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(54) Improved headset device.

(57) The present invention provides an improved headset device having at least one roller mounted at one end of a roller shaft which is at least partially enclosed in a bushing. The roller shaft is adapted for both axial and rotational movement. The headset device drives the roller and roller shaft bi-directionally for deformably securing a closure on a container. An absorbent material is disposed within a recess in the bushing, with at least a portion of the absorbent material adjacent to an outside surface portion of the roller shaft. The device also includes an aperture through which lubricant is periodically supplied to the absorbent material.

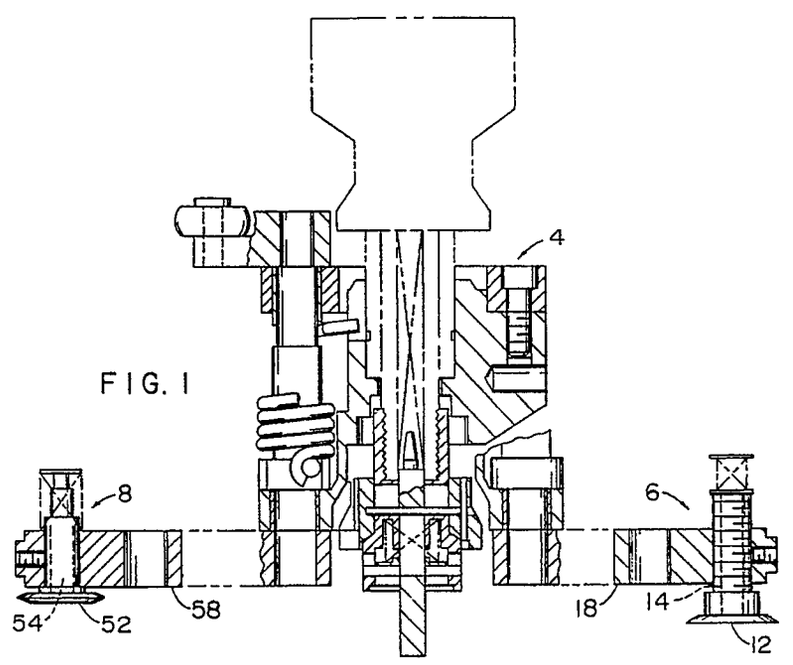

FIG. 1

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Background of the Invention

1. Field of the Invention

The present invention relates to a headset device for applying roll-on closures to a container. More particularly, this invention relates to a structure of a headset device which includes means for supplying lubricant to an absorbent material within a recess and in contact with a roller shaft to provide an improved headset lubrication system.

2. Description of the Art

Capping machines which employ headset devices have been in use for many years to apply roll-on closures to containers. Roll-on closures typically have a generally planar central panel and a cylindrical depending skirt with threads formed by the inward deformation of the skirt against an exterior finish on the mouth of a container. Thus, a roll-on closure is custom fit to a container finish.

The operation of a typical capping machine headset involves considerable movement of the elements of the headset such as the roller shaft. In the headset operating cycle a closure shell is disposed loosely over the mouth of a container. A centrally located pressure block in the headset forces the central panel of the closure against the open mouth of the container. This force forms a seal over the container mouth, typically along a plastic liner inside the closure. Then, thread rollers on the capping machine headset depress the wall of the closure inwardly along the threads on the container mouth as the capping machine headset rotates about the mouth of the container. In a typical operation, a pilferproof roller tucks a lower portion of the closure under a locking ring on the container simultaneously with the threading operation. A preferred headset device for a capping machine is described in U.S. Patent 4,086,747, the contents of which are incorporated herein by reference.

The rollers on the headset are mounted at the end of a roller shaft, which shaft is mounted in roller bushings. The roller bushings typically are provided within an aperture extending through a pivot arm. Such structure permits the roller shaft to rotate when the roller is in contact with a closure skirt. Such roller shaft also reciprocates axially through the roller bushing during operation, and such axial movement is typically subject to spring biasing. The speed of the capping operation is considered to be significant. Each headset has the capability to apply at least about 3,000 closures to containers in one hour. Each capping operation includes multiple spindles, each carrying a headset. In a typical operation, with 20 spindles, 20 containers are capped with each revolution of a turret, or about 60,000 closures are applied in one hour.

