame means **27** of the apparatus **10** being effectively grounded through interconnection thereof to the gas supply lines and the like and also by conventional grounding means.

In this manner, it can be seen that the pilot burner means **21** and **22** respectively provide ground electrodes cooperating with the electrodes **55** and **56** to define the spark gaps **57** and **58**. Similarly, the pilot burners **19** and **20** provide ground electrodes for cooperating with the electrodes **63** and **64** to provide the spark gaps **65** and **66**.

The operation of the igniting means **25** for the apparatus **10** will now be described.

When the housewife or the like notices that one of the burner means **12, 13, 15, 16, 17** or **18** does not ignite when she turns on one of the main selector knobs of the apparatus **10**, or when she actually notices that one of the pilot burner means **19, 20, 21** and **22** are not burning, she can merely turn on the manual actuator means **28** to effect rocking of the cam member **46** of the igniter means **25** whereby the stresses in each crystal element **33** and **34** will be altered in the manner previously described so that one potential will be created at the electrodes **55** and **63** and an equal and opposite potential will be created at the electrodes **56** and **64**. When the differences in potential between the electrodes **55, 56, 63** and **64** and their respective grounded electrodes **21, 22, 19** and **20** reaches a particular magnitude, electrical arcing will be created across the spark gaps **57, 58, 65** and **66** in substantially a simultaneous manner whereby such electrical sparking will ignite the fuel issuing from any unlit pilot burner means **21, 22, 19** or **20**.

Continued operation of the manual actuator means **28** will effect a continuous cycling movement of the rocker arm **44** to first provide a squeezing action on the elements **33** and **34** to produce the above-described sparking one or more times depending upon the length of counterclockwise movement of the rocker arm **44** and then provide a relieving of the compression force on the elements **33** and **34** by the subsequent clockwise movement of the rocker arm **44** that also alters the stresses in the crystals **33** and **34** to effect sparking at the spark gaps **57, 58, 65** and **66**.

This continuous cycling movement of the rocker arm **44** in its counterclockwise and clockwise directions to cause the aforementioned sparking at the spark gaps **57, 58, 63** and **66** is produced as long as the housewife or the like causes the manual actuator means **28** to interconnect a pneumatic source **73** to a pneumatically operated actuator means **74** of this invention, the manual actuator

means **28** being illustrated in FIG. 2 as a valve member disposed in a conduit means **75** leading from the pneumatic source **73** to the actuator **74** and the source **73** comprising a vacuum pump.

The pneumatically operated actuator means **74** of this invention comprises a housing means **76** formed by two cup-shaped housing members **77** and **78** snap fitted together at their open ends **79** and **80** to not only secure the housing members **77** and **78** together but also to sealing trap and secure an outer peripheral edge means **81** of a flexible diaphragm **82** therebetween, the flexible diaphragm **82** cooperating with the cup-shaped housing member **76** to define a chamber **83** therebetween.

The flexible diaphragm **82** has its inner periphery **84** snap fitted into an annular recess **85** of an actuating post **86** that has an integral diaphragm backup plate means **87** on one end thereof inside the chamber **83** and an elongated stem part **88** at the other end thereof that projects through an opening means **89** in the end wall **90** of the cup-shaped housing member **78** to be pivotally interconnected to the right hand end **91** of the rocker arm **44**. For example, the end **91** of the rocker arm **44** can be received in a slot **92** at the free end of the stem **88** and be pivotally interconnected thereto by a pivot pin **93** carried by the stem **88** and passing through an elongated slot **94** in the end **91** of the rocker arm **44**.

The end wall **95** of the other cup-shaped housing member **77** is interrupted by a plurality of first passage means **96** disposed in a concentric manner about a second passage means **97** passing centrally through the end wall **95**, the passage means **96** and **97** respectively leading to the chamber **83** of the actuator **74**. An adaptor **98** is carried by the housing means **76** and is disposed in sealing relation against the exterior surface of the end wall **95** of the cup-shaped housing member **77** as illustrated in FIG. 2, the adaptor **98** having a first tubular nipple means **99** provided with a passage **100** that is disposed in fluid communication with the first passage means **96** and is adapted to be fluidly interconnected to the conduit means **75**, such as by having the conduit means **75** telescopically disposed over the nipple **99**. In this manner, the selector valve means **28** is disposed intermediate the pneumatic source **73** and the first passage means **96** of the actuator **74** for a purpose hereinafter described.

