(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 045 208 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
08.04.2009 Bulletin 2009/15

(51) Int Cl.:
B67B 5/03 *(2006.01)*

(21) Application number: **08007081.6**

(22) Date of filing: **10.04.2008**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT RO SE SI SK TR
Designated Extension States:
AL BA MK RS

(30) Priority: **13.07.2007 IT TO20070520**

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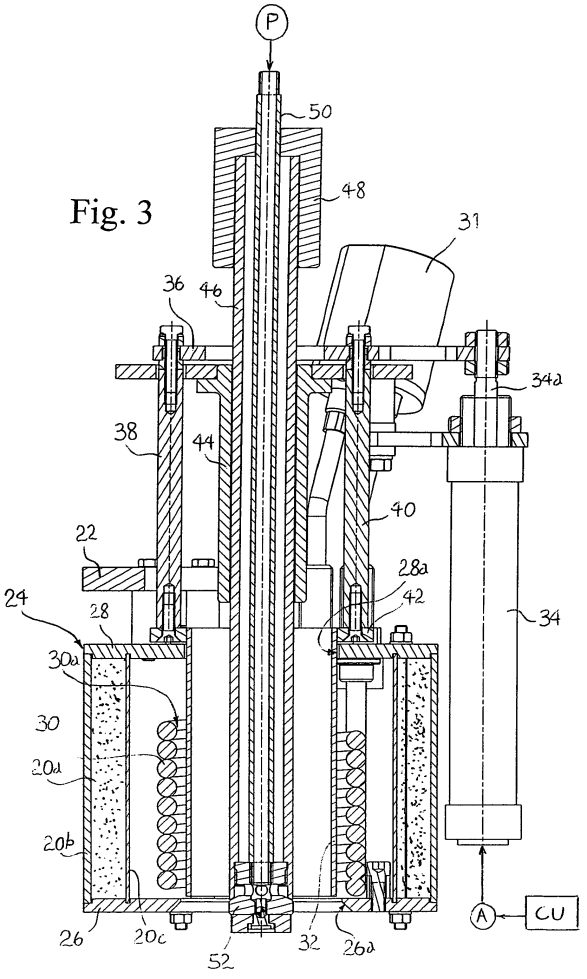
(54) **Heating head for thermally shrinking sealing capsules on bottle necks**

(57) A heating member (30) integral with the head has a cylindrical heated cavity (30a) in which the bottle neck with capsule is insertable. The head (20) is mountable on a heating machine adapted to movably support the head between a resting position in which the heating member (30) is axially spaced from the capsule, and an operative position in which the heating member (30) surrounds the capsule and interacts with it by heating it. A shield (32) having a tubular profile is insertable between the heating member (30) and the bottle neck and is movably supported in an axial direction with respect to the heating member (30) under control of actuator means (34), between a resting position external to the heated cavity (30a), and an working position in which it is interposed between the capsule and the heating member (30) and shields the capsule from the heating action applied by the heating member (30).

Fig. 3



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Description

[0001] The present invention relates to a heating head for thermally shrinking sealing capsules made of a thermally shrinkable material on the necks of bottles arranged along a bottling line of liqueur, wine, oil, and the like.

[0002] It is well known to seal the mouths of bottles by plugs and capsules, in order to insulate the content of the bottles from the external environment as well as to enhance its preservation. This invention particularly relates to the application on the bottles of capsules consisting of a cap made of a thermally shrinkable material, such as polyvinyl chloride (PVC), which projects downwards from the bottle mouth and surrounds the end portion of the bottle neck.

[0003] In a general bottling line, the bottles are filled and then closed by a plug which, e.g., may be made of cork or metal. Then, the bottles are fed to a capsule-feeding device which individually draws the capsules from a pile and fits them onto the bottle necks. Thereafter, the bottles are fed by an auger to a heating carousel supporting a plurality of heating heads provided with a resistor. Then, the heads are lowered under control of a cam-based guide system to surround the necks of the bottles through a fixed length of the carousel stroke, so that the material of the capsule is heated and consequently shrinks around the bottle.

