Oct. 17, 1939. A. C. EVERETT 2,176,126

CONTAINER CLEANING DEVICE

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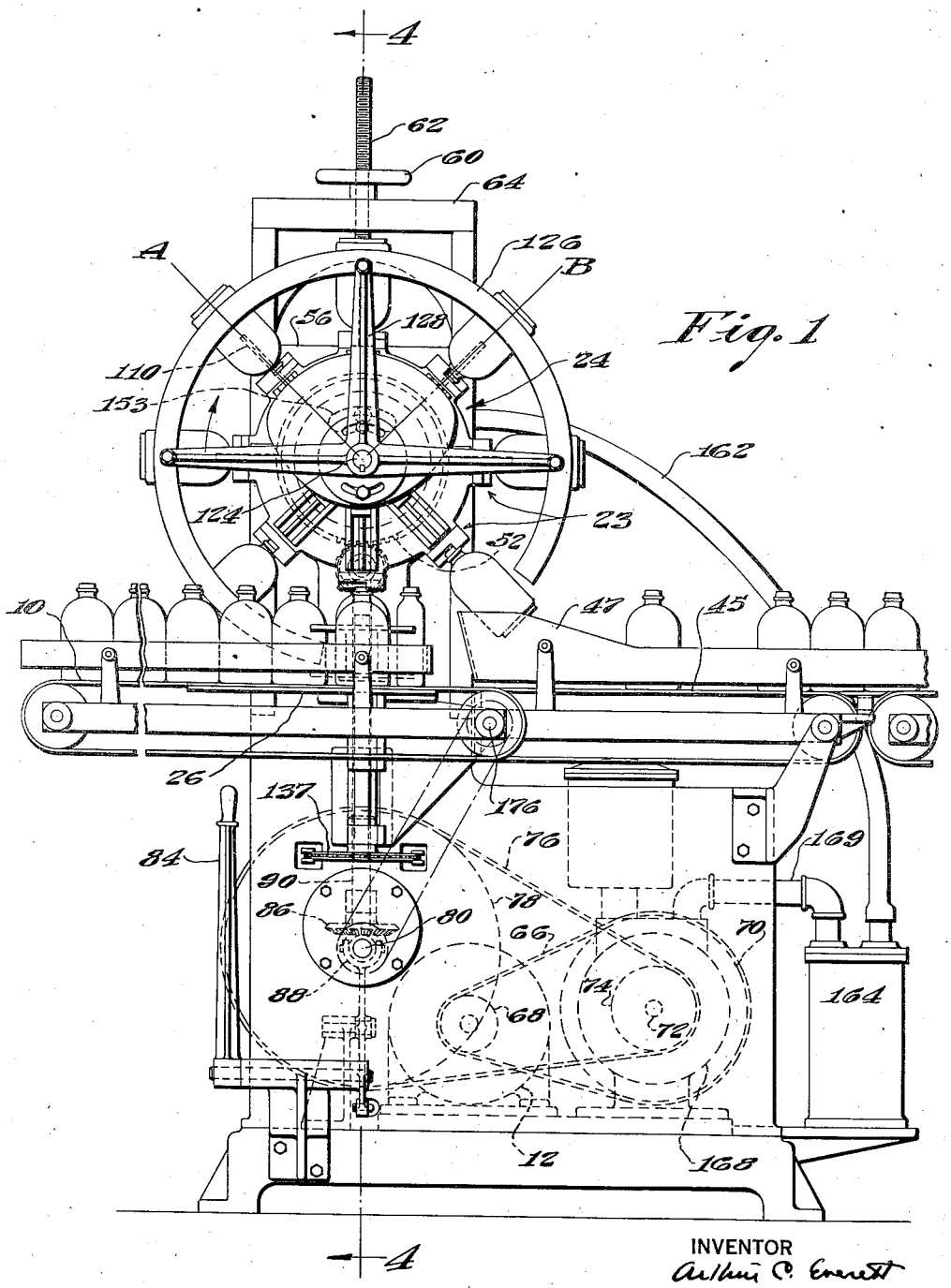