The capping equipment operates within confined space limitations; and, within the equipment, the roller shafts are further confined. In normal capping operations, the roller bushings must be lubricated to insure that the rollers mounted at the end of the roller shaft move properly. Accordingly, lubricant assures that the roller shaft rotates and reciprocates through the high speed operation without sticking or binding which could cause thread cutting on the cap.

The present capping machine headsets require that the roller bushings be lubricated every two hours in order to insure continuous operation. One reason for the two hour requirement is that the capping machines operate in a high water environment. The water is continuously sprayed onto the headsets to prevent the accumulation of material, particularly sugar from container filling contents, that could interfere with the operation of the equipment. The water is typically sprayed at an elevated temperature, typically about 90 to 110 °F, and the water acts to wash the lubricant from the reciprocating and rotating roller shaft within a relatively short period of time. Considering the number of roller bushings that need to be lubricated, and the confined space within which lubrication must occur, a person skilled in the art is able to recognize the magnitude and the costs of such an interruption in a capping operation. In particular, in an operation having a twenty (20) head machine, eighty (80) bushings need to be oiled by hand in each lubricating cycle.

There has been a long felt need in the capping machine art to extend the time between lubrication operations. Numerous prior attempts have been unsuccessful or at best have enjoyed limited success. For example, attempts to run the equipment without lubrication have been unsuccessful. Also, prior attempts to use alternative lubricating media, such as grease, have been proven unsuccessful for a variety of reasons. Grease is inherently difficult to handle and apply in a clean manner. Additionally, the close confined area of the capping equipment makes it difficult to prevent undesirable grease from touching or entering the mouth of an open container. This is disadvantageous because the containers, such as juice or soft drink bottles, have been filled with their contents and are ready to be sealed at this point. The use of alternative lubricating materials such as glass filled teflon bearings have been functional; however, they are costly and require more frequent replacement than current systems which causes excessive downtime.

Accordingly, an improved lubrication system for lubricating the bi-directional roller shafts in a

headset device of a capping machine which operates in a water environment is desired which is cost effective in terms of installation and application, and furthermore significantly reduces the downtime required to refurbish the lubricant in the lubricating system.

Summary of the Invention

The present invention may be summarized as providing an improved headset device having at least one roller mounted at one end of a roller shaft which is at least partially enclosed in a bushing. The roller shaft is adapted for both axial and rotational movement. The headset device includes means for moving the roller and roller shaft bidirectionally for deformably securing a closure on a container. An absorbent material is disposed within a recess in the bushing, with at least a portion of the absorbent material adjacent to, and preferably in contact with, an outside surface portion of the roller shaft. The device also includes means for supplying lubricant to the absorbent material.

An advantage of the present invention is the provision of a lubrication system for use in a headset device of a capping machine which maintains lubrication for roller shafts over longer operational periods than have been experienced in the past.

An objective of the headset device of the present invention is to provide a device which is able to maintain shaft lubrication within a warm water spray environment.

A feature of this invention is to provide a headset device having a shaft lubricating system which is able to receive lubricant quickly and efficiently, hold the lubricant during the fast reciprocating and rotating roller shaft operation, and efficiently dispense lubricant to the shaft over longer periods of operation.

Another advantage of this invention is the provision of an improved headset device having shaft lubricating material, which can be readily adapted for use in existing headsets with minimal retrofit time or expense.

These and other objectives and advantages of the invention will be more fully understood and appreciated with reference to the following description and the accompanying drawings.

Brief Description of the Drawings

Figure 1 is a cross-sectional view of a portion of a headset assembly including a pilferproof roller and a thread forming roller.

Figure 2 is a cross-sectional view of the portion of an exemplary headset device which supports a pilferproof roller and roller shaft.

Figure 3 is a cross-sectional view taken along III-III of Figure 2.

Figure 4 is a cross-sectional view of the portion of an exemplary headset device which supports a thread forming roller and roller shaft.

Figure 5 is a cross-sectional view taken along V-V of Figure 4.

Figure 6 is a perspective view of a bushing which may be employed in the present invention.

Figure 7 is a cross-sectional view of an alternative portion of an exemplary headset device which supports a thread forming roller and roller shaft.