The adaptor **98** carries another tubular nipple means **101** having a passage **102** provided therein that defines a chamber **103** in fluid communication with the second passage means **97** of the actuator **74**. In this manner, the passage **102** can be interconnected to the atmosphere for a purpose hereinafter described by a suitable conduit means telescoped on the nipple **101** and carrying suitable filter means (not shown) to filter air that will enter into the chamber **83** from the passage means **102** in a manner hereinafter described.

The actuator **74** carries a valve means generally indicated by the reference numeral **104** for controlling the passage means **96** and **97**, the valve means **104** comprising a first valve part **105** for controlling the passage means **96** and a second valve part **106** for controlling the passage means **97**.

The valve part **105** is in substantially disc shape form and has an annular groove **107** therein which defines two annular valve seating surfaces **108** and **109** so constructed and arranged that when the same seat against the undersurface **110** of the end wall **95** of the housing member **77**, such groove **107** is in fluid communication with the first passage means **96** so as to completely close the passage means **96** from the chamber **83**. The first valve part **105** also has a plurality of opening means **111** passing therethrough inboard of the annular seating surface **109** and outboard of a central opening **112** passing therethrough and receiving a stem **113** projecting from the valve part **106** and extending through the central opening **97** in the end wall **95**. The stem **113** of the second valve part **106** also has a shoulder means **114** adapted to abut against the first valve part **105**.

The second valve part **106** of the valve means **104** has an annular seating surface **115** for seating against the external side **116** of the end wall **95** so as to close the passage means **97** from the chamber **83**.

A first compression spring means **117** is disposed in the chamber **83** and has one end **118** disposed against the backup plate **87** of the diaphragm **82** while the other end **119** thereof is disposed against the valve part **105** and tends to urge the valve part **105** toward its closed position. A second compression spring **120** is carried by the actuator **74** and has one end **121** abutting against the adaptor **98** and the other end **122** abutting the second valve part **106** to tend to cause the valve part **106** to close the passage means **97**.

The operation of the actuator means **74** of this invention for providing a continuous squeezing and relieving cycling action of the igniter means **25** will now be described.

Normally the valve means **28** is disposed in a position to prevent the vacuum source **73** from being interconnected to the passage **100** of the nipple **99** so that the actuator **74** is normally disposed in the position of FIG. 4 where the chamber **83** is at atmospheric condition and the diaphragm **82** and actuating post means **86** are in their outermost deactuated stroke position, such position of the actuator **74** being coordinated with the igniter means **25** to maintain the rocker arm **44** so that the cam member **46** has its flat surface **49** disposed flat against the flat end surface **48** of the support frame **26**.

However, when the housewife or the like desires to initiate an igniting cycle, the housewife or the like turns on the selector or manual actuator means **28** to a position thereof which will interconnect the vacuum source **73** with the nipple **99** of the actuator **74** and as long as the selector means **28** maintains such fluid communication, the actuator **74** will cause continuous cycling action of the rocker arm **44** as previously described.

In particular, with the vacuum source **73** now interconnected to the chamber **83** when the actuator **74** is in the position of FIG. 4, it can be seen that the compression spring **117** is in its extended condition so that the force of the compression spring **120** is sufficient to maintain the second valve part **106** in its closed position against the end wall **95** to prevent fluid communication of the chamber **83** with the atmosphere while the shoulder means **114** thereof maintains the first valve part **105** away from the end wall **95** to permit fluid communication between the passage means **96** and the chamber **83**. Thus, as the chamber **83** is being evacuated by the interconnected vacuum source **73**, the pressure differential across the diaphragm **82** causes the diaphragm **82** to be pulled upwardly in the manner illustrated in FIG. 2 to cause counterclockwise rotation of the rocker arm **44** for the previously described sqeezing action on the crystal means **33** and **34** for sparking at the spark gaps **57**, **58**, **65** and **66** in the manner previously described.

As the diaphragm **82** is being drawn upwardly by the continued evacuation of the chamber **83**, the compression spring **117** is being progressively compressed between the backup plate **87** and the valve part **105** that is maintained away from the end wall **95** by the combined effect of the compression spring **120** and the pressure differential acting on the valve part **106** that maintains the valve part **106** at its closed position.