Fig. 1

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Fig. 2

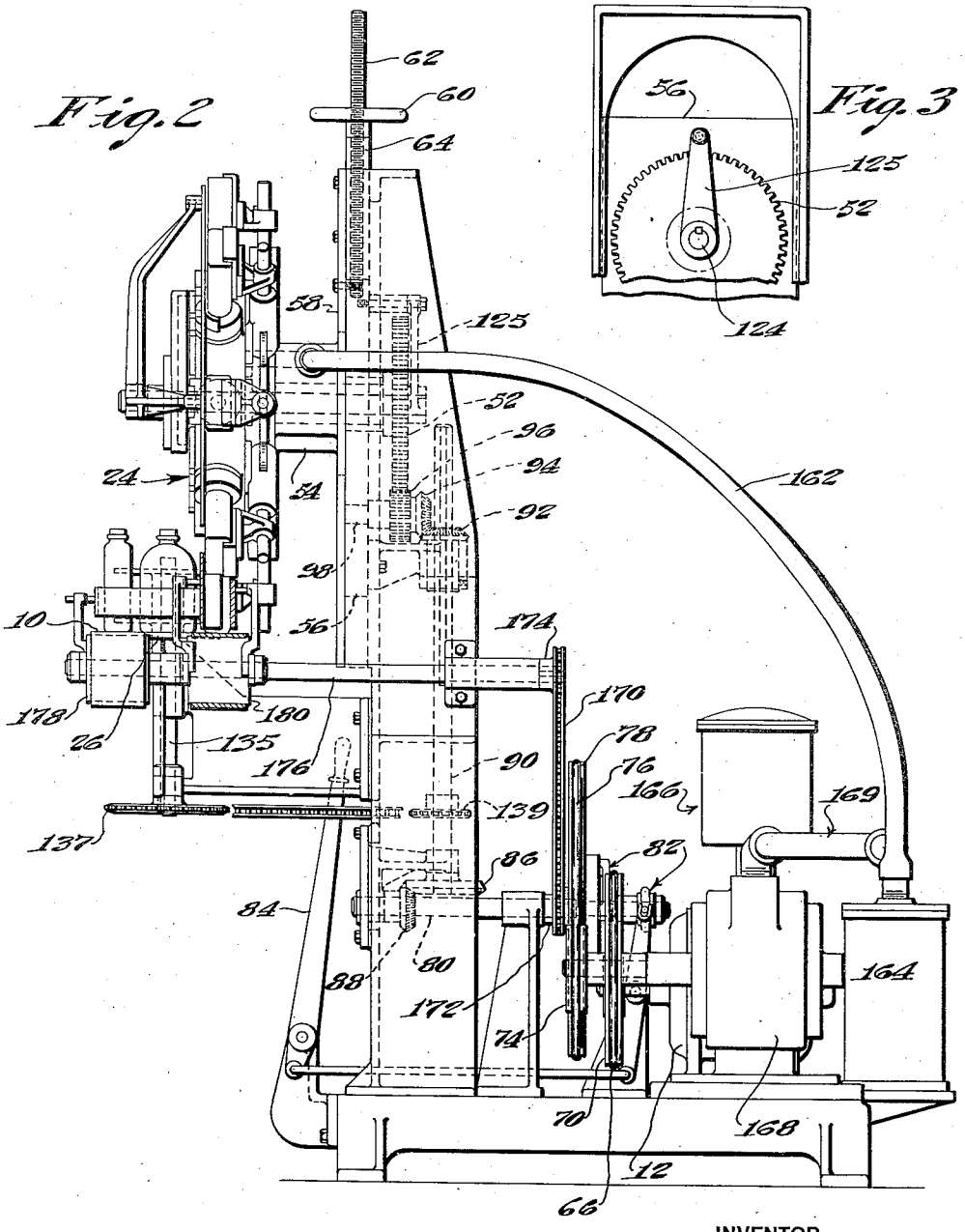


Fig. 3

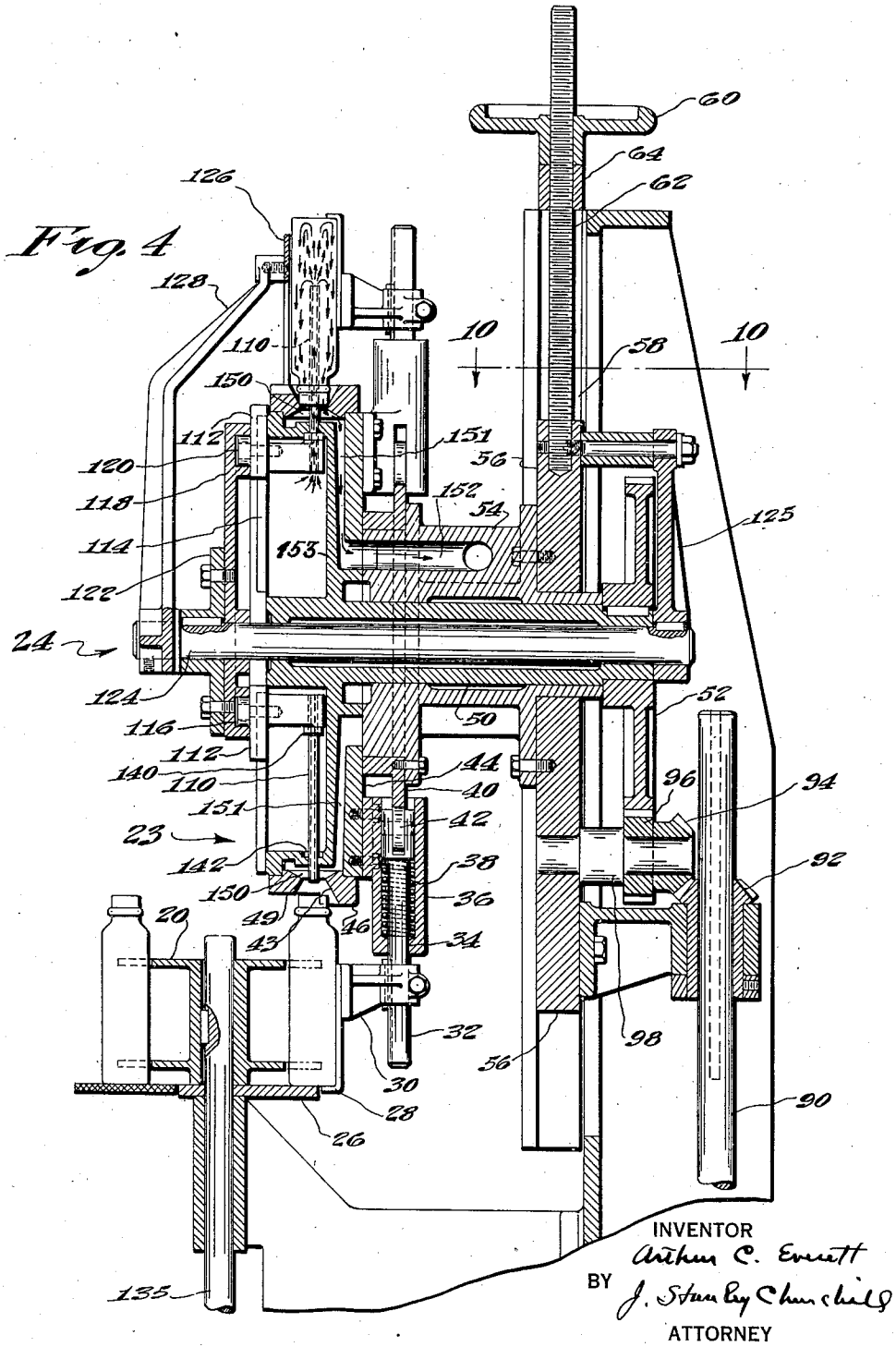
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Fig. 4