Figure 8 is a cross-sectional view taken along VIII-VIII of Figure 7.

Detailed Description

Referring particularly to the drawings, Figure 1 illustrates, in cross section, a view of a portion of a headset assembly 4 including a pilferproof roller arm 6 and a threadforming roller arm 8. The pilferproof roller arm 6 holds the pilferproof roller 12 at the end of roller shaft 14. Similarly, the threadforming roller arm 8 holds the threadforming roller 52 at the end of roller shaft 54.

Figure 2 shows, in cross section, a portion of an exemplary headset device which supports a pilferproof roller 12 and roller shaft 14. The pilferproof roller 12 is integrally attached to the shaft 14, such that the roller 12 rotates and reciprocates as the shaft 14 rotates and reciprocates. It is noted that there is a spring bias only when the shaft moves downwardly. The roller shaft 14 is mounted in a roller bushing 16. The bushing 16 is preferably metallic, and may be made of a steel or bronze material. As shown in Figure 2, the bushing 16 may be held in the roller arm 18 with a set screw and a nylon pad. A preferred clearance between an inside cylindrical sidewall 17 of the bushing 16 and the outside cylindrical surface of the roller shaft 14 is about .005 inch. The bushing 16 is mounted inside a mating aperture in a pilferproof roller arm 18. In a preferred embodiment illustrated in Figure 2, the bushing 16 is threaded into a mating recess in the roller arm 18. The roller 12 and the shaft 14 are free to rotate and reciprocate when an outside surface 20 of the pilferproof roller 12 is in contact with the outside surface 22 of a closure 24 seated on the mouth of a container 26.

A resilient thrust means, such as a spring 28, or the like, is provided between thrust washers 30 and a keeper 32 provided about an upper portion of the roller shaft 14. The spring 28 provides a biasing force in one direction, i.e., downwardly, for the respective roller 12. The keeper 32 may be held at the top of the shaft by an integral head 34, or by a bolt assembly at the top of the shaft, or a dowel pin, or the like. The washers 30 and the

keeper 32 in conjunction with a relatively close bushing-to-roller shaft clearance on the order of about .005 inch prevents significant accumulations of water from the water spray from entering the recesses during operation of the headset device. The spring 28 provides a biasing force for the pilferproof roller 12. More particularly, as the outside surface 20 of the pilferproof roller 12 rotates about a bottom portion of the closure 24, the spring 28 aids in the operation of deforming the bottom portion of the closure 24 inwardly and under a rim, or locking ring on a mouth of a container 26. Such force is sufficient to deform the metal closure 24 without causing damage to the closure 24 or to the finish of the container 26. Such force is typically on the order of 40-50 pounds of force.

In the embodiment illustrated in Figure 2, an upper portion of the bushing 16 is provided with an annular recess 35. An absorbent material 36 is disposed within the recess 35 in the bushing 16 in a manner such that at least a portion of the absorbent material 36 is adjacent to and preferably in contact with an outside surface portion of the roller shaft 14. The absorbent material 36 should be sized to fit the shape of the recess 35 as closely as possible, with any precautions for dimensional variation resulting in error in favor of slightly oversizing the absorbent material 36 in order to insure a tight fit of the material 36 in the recess 35. In Figure 2, the preferred shape for the absorbent material 36 is cylindrical, with an inside wall 38 of the cylinder adjacent the roller shaft 14 and an outside wall 40 adjacent the recessed surface in the bushing 16. The wall thickness of such absorbent material 36 may be about 1/16 inch. The volume occupied by a preferred absorbent material 36, such as that illustrated in Figure 2, is approximately .032 cubic inch.

It will be appreciated by those skilled in the art that a plurality of recesses may be provided within the bushing of the present invention, and that a plurality of absorbent materials may be employed in such multiple recesses.

A preferred absorbent material 36 is felt. Felt is an unwoven fabric made by matting together fibers of such materials as wool, cotton, fur pulp or hair through pressure and the use of heat and chemicals. Alternative absorbent materials include, but are not limited to, wool, cotton, polypropylene, polyethylene, nylon and combinations thereof. The absorbent material 36 is able to absorb a lubricant which is used in the operation of capping machine headsets. The degree of absorbency of such felt material is estimated to be at least about 85%. An exemplary lubricant for use in the present invention is Myvacet 9-40 lubricant, a distilled acetylated monoglyceride product of Eastman Chemicals Company. Other exemplary lubricants are Ultragard 100 and FG-180, products of Debois Company; and G-002, a product of Fallek Chemical Company.