However, when the diaphragm **82** reaches the position illustrated in FIG. 2, it can be seen that the backup plate **87** of the diaphragm **82** contacts the end of the stem **113** of the valve part **106** to cause the valve part **106** to move upwardly in unison therewith so that not only is the passage means **97** now opened by the upwardly moving diaphragm **82**, but also the valve part **105** can now move upwardly with the diaphragm **82** and seat against the end wall **95** to disconnect the vacuum source **73** from the chamber **83**.

At this time, the diaphragm and actuating post **86** have reached their predetermined actuated position and have caused the beginning of the deactuation cycle of the actuator **74**.

In particular, with the valve part **106** now in its open position in the manner illustrated in FIG. 3, atmosphere can return through the nipple means **101** into the chamber **83** and thereby permit the compression spring **117** to begin to move the diaphragm **82** and actuating post **86** from substantially the position illustrated in FIG. 2 toward the position illustrated in FIG. 3. During such downward movement of the diaphragm **82**, even though the force of the compression spring **117** is progressively decreasing, the valve part **106** is maintained in its opened position in opposition to the force of the compression spring **120** because of the pressure differential acting on the valve part **105** to maintain the same in its closed position against the end wall **95** because the vacuum source **73** is still in fluid communication with the annular groove **107** of the valve part **105**.

During such deactuation of the actuator **74**, it can be seen that the rocker arm **44** is now being moved in its clockwise direction to relieve the previously squeezed condition of the crystal means **33** and **34** to further cause sparking at the spark gaps **57**, **58**, **60**, **65** and **66** in the manner previously described.

When the diaphragm **82** and actuating post **86** reach their predetermined deactuated stoke position as illustrated in FIG. 4, the force of the compression spring **117** has so decreased that the force of the compression spring **120** can now overcome the combined force of the compression spring **117** and the pressure differential acting on the valve part **105** to move the same downwardly to the position illustrated in FIG. 4 whereby the valve part **106** will now close the passage means **97** so that the chamber **83** is no longer interconnected to the atmosphere and the vacuum source **73** will again be interconnected to the chamber **83** to begin an actuation stroke of the actuator **74**.

Therefore, it can be seen that as long as the vacuum source **73** is being interconnected to the nipple **99** of the actuator **74**, the actuator **74** will automatically cycle between its actuated position and deactuated position to cause rocking of the rocker arm **44** in a cycling manner so as to continuously create sparking at the spark gaps **57**, **58**, **65** and **66** to insure full ignition of the pilot burner means **19–22**.

While the selector or manual actuator **28** has been previously described as being a valve means that must be held in a certain position by the housewife to maintain continuous interconnection of the vacuum source **73** with the actuator **74**, it is to be understood that the selector means **28** could be a timer arrangement so that when the housewife or the like initiates an ignition cycle by manually actuating the actuator **28**, the actuator **28** will maintain full communication of the vacuum source **73** with the actuator **74** for a predetermined time period after the lapse of which the selector means **28** will automatically disconnect the vacuum source **73** from the actuator **74** until the selector means **28** is again actuated by the housewife or the like.

While the actuator **74** of this invention has been previously described and illustrated as actuating a particular piezoelectric crystal means **25** disclosed and claimed in the aforementioned copending patent application, it is to be understood that such actuator means **74** could be utilized to operate another type of pizoelectric crystal means for ignition purposes as well as operate other devices unrelated to ignition means.

Therefore, not only does this invention provide an improved pneumatically operated ignition means for a cooking apparatus or the like, but also this invention provides an improved pneumatically operated actuator means.

While the form of the invention now preferred has been disclosed as required by the statutes, other forms may be used, all coming within the scope of the claims which follow.

What is claimed is:

1. In combination, a vacuum operated actuator, a vacuum source, interconnection means for interconnecting said source to said actuator, and a piezoelectric crystal ignition means for burner means or the like, said actuator being operatively interconnected to said ignition means to alter the stresses therein at least during one of the actuation and deactuation strokes thereof, said actuator having means for automatically causing said vacuum source to actuate the same to a predetermined actuated stroke position and thereafter deactuating the same to a predetermined deactuated stroke position thereof in a continuous cycling manner as long as said source is interconnected to said actuator.