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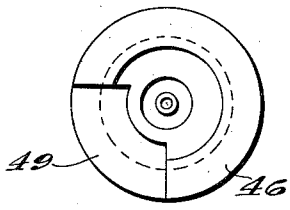


Fig. 6

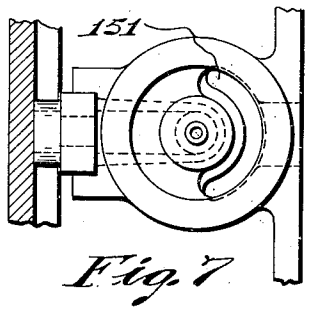


Fig. 7

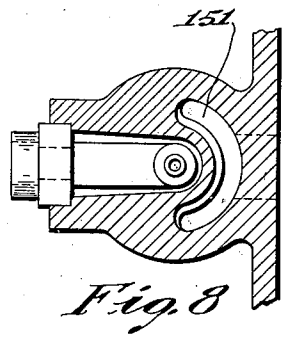


Fig. 8

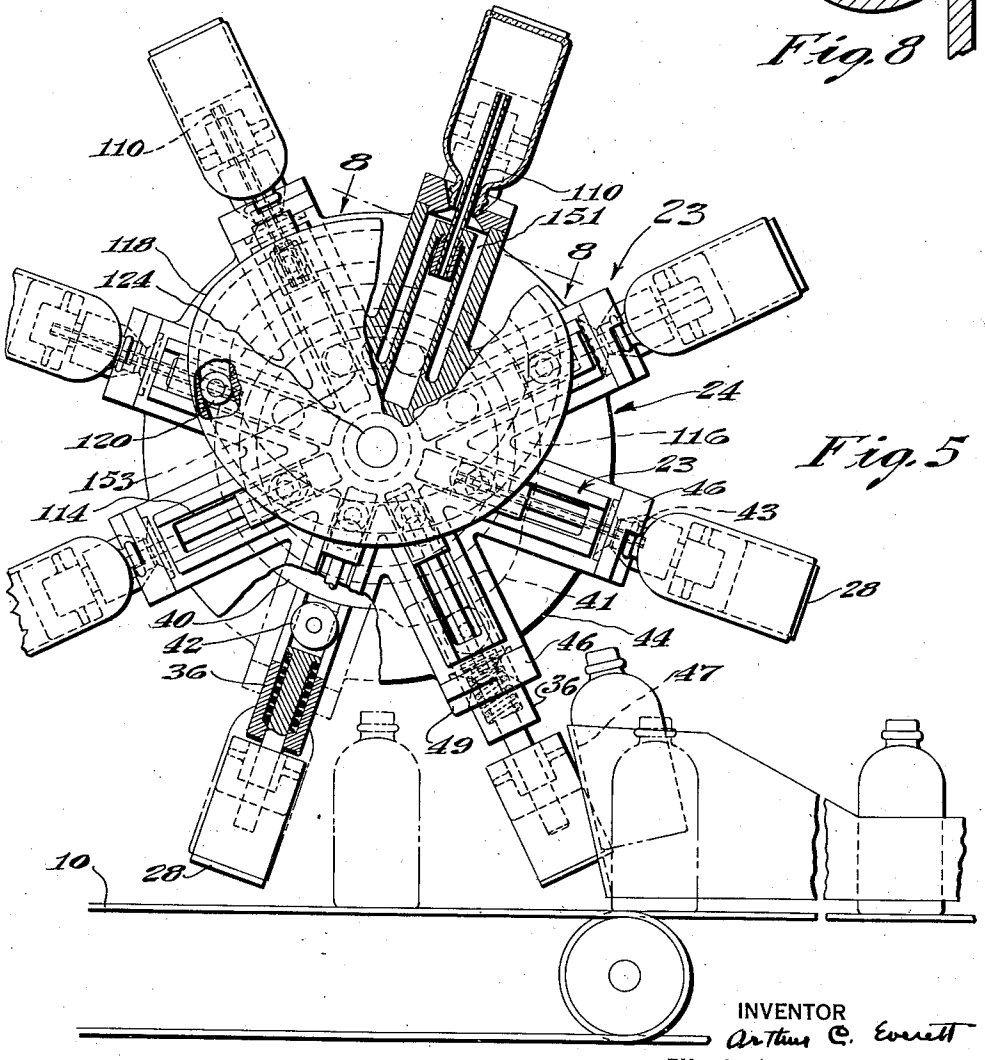


Fig. 5

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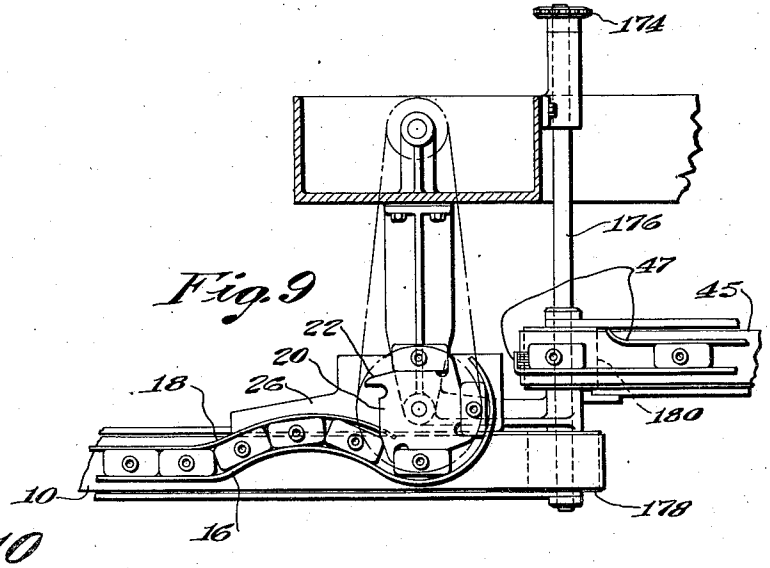