In the invention shown in Figure 2, an aperture 42 is provided through the bushing 16, at an upper, outward location on the bushing 16 radially outwardly of the recess within which the absorbent material 36 is located. The aperture 42 may have a diameter of about .062 inch at the outside wall of the bushing and may taper inwardly at an angle, such as an angle of about thirty degrees (30°). Such an aperture 42 provides a passageway through which lubricant may be delivered to the absorbent material 36 with the use of a conventional pump-type oil can. It is considered unique that the lubricant can be delivered through such a narrow passageway 42 by pushing the dispensing spout against the entry end of the passageway 42 merely with manual pressure. Dispensing the lubricant by the nominal force and pressure generated in a normal oil can squeezing operation acts to squirt sufficient lubricant through the passageway and then saturate the absorbent material 36 to substantially a full 85% absorbency. This quick and efficient oil delivery operation within a confined space, in combination with the extended operating time between lubricant replenishment, makes this invention commercially, economically and technically attractive.

Figure 3 shows the absorbent material 36 disposed circumferentially about the roller shaft 14 along lines III-III in Figure 2, which corresponds with the location where the aperture 42 provides a passageway for lubricant.

A portion of an exemplary headset device which supports a threadforming roller 52 and roller shaft 54 is shown in cross section in Figure 4. The threadforming roller 52 is integrally attached to the shaft 54, such that the roller 52 rotates and reciprocates as the shaft 54 rotates and reciprocates. The threadforming roller shaft 54 is mounted in a roller bushing 56. The bushing is preferably made of a steel or bronze material. A preferred clearance between an inside cylindrical sidewall 57 of the bushing 56 and the outside cylindrical surface of the roller shaft 54 is about .005 inch. The bushing 56 is mounted inside a mating aperture in a threadforming roller arm 58. The threadforming roller 52 and shaft 54 are free to rotate and reciprocate when an outside surface 60 of the threadforming roller 52 is in contact with the outside surface 22 of a closure 24 seated on the mouth of a container 26.

A spring 68, or the like, is provided between a first keeper 70 and a second keeper 72 which may be held by an integral head 74. The spring 68 provides a biasing force for the threadforming roller 52, similar to that for the pilferproof roller 12 described above with reference to Figure 2. In the

operation of a headset device the pilferproof roller 12 and the thread roller 52 are provided on different arms of the same capping machine headset. In a typical operation there may be two (2) pilferproof rollers and two (2) thread rollers on each headset. As the capping machine headset spins about a closure on the mouth of a container, the thread rollers 52 reform the closure, to thereby thread the closure onto the container mouth, by following the thread of the bottle finish as a guide. Substantially simultaneously, the pilferproof roller 12 tucks the pilferproof band under a locking ring on the container. These closure forming operations are performed after the closure shell, typically an aluminum shell, is loosely placed over a container mouth, and top and side seals are formed between the closure and the container mouth by bringing a pressure block in the capping machine headset into contact with the top of the closure. The pressure block typically exerts a downward pressure on the closure to compress a plastic liner inside the closure, against the mouth of the container, whether glass, plastic or otherwise, to seal the container and its contents.

Figure 6 illustrates a perspective view of a bushing 56 which may be mounted inside the threadforming roller arm 58 shown in Figure 4. The bushing 56 shown in Figure 6 has a recess 76 cut in the sidewall 78. The absorbent material 80 fits into the recess 76 as shown in Figures 4 and 5. The absorbent material 80 is sized to fit the recess 76. The volume occupied by a preferred absorbent material 80, such as that illustrated in Figure 4, is approximately .022 cubic inch. Figure 5 illustrates a bolted oil fitting 82 having an aperture 84 therethrough which extends to the recess 76 where the absorbent material 80 is seated. The aperture 84 provides a passageway through which lubricant may be delivered to saturate the absorbent material 80 with a pump-type oil can as explained above. Considering the very tight clearances, and the many roller shafts in a capping operation, such oil fittings 82 in the headset device of the present invention provide ideal locations for accessible oil replenishment.