2. A combination as set forth in claim **1** wherein said interconnection means interconnecting said source to said actuator comprises a passage defining means having a selector valve means for selectively opening and closing said passage defining means.

3. A combination as set forth in claim **1** wherein said ignition means is of the squeeze-type whereby the stresses thereof are altered on both the actuation and deactuation strokes of said actuator.

4. A combination as set forth in claim **3** wherein said ignition means has a movable lever for causing the squeeze action thereof, said lever being interconnected to said actuator.

5. A combination as set forth in claim **1** wherein said actuator has a chamber therein defined in part by a movable wall of said actuator, said actuator having first passage means leading to said chamber and being interconnected to said source by said interconnection means, said actuator having second passage means leading to said chamber and being interconnected to the atmosphere, said automatic means of said actuator comprising valve means for controlling said first and second passage means.

6. A combination as set forth in claim **5** wherein said valve means comprises first and second valve parts respectively controlling said first and second pasage means.

7. A combination as set forth in claim **6** wherein a first spring means is disposed between said movable wall of said actuator and said first valve part to tend to urge said first valve part to close said first passage means.

8. A combination as set forth in claim **7** wherein a second spring means is carried by said actuator and tends to urge said second valve part to close said second passage means.

9. In combination, a pneumatically operated actuator, a pneumatic source, interconnection means for interconnecting said source to said actuator, a piezoelectric crystal ignition means for burner means or the like, said actuator being operatively interconnected to said ignition means to alter the stresses therein at least during one of the actuation and deactuation strokes thereof, said actuator having means for automatically causing said pneumatic source to actuate the same to a predetermined actuated stroke position and thereafter deactuating the same to a predetermined deactuated stroke position thereof in a continuous cycling manner as long as said source is interconnected to said actuator, said actuator having a chamber therein defined in part by a movable wall of said actuator, said actuator having first passage means leading to said chamber and being interconnected to said source by said interconnection means, said actuator having second passage means leading to said chamber and being interconnected to the atmosphere, said automatic means of said actuator comprising valve means for controlling said first and second passage means, said valve means comprising first and second valve parts respectively controlling said first and second passage means, a first spring means being disposed between said movable wall of said actuator and said

first valve part to tend to urge said first valve part to close said first passage means, and a second spring means being carried by said actuator and tending to urge said second valve part to close said second passage means, said pneumatic source being a vacuum source for imposing a vacuum in said chamber through said first passage means and moving said movable wall toward its predetermined actuated stroke position in opposition to said first spring means, said chamber when returning to atmospheric condition by said second passage means causing said first spring means to move said movable wall toward its predetermined deactuated stroke position.

10. In combination, a pneumatically operated actuator, a pneumatic source, interconnection means for interconnecting said source to said actuator, a piezoelectric crystal ignition means for burner means or the like, said actuator being operatively interconnected to said ignition means to alter the stresses therein at least during one of the actuation and deactuation strokes thereof, said actuator having means for automatically causing said pneumatic source to actuate the same to a predetermined actuated stroke position and thereafter deactuating the same to a predetermined deactuated stroke position thereof in a continuous cycling manner as long as said source is interconnected to said actuator, said actuator having a chamber therein defined in part by a movable wall of said actuator, said actuator having first passage means leading to said chamber and being interconnected to said source by said interconnection means, said actuator having second passage means leading to said chamber and being interconnected to the atmosphere, said automatic means of said actuator comprising valve means for controlling said first and second passage means, said valve means comprising first and second valve parts respectively controlling said first and second passage means, a first spring means being disposed between said movable wall of said actuator and said first valve part to tend to urge said first valve part to close said first passage means, and a second spring means being carried by said actuator and tending to urge said second valve part to close said second passage means, said spring means being so constructed and arranged that said second spring maintains said second valve part in its closed position until said movable wall reaches its predetermined actuated stroke position and engages and moves said second valve part to its open position in opposition to the force of said second spring means, said valve parts being operatively interconnected together so that when said second valve part is moved to its open position by said wall said first valve part can move to its closed position and will remain in its closed position until said wall moves to its predetermined deactuated stroke position where said spring means cause said first valve part to move to its open position and said second valve part to move to its closed position.

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MILTON O. HIRSHFIELD, Primary Examiner

M. O. BUDD, Assistant Examiner

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