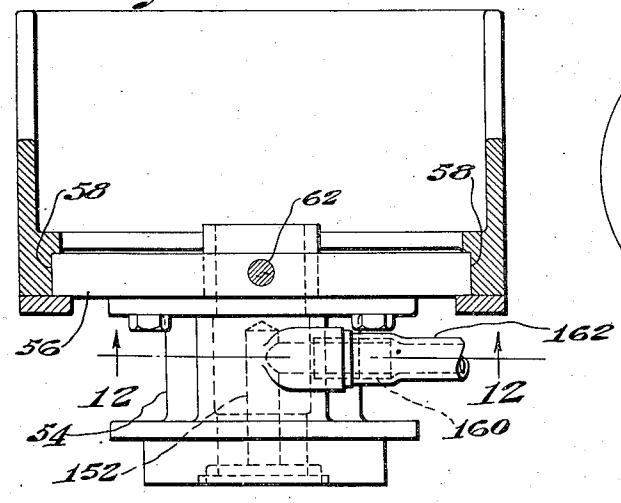


Fig. 9

Fig. 10



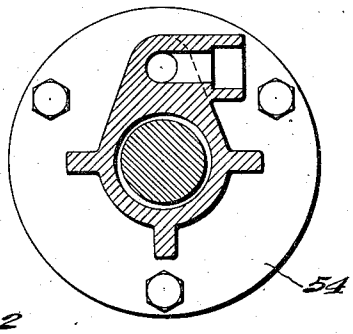


Fig. 12

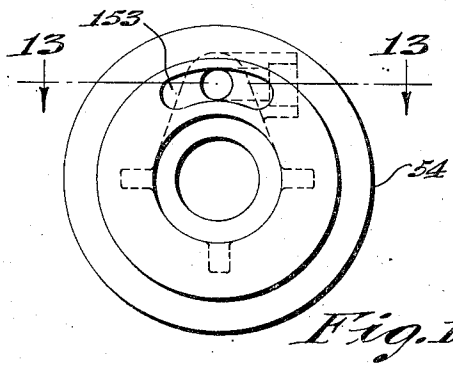


Fig. 11

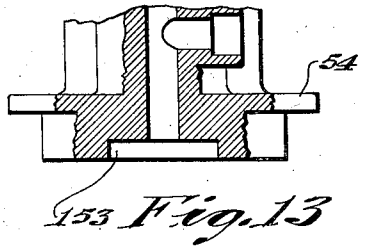


Fig. 13

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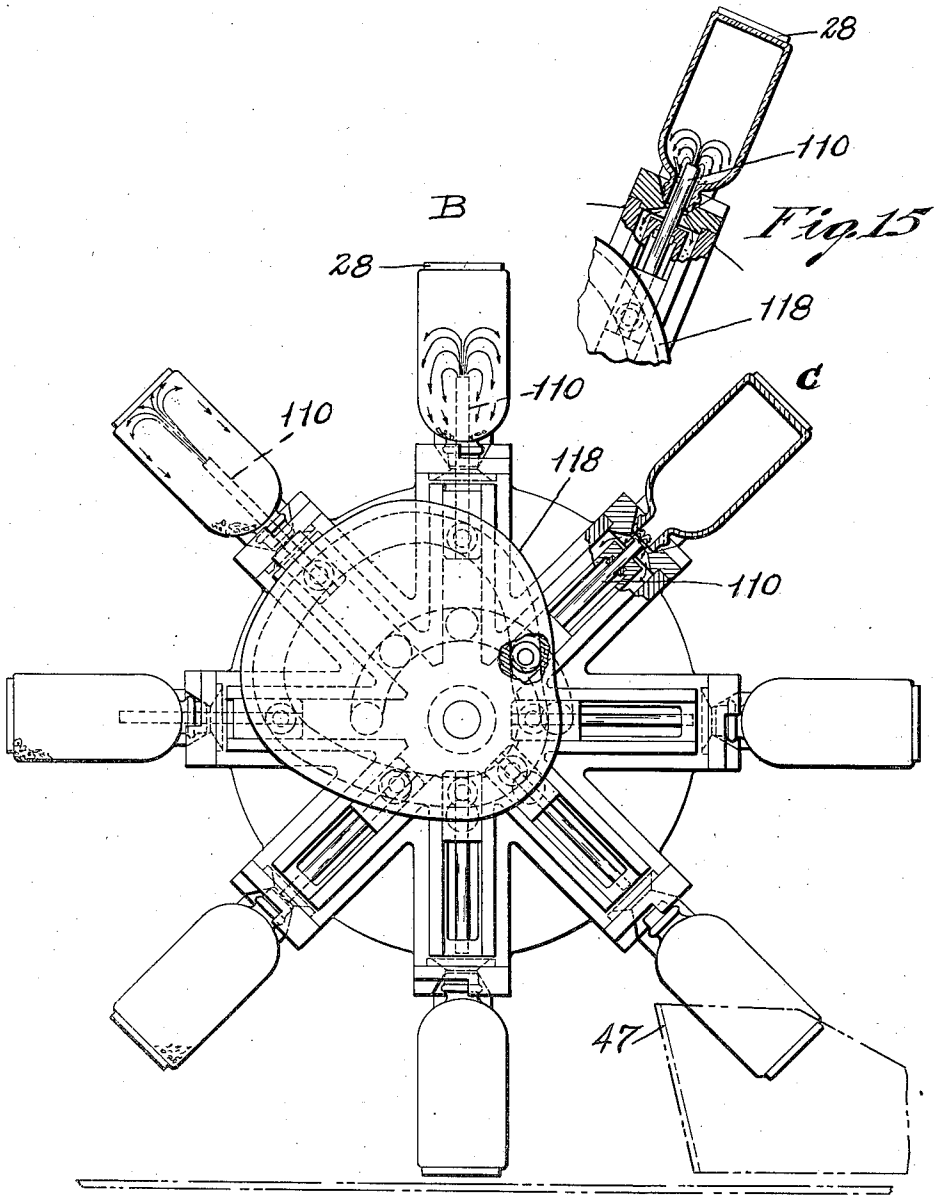