The absorbent material 80 shown in Figures 4 and 5 is in the shape of a section of a cylinder which approximates the shape of the recess 76 into which the absorbent material 80 is disposed. Such cylindrical section of absorbent material may be adequate to retain sufficient lubricant to lubricate the roller shaft 54, as the shaft reciprocates and rotates past the adjacent absorbent material 80 in its normal operation. In a preferred operation the outside surface of the roller shaft 54 wipes the absorbent material 80 thereby providing a thin film coating of oil on the shaft. In some operations, however, the thin film coating of oil may be provided without actual or continuous contact between the outside surface of the roller shaft 54 and the absorbent material 80. In such operations, it is believed that the action of the roller shaft passing the cavity where the absorbent material 80 and lubricant reside acts to draw a thin film of lubricant therefrom.

Figures 7 and 8 illustrate one example of an alternative structure for the present invention. Figure 7 shows a fully circumferential absorbent material 90 in the form of a cylinder fit about the roller shaft 92, and axially aligned between two complimentary bushings, a lower bushing 94 and an upper bushing 96. It is understood that such bushings must be held in place, such as with threads, keeper pins, or the like. Such embodiment may be particularly useful where it is necessary to utilize a larger volume of absorbent material 90 to hold a correspondingly larger volume of lubricant.

A preferred capping machine headset includes two pilferproof rollers 12 and two threadforming rollers 52 which cooperate to quickly conclude a capping operation as the headset rotates about the mouth of a container. Headsets of this type are characterized by smooth, accurate operation, low friction and dependable repeatability. To insure such operation, preventive maintenance requires that the moving parts, and particularly the roller shafts 14 and 54, be lubricated. Previously, each pilferproof roller shaft 14 and each threadforming roller shaft 54 were lubricated along upper and lower portions by hand, after every two hours of operation. This interruption in operation, and resulting loss of production due primarily to the downtime, is significantly reduced by the present invention.

The conventional preventive maintenance schedule for headsets of the prior art recognized the operating environment. In particular, the headset is exposed to high humidity, sugar solids, glass chips and other substances. In normal operation a warm water rinse, 90-110°F water, is constantly applied to the threadforming and pilferproof rollers. Such environment required frequent replenishment of the lubricant.

The present invention has successfully accomplished the long-standing objective of increasing the headset operating time between roller lubrication requirements. By providing an absorbent material within the structure of the roller arm holding the roller shaft, and by saturating the absorbent material with lubricant, the headset operating time between roller lubrication is increased. The oil saturated absorbent material, typically saturated to a level of at least 85% saturated, acts to release lubricant against the outside surface of the roller shaft as the shaft moves bi-directionally, i.e., the shaft reciprocates and rotates, past the absorbent

material.

The present invention has been found to significantly increase the time between replenishment of lubricant on the roller shafts of a headset device from two hours to at least eight hours. In such trials, the time has been extended beyond eight hours which indicates that the present invention provides a headset device which can operate at high speeds, in a hot, wet, product accumulating environment, through an entire operating shift without requiring roller shaft lubrication.

What is believed to be the best mode of this invention has been described above. It will be apparent to those skilled in the art that numerous variations of the illustrated and described details may be made without departing from the scope of this invention. For example, the bushing described in this invention may be an integral unit within the roller arm, or alternatively the bushing may be a multiple piece structure. Also, although only one piece of absorbent material is shown in the various illustrated embodiments, multiple pieces adjacent to one another, or spaced, radially, axially or diagonally, may be employed in this invention.

Claims

1. A headset device of the type for use with a capping machine for securing closures on containers comprising

at least one roller mounted at one end of a roller shaft, said shaft at least partially enclosed in a bushing, said roller shaft adapted for axial and rotational movement,

means for moving the roller and roller shaft bi-directionally for deformably securing a closure on a container,

an absorbent material disposed within at least one recess in the bushing with at least a portion of the absorbent material adjacent to an outside surface portion of the roller shaft, and

means for supplying lubricant to the absorbent material in the recess.

2. A headset device as set forth in claim 1 including two thread forming rollers and two pilferproof rollers.

3. A headset device as set forth in claim 1 wherein said absorbent material is selected from the group consisting of felt, wool, cotton, polypropylene, polyethylene, nylon and combinations thereof.