Fig. 14

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UNITED STATES PATENT OFFICE

2,176,126

CONTAINER CLEANING DEVICE

Arthur Clarence Everett, Boston, Mass., assignor to Pneumatic Scale Corporation, Limited, Quincy, Mass., a corporation of Massachusetts

Application February 11, 1935, Serial No. 5,974

11 Claims. (Cl. 15—14)

This invention relates to a receptacle cleaning machine and more particularly to a bottle cleaning machine.

One object of the invention is to provide a novel and improved machine for cleaning receptacles, and particularly bottles, by means of an air stream and with which the bottles may be cleaned in a superior, rapid, and economical manner.

A further and more specific object of the invention is to provide a novel and improved machine for cleaning receptacles and particularly bottles by an air stream which is caused to flow into the receptacle by suction created within the receptacle, and in which the cleaning operation may be performed in a commercially satisfactory manner with moderate amounts of suction.

With these general objects in view and such others as may hereinafter appear, the invention consists in the machine for cleaning receptacles and in the various structures, arrangements, and combination of parts hereinafter described and particularly defined in the claims at the end of this specification.

In the drawings illustrating the preferred embodiment of the invention, Fig. 1 is a front elevation of the machine; Fig. 2 is a side elevation of the machine viewed from the right in Fig. 1; Fig. 3 is a detail to be referred to; Fig. 4 is a vertical sectional view on the line 4—4 of Fig. 1; Fig. 5 is an enlarged detail with parts in section illustrating the rotary bottle supporting member; Fig. 6 is a detail in plan illustrating one of the sealing nozzles for sealing the mouth of the bottle; Fig. 7 is a detail illustrating in plan one of the radial bottle supporting arms with the sealing nozzle removed therefrom; Fig. 8 is a detail in section on the line 8—8 of Fig. 5; Fig. 9 is a detail in plan illustrating more or less diagrammatically the mechanism for feeding the bottles into the machine and the bottle discharge mechanism; Fig. 10 is a sectional detail on the line 10—10 of Fig. 4, with parts omitted; Fig. 11 is an end view of a portion of the machine shown in Fig. 10; Figs. 12 and 13 are details in section taken on the lines 12—12 and 13—13 of Figs. 10 and 11, respectively; and Figs. 14 and 15 are details in elevation with parts in section illustrating a modification of the invention.

In general, the present invention contemplates a machine for cleaning receptacles and in its preferred embodiment contemplates a machine for cleaning bottles by means of a stream or jet of air introduced into the receptacle or bottle while the latter is in an inverted position. The stream of air is preferably but not necessarily caused to flow into the receptacle or bottle by suction created therein and provision is preferably made for moving the receptacle or bottle from an upright to an inverted position, during which the pneumatic cleaning operation is caused to take place. In the preferred embodiment of the invention, the machine is provided with a rotatable bottle supporting member and provision is made for controlling the operation of the suction creating means to cause the cleaning operation to take place during that portion of the rotation of the bottle just before and after the bottle is passed through a vertical and inverted position.

Referring now to the drawings; in the illustrated machine a supply of bottles to be cleaned is fed into the machine by an incoming conveyor comprising a belt 10 driven, as will be described, from a motor 12.

Referring now to Fig. 9, the path of travel of the incoming bottles is controlled by suitable guide members or rails 16, 18, which, as illustrated in Fig. 9, are preferably curved to properly present successive bottles in a generally tangential direction with respect to a rotary toothed member 20. The latter is also driven, as will be described, through connections from the motor 12 and is provided with a plurality of teeth 22 arranged to engage the rear surface of successive bottles and to advance the bottles between the toothed member and the guide rail 16 to consecutively advance the bottles to a position immediately beneath one of the sealing nozzles 23 forming a part of the rotary bottle supporting member indicated generally at 24. During the movement of the bottles by the toothed member 20, the bottles are supported upon a supporting plate 26, and when each bottle arrives beneath its sealing nozzle 23, it is positioned as illustrated in Fig. 4 over a bottle elevating member 28 comprising an angular plate attached to a member 30 adjustably secured to a cam rod 32 having a bearing 34 within a housing 36 and arranged to slide vertically therethrough under the influence of a compression spring 38 interposed between a shoulder on the upper portion of the cam rod 32 and the bottom of the housing 36. The movements of the cam rod and bottle elevating member under the influence of the spring are controlled by an operating cam 40 which cooperates with a cam roll 42 mounted upon the upper end of the cam rod 32. The housing 36 within which each cam rod 32 is supported is bolted directly to the rear face of a circular disk 44 con-

stituting a portion of the rotary bottle supporting member 24 in which the several bottle sealing nozzles 23 are mounted, and as a result, during the rotation of the bottle supporting member 24, as will be described, the cam roll 42 enters a depression in the cam 40 and permits the spring 38 to elevate the bottle into a position in which the mouth of the bottle is received within the nozzle and sealed against a resilient sealing collar 46. The cam 40 is so designed as to retain the bottle in its bottle sealing position until after the cleaning operation has been performed and the bottle has been rotated through nearly 360° into a position in which it is discharged onto the discharge belt to be conveyed from the machine. During the operation of the machine, the relative movement of the continuously rotated member 20 and the continuously rotated bottle supporting member 24 is such that a bottle is advanced into alignment with each individual sealing nozzle 23. As will be seen, from an inspection of Figs. 4, 5, and 6, each sealing collar 46 is provided with a cut-out portion 49 through which the mouth of the bottle is permitted to pass while the sealing nozzle and the bottle are approaching alignment. When the bottle and the cooperating sealing nozzle reach a position in alignment with each other, as above described, and as shown in Fig. 4, the bottle is raised up into contact with the sealing collar 46 and during this time, the tapered walls 43 of the sealing collar act as a guide for the mouth of the bottle to register the latter in alignment with its air nozzle 110.

As above stated the rotatable bottle supporting member 24 includes the disk 44 and the latter is provided with a rearwardly extended sleeve 50 upon the end of which a gear 52 is keyed. The sleeve 50 is arranged to be rotated in bearings in a supporting piece 54 bolted to a slide member 56 arranged to slide vertically in suitable guideways 58 in uprights forming a part of the machine frame. The rotatable bottle supporting member is accordingly vertically adjustable to adapt the machine for operation upon bottles of varying heights. The position of the supporting piece 54 and parts carried thereby is adjustably regulated by a hand wheel 60 screwed upon a threaded shaft 62 secured to the slide 56. The shaft 62 is slidably extended through a cross-piece 64 forming a part of the machine frame, as illustrated in Figs. 1 and 4, and the hand wheel 60 is supported upon the cross-piece.

Provision is made for rotating the sleeve 50 to effect rotation of the rotatable bottle supporting member, and as herein shown the sleeve 50 is driven from the motor 12 through a driving belt 66 running over a driving pulley 68 on the motor shaft and over a large pulley 70 on a pump shaft 72. The cross shaft 72 has also mounted thereon a smaller pulley 74 which is connected by a belt 76 running over the same and over a large pulley 78 on a second cross shaft 80. The large pulley 78 on the second cross shaft is loosely mounted thereon and a clutch 82 of any usual or preferred construction herein shown as adapted to be operated by the handle 84, is utilized to connect the pulley 78 with the second cross shaft 80. The rotations of the cross shaft 80 are transmitted through cooperating bevelled gears 86, 88 to a vertical shaft 90 connected by bevelled gears 92, 94 to a pinion 96 on a stud 98 secured to the rear face of the slide 56 and arranged to mesh with the large gear 52 which, as above described, is keyed upon the end of the sleeve, as clearly illustrated in Fig. 4.

From the description thus far it will be observed that during the operation of the machine the disk 44 constituting a part of the bottle supporting mechanism 24 is continuously rotated so that after a bottle has been moved into a position to seal the mouth thereof by the elevating and clamping member 28, as above described, the bottle is continuously moved with the rotating disk 44 until the bottle reaches a point immediately above the discharge conveyor 45 where provision is made for effecting disengagement of the bottle from the bottle supporting member, permitting it to drop into the guideway formed by guides 47 and onto the outgoing belt 45. The clamping member 28 is caused to release its hold on the bottle by the raised portion 41 of the stationary cam 40 so that when the bottle reaches the angular guide 47, it will be disengaged from the clamp 28 and slide down onto the belt 45, as shown in Fig. 5.

Provision is made for pneumatically cleaning the interior of each bottle during the movement of the bottle as it is rotated by the bottle supporting member 24, and for this purpose the machine is provided with a series of air nozzles 110, one for each bottle sealing nozzle 23, and as herein shown, the air nozzles 110 comprise tubes open at both ends and secured at their upper ends in slide members 112 arranged to slide in radial guideways 114, being actuated by a cam path 116 in a stationary cam 118. Cam rollers 120 secured to the outer sides of the slides 112 are arranged to run in the cam path 116. The cam 118 itself is bolted to a flanged collar 122 keyed to a central stationary shaft 124, as illustrated in Fig. 4. The cam path in the cam 118 is so designed that the air tubes are withdrawn from the bottles when the bottles are in the lower half of the path of movement of the bottles during their rotation by and with the bottle supporting member 24, and are introduced into the bottles during the portion of the bottle movement between the lines A and B of Fig. 1. The machine is also provided with a fixed guide rail 126 secured upon the upper end of the arms 128 of a spider also mounted upon the end of the stationary shaft 124, and the guide rail 126 is cut away, as illustrated in Fig. 1, at a point where the bottle is to be discharged onto the discharge conveyor. The guide rail 126 cooperates with the clamping and bottle elevating members 28 to firmly support the bottles during their movement with the bottle supporting member. In order to hold the stationary shaft 124 from turning in its bearings, an arm 125 is secured at one end to the shaft 124 and bolted at the other end to the slide member 56.