4. A headset device as set forth in claim 1 further including resilient thrust means disposed at upper end portions of each roller shaft for providing a biasing force for the respective rollers.

5. A headset device as set forth in claim 1 wherein the recess in the bushing is circumferential.

6. A headset device as set forth in claim 5 wherein at least a portion of the absorbent material in the recess is in contact with a circumferential outside surface portion of the roller shaft.

7. A headset device as set forth in claim 1 wherein the lubricant supplying means comprises an aperture through the bushing, through which lubricant is supplied to the absorbent material.

8. A headset device for use with a capping machine for securing closures on containers comprising:

a housing,

two thread forming rollers mounted at respective lower end portions of respective roller shafts in said housing,

two pilferproof rollers mounted at respective lower end portions of respective, generally cylindrical roller shafts in said housing,

each roller shaft having an outside cylindrical surface mounted through a sleeve and disposed for axial and rotational movement,

resilient thrust means disposed at upper end portions of each roller shaft for providing a biasing force for the respective rollers,

at least one recess in each sleeve,

a lubricant absorbent material disposed within each said recess with at least a portion of said material in contact with said outside surface portion of each roller shaft,

apertures in the housing through which lubricant is supplied to said material in each respective recess,

means for spraying water, at a temperature greater than about 90 °F, toward the rollers during operation of the headset device to prevent accumulations of material on the headset device, and

means between the outside surface of each bi-directionally moving roller shaft and each respective sleeve sufficient to prevent substantial water from the water spray from entering the recess in the sleeve during operation of the headset device.

9. A method for lubricating roller shafts in a headset device for use with a capping machine for containers comprising the steps of

providing an absorbent material inside a recess in a bushing with at least a portion of the absorbent material adjacent to an outside surface portion of the roller shaft,

saturating the absorbent material with a lubricant by delivering the lubricant through a passageway to the absorbent material in the recess in the bushing, and

operating the headset device such that the roller shafts move axially and rotationally through the bushing and along a portion of the absorbent material.