In the preferred embodiment of the invention, the air stream for cleaning the interior of the bottles is preferably caused to flow into each bottle by suction or by partial vacuum created within the bottle, and for this purpose each sealing nozzle 23 constituting a part of the bottle supporting member is connected by connecting passages indicated at 150 and 151 to a suction passage 152 in the supporting piece 54. In order to permit the cleaning operation to take place during the rotary movement of each bottle just prior and subsequent to the passage of the bottle through a vertical inverted position, the end portion of the suction passage 152 is elongated to form an arcuate shallow slot 153 in the face of the supporting piece 54 so that the cylindrically shaped suction passage 151 in the bottle supporting member 24 may remain in communi-

cation with the slot 152 and suction passage 152 during the entire movement of the bottle from a position such as is indicated by the line A in Fig. 1 until the bottle has reached the position corresponding to the line B. The suction passage 152 is connected through a nipple 160 and flexible hose 162 to the storage tank 164 of a vacuum pump unit 166 of any usual or preferred construction. The storage tank 164 may comprise a trap for collecting the dirt and the foreign matter removed from the bottles, and suction is supplied thereto from the suction pump 168 of any usual or preferred structure through a connecting pipe line 169. During the operation of the machine, when the air nozzle 110 is projected into the bottle by the cam 118 a sealing washer 140 fixed on the nozzle is arranged to extend into a counterbored hole 142 in the bottle supporting member 24, to thereby form an air tight seal, as shown in Fig. 4. Now, when the bottle arrives at the open part 153, free air will be drawn through the outer end of the tube 110 and into the bottle. The action of the air thereafter will follow through the passageways 150, 151, 152 and thence to the vacuum pump, as described.

In the illustrated machine, the rotary toothed member 20 is driven from the vertical shaft 90 from the motor 12 through the connections above described, and the supporting shaft 135 upon which the rotary toothed member is mounted, is provided upon its lower end with a sprocket 137 connected by a chain to a sprocket 139 on the vertical shaft 90. As shown in Figs. 1 and 2, the incoming and outgoing conveyors 10 and 45 respectively are arranged to be driven from the same source. A chain 170 connects a sprocket 172 on the clutch shaft 80 to a sprocket 174 on the pulley shaft 176. The driving pulleys 178 and 180 are secured to the other end of the shaft 176 which is mounted in suitable bearings in the machine frame.

From the description thus far, it will be observed that after a bottle has been elevated into bottle sealing position by its bottle elevating and clamping member, the bottle remains in this position as the bottle supporting member 24 rotates, and when the bottle reaches a position corresponding to the line A in Fig. 1, the bottle is evacuated. In the meantime, the air nozzle 110 will have been introduced down into the bottle, so that during the movement of the bottle through the arc between the lines A and B, a stream of fresh air is caused to flow into the bottle through the air nozzle in the manner illustrated in Fig. 4. The action of gravity is utilized in assisting the air stream in the removal of the foreign matter within the bottle, and such action is particularly useful in removing heavy particles such as glass and the like. An important advantage is derived from the fact that during the cleaning operation the position of the bottle is changed as it passes a vertical inverted position, so that the particles are dislodged and caused to travel from the bottle with the air stream through the connected suction passages into the storage tank 164 of the vacuum unit where they may be trapped.

After the cleaning operation has been performed in the manner above described, the bottle continues to move until it is disengaged from its sealing nozzle and is deposited upon the discharge belt to be discharged from the machine.

In Figs. 14 and 15, I have illustrated a modified form of cleaning machine embodying the invention, in which the cam path in the operating cam 118 is designed to effect the withdrawal of the air tubes from the bottles or other receptacles during the movement of the bottles from an inverted vertical position indicated at B in Fig. 14, to such an intermediate position as indicated at C in Fig. 14 where gravity tends to cause the foreign matter to fall back into the bottle. As illustrated in Fig. 14, when the bottle reaches an inverted vertical position the larger pieces of foreign matter tend to accumulate around the air tube and by withdrawing the air tube during the immediate movement of the bottle from this position, the accumulated particles of foreign matter are subjected to the sweeping action of umbrella shaped air stream emerging from the end of the air tube, thus insuring the most efficient removal of such particles.

While the preferred embodiment of the invention has been herein illustrated and described, it will be understood that the invention may be embodied in other forms within the scope of the following claims.

Having thus described the invention what is claimed is:

1. A receptacle cleaning machine for dry cleaning the interior of a receptacle having in combination, a rotatable member; means on said rotatable member engaging the base of the receptacle for retaining said receptacle to be cleaned in temporary assembled relation with said rotatable member, said rotatable member being arranged to move said receptacle into an inverted position during the cleaning operation; and means including an air nozzle operatively associated with said rotatable member and the mouth of the receptacle arranged and constructed to cause a stream of air to flow into said receptacle and out of the mouth of said receptacle at high velocity while the receptacle is being moved in a substantially inverted position, whereby the foreign particles in the receptacle are placed in suspension in said air stream for discharge through the mouth of the receptacle.

2. A receptacle cleaning machine for dry cleaning the interior of a receptacle having in combination, a rotatable member; means on said rotatable member for carrying a receptacle to be cleaned, said rotatable member being arranged to move said receptacle from a substantially upright into an inverted position during the cleaning operation and to return the same to a substantially upright position after the receptacle has been cleaned, the cleaning of the receptacle occurring while the receptacle is being moved in substantially inverted position; and means including an air nozzle operatively associated with said rotatable member and the mouth of said receptacle arranged and constructed to cause a stream of air to flow into said receptacle and out of the mouth of said receptacle at high velocity while the receptacle is being moved in substantially inverted position, whereby the foreign particles in the receptacle are placed in suspension in said air stream and the inversion of said receptacle during the cleaning operation aids in the suspension of said foreign particles in said air stream and their ultimate discharge through the mouth of the receptacle.

3. A receptacle cleaning machine for dry cleaning the interior of receptacles having in combination, a rotatable member; means on said rotatable member for simultaneously carrying a plurality of receptacles to be cleaned, said rotatable member being arranged to continuously move said receptacles from a substantially upright into an inverted position during the cleaning operation

and to return the same to a substantially upright position after the receptacles have been cleaned, the cleaning of the receptacle beginning just prior to and continuing during the movement of the receptacle in inverted position; and means including an air nozzle associated with said rotatable member and the mouth of each of said receptacles arranged and constructed to cause a stream of air to flow into said receptacles and out of the mouth of said receptacles at high velocity just prior to and during the movement of said receptacles in inverted position, whereby the foreign particles in the receptacles are placed in suspension in said air stream and the inversion of said receptacles during the cleaning operation aids in the suspension of said foreign particles in said air stream and their ultimate discharge through the mouth of the receptacles.

4. In a receptacle cleaning machine for dry cleaning the interior of receptacles, in combination, an incoming conveyor for feeding successive receptacles into the machine, a receptacle supporting member provided with a plurality of radially arranged suction heads, means for rotating said receptacle supporting member so that said receptacles can assume an inverted position, a transfer device for transferring successive receptacles from the incoming conveyor to successive suction heads, a source of suction, connections between the source of suction and said suction heads whereby suction may be created in a receptacle during the rotation thereof to set in motion any foreign matter within the receptacle, an air admitting nozzle for each suction head, said air admitting nozzle having one end thereof open to the atmosphere and its opposite end extending into the receptacle during the cleaning operation, and means for maintaining the receptacles in engagement with the suction heads during their movement with said rotatable supporting member.

5. In a cleaning machine for dry cleaning the interior of bottles, a bottle supporting member provided with a plurality of suction heads, means for moving successive bottles into engagement with successive suction heads, means for rotating said bottle supporting member so that said bottles can assume an inverted position, a source of suction, connections between said source of suction and said suction heads, air nozzles extending into the receptacles supported upon said suction heads for permitting an air stream to be drawn into the receptacles by the suction created therein, and means for starting withdrawal of the air nozzles immediately after the movement of the receptacles from a vertical inverted position.

6. In a cleaning machine for dry cleaning the interior of bottles, a bottle supporting member provided with a plurality of suction heads, means for moving successive bottles into engagement with successive suction heads, means for rotating said bottle supporting member so that said bottles can assume an inverted position, a source of suction, connections between said source of suction and said suction heads, air nozzles extending into the receptacles supported upon said suction heads for permitting an air stream to be drawn into the receptacles by the suction created therein, and means for withdrawing the air nozzles from the receptacles before the receptacles in their movement have reached a position where gravity tends to cause the foreign particles therein to fall back into the receptacles.

7. In a receptacle cleaning machine for dry cleaning the interior of receptacles, in combination, an incoming conveyor for feeding successive receptacles into the machine, a receptacle supporting member provided with a plurality of radially arranged suction heads, means for rotating said receptacle supporting member so that said receptacles can assume an inverted position, a transfer device for transferring successive receptacles from the incoming conveyor to successive suction heads, a source of suction, connections between the source of suction and said suction heads whereby suction may be created in a receptacle during the rotation thereof, an air admitting nozzle for each suction head, means for maintaining the receptacles in engagement with the suction heads during their movement with said rotatable supporting member to seal the receptacles, and means for starting withdrawal of the air nozzles immediately after the movement of the receptacles from a vertical inverted position.

8. In a receptacle cleaning machine for dry cleaning the interior of receptacles, in combination, an incoming conveyor for feeding successive receptacles into the machine, a receptacle supporting member provided with a plurality of radially arranged suction heads, means for rotating said receptacle supporting member so that said receptacles can assume an inverted position, a transfer device for transferring successive receptacles from the incoming conveyor to successive suction heads, a source of suction, connections between the source of suction and said suction heads whereby suction may be created in a receptacle during the rotation thereof to thereby set in motion any foreign matter within the receptacle, an air admitting nozzle for each suction head, means for maintaining the receptacles in engagement with the suction heads during their movement with said rotatable supporting member to seal the receptacles, and means for withdrawing the air nozzles from the receptacles before the receptacles in their movement have reached a position where gravity tends to cause the foreign particles therein to fall back into the receptacles.

9. In a receptacle cleaning machine for dry cleaning the interior of receptacles, in combination, means for moving successive receptacles from substantially upright positions into inverted position and for thereafter returning the receptacles to substantially upright positions, and suction operated means operatively disposed relatively to said first mentioned means for causing an air stream to flow into the receptacles during that portion of the foregoing motion when the receptacles are being moved through their substantially inverted position to perform the cleaning operation whereby to set in motion foreign matter within the receptacles to assist in suspending it in the air stream.

10. A machine for dry cleaning the interior of receptacles, comprising, a support for a receptacle to be cleaned; a suction head; means for moving said receptacle into sealing engagement with said suction head; an air nozzle slidably received in said suction head and adapted to be moved relatively to said suction head to project one end thereof into a receptacle, the opposite end of said nozzle being open to the atmosphere; a source of suction connected with said suction head for inducing a flow of air through said open end of said nozzle into said receptacle at high velocity; and actuating means for advancing said first-mentioned end of said nozzle relatively to said suction head and into the body of said recep-

tacle and for withdrawing the same from said receptacle during the cleaning operation.

11. A machine for dry cleaning the interior of receptacles, comprising, a support for a receptacle to be cleaned; a suction head; means for elevating said receptacle from said support into sealing engagement with said suction head; an air nozzle slidable received in said suction head and adapted to be moved relatively to said suction head to project one end thereof into a receptacle, the opposite end of said nozzle being open to the atmosphere; a source of suction connected with said suction head for inducing a flow of air through said open end of said nozzle into said receptacle at high velocity; means connected with said air nozzle for advancing the said first-mentioned end of said nozzle relatively to said suction head into said receptacle and for withdrawing the same from said receptacle during the cleaning operation; and means for removing the cleaned receptacle from said elevating means.

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