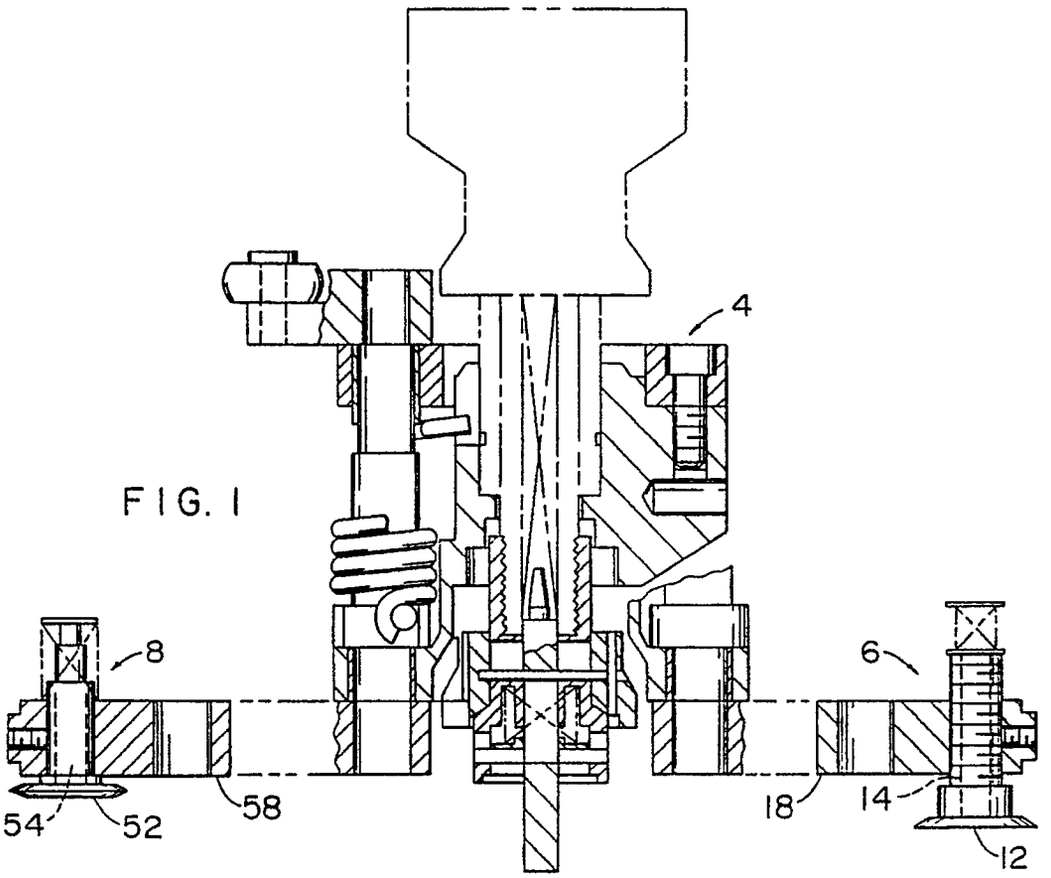

FIG. 1

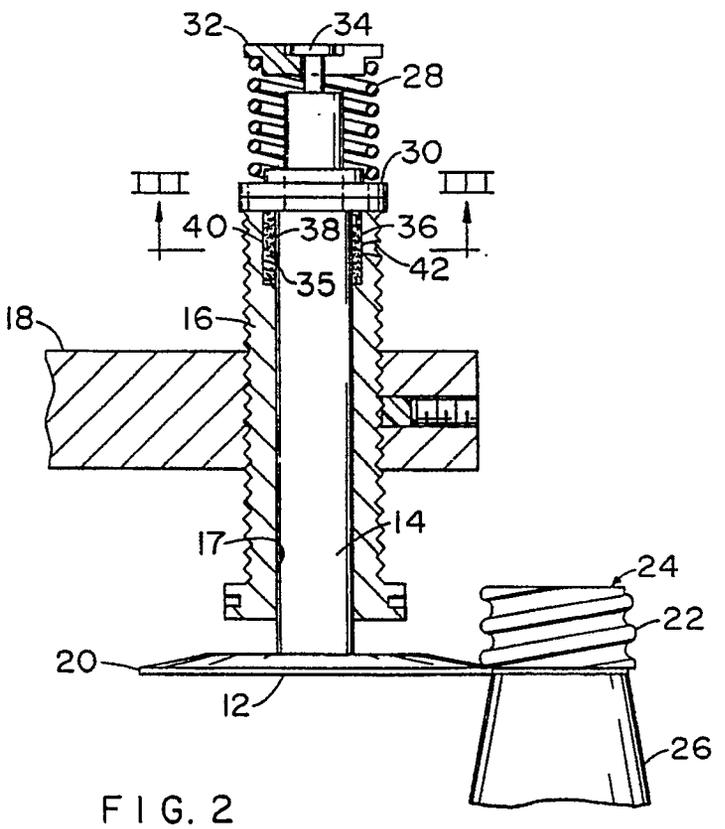

FIG. 2

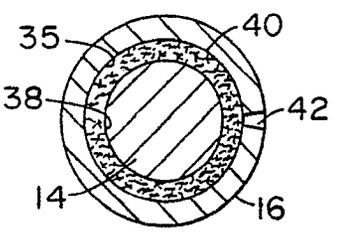

FIG. 3

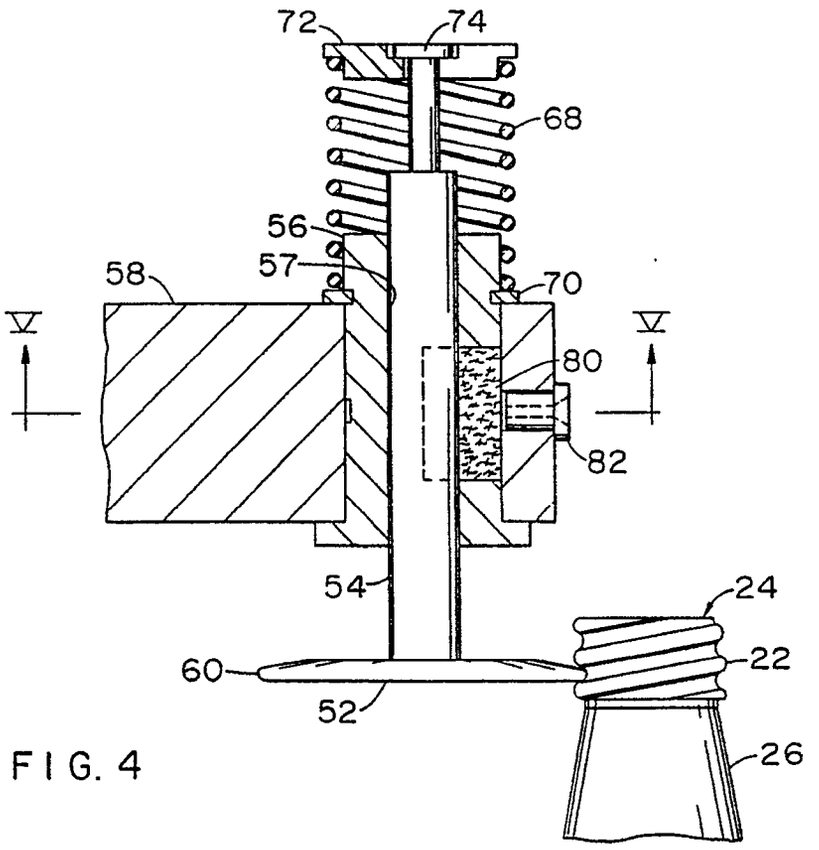

FIG. 4

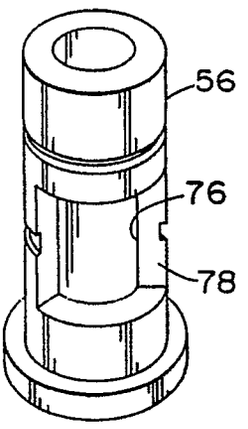

FIG. 6

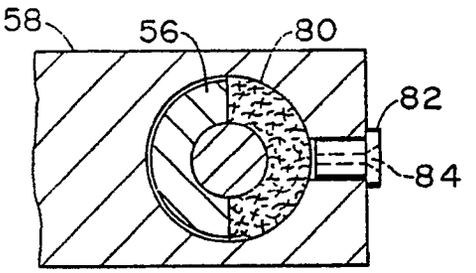

FIG. 5

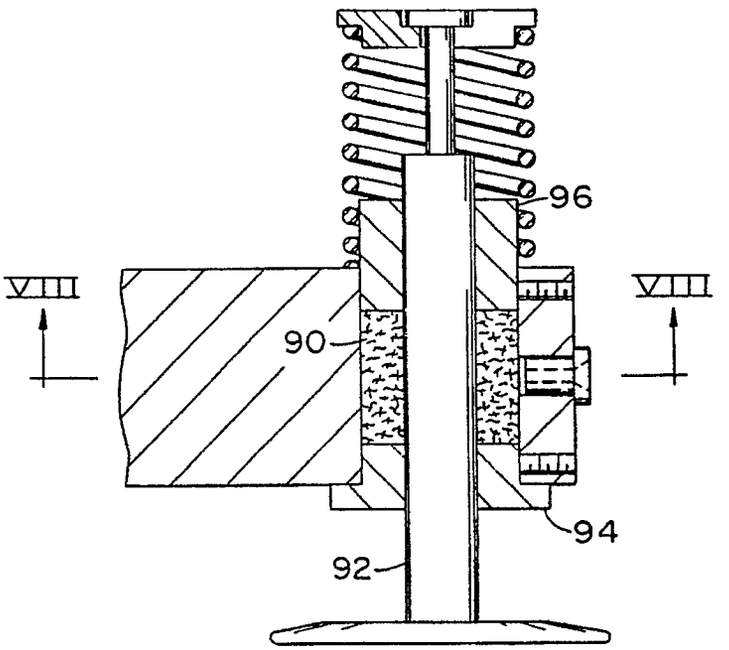

FIG. 7

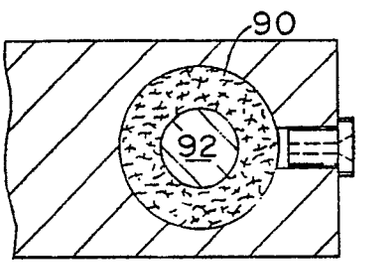

FIG. 8