[0004] Since the speed of the line changes depending on the amount of bottles fed by the auger, the rotational speed of the carousel also changes. Accordingly, the heating heads engage the bottle necks for a period of time that is not fixed but may be shorter or longer depending on how fast the carousel rotates (faster of slower respectively). As the skilled person will immediately understand, this circumstance may cause drawbacks because a period of time that is too short will result in an incomplete shrinkage, while a period of time that is too long may damage the material of the capsule, both circumstances producing rejects.

[0005] It was proposed to overcome the above drawback by providing each head with its own driving means so that it can be independently driven to engage the bottle neck for a predetermined period of time not depending on the carousel speed. However, this solution would be very expensive because each head should be provided with a sizable actuator, due to the above heating heads being very heavy.

[0006] Another drawback of the known carousels derives from the circumstance that the heating heads drop onto the bottle neck only gradually, i.e., with a speed which, though maximized, cannot be regarded as substantially instantaneous, due both to the high inertia resulting from the considerable weight of the heads, and to the geometrical restrictions intrinsically connected to the cam-based systems. This circumstance causes the upper area of the capsule (which is the first engaged by the head during the down-stroke and the last disengaged during the up-stroke) to be heated for a period of time longer then the lower areas, thereby causing the heating action, and consequently the shrinking, to be uneven over the height of the capsule.

[0007] Therefore, it is a main object of the present invention to improve the heating head in such a way that all the capsules are subjected to a heating action for a predetermined, fixed period of time not depending on the rotational speed of the carousel, without requiring changes to the cam-based, head-driving system.

[0008] It is another object of the invention to improve the heating head in such a way that it applies a more even heating action substantially for the same period of time upon all the areas of the capsule.

[0009] The above objects and other advantages, which will better appear from the following description, are achieved by the heating head having the features recited in claim 1, while the dependent claims state other advantageous, though secondary features of the invention.

[0010] The invention will be now described in more detail with reference to a preferred, non-exclusive embodiment shown by way of non-limiting example in the attached drawings, wherein:

Fig. 1 is a diagrammatical plan view of a general bottling line;

Fig. 2 is a plan view of the heating head according to the invention;

Fig. 3 is a cross-sectional view of the heating head of Fig. 2 along line III-III;

Figs. 4 to 6 are three cross-sectional views similar to Fig. 3, which show three successive operative steps of the head.

[0011] A portion of a general bottling line is diagrammatically shown in Fig. 1. Bottles 10, which have already been filled, closed, and provided with a capsule 12 of a thermally shrinkable material such as PVC, which surrounds the bottle neck with a loose fit, are fed by an auger 14 to a rotating loader 16. The latter feeds the bottles to a heating carousel 17 supporting a plurality of heating stations such as 18 on its periphery, which are provided with respective heating heads. A rotating unloader 19 is supported near the carousel to draw the bottles away from the carousel at the end of the heating process. Conventionally, the speed of the carousel is automatedly controlled depending on the amount of bottles along the line.

[0012] Figs. 2, 3 show an improved heating head 20 according to the invention. Head 20 is supported on a frame 22 and is conventionally movable in a vertical direction between an upper, resting position and a lower, operative position, under control of cam-based guides (not shown). Accordingly, the period of time through which the heating head is in its operative position is not

fixed but may be shorter or longer depending on how fast the carousel rotates (faster of slower respectively).

[0013] Heating head 20 comprises a vertical axis cylindrical shell 24 attached to frame 22 and terminating at its opposite ends with a lower wall 26 and an upper wall 28 which are provided with respective axial openings 26a, 28a. A spiral-shaped resistor 30 is coaxially supported within shell 24 and defines a substantially cylindrical heated chamber 30a, which is sized to surround the bottle neck with capsule when the head is lowered in its operative position. The cylindrical wall of shell 20 consists of a layer of an insulating material 20a sandwitched between two steel sheets 20b, 20c. Spiral resistor 30 is connectable to power supply means via a connector 31.

[0014] According to the invention, heating head 20 is provided with a thin-walled tubular shield 32 which is insertable between resistor 30 and the bottle neck with capsule 12 when the head is lowered in its operative position. Shield 32 is axially movable under control of a vertical axis cylindrical actuator 34 anchored to frame 22, between a raised, resting position external to resistor 30, in which it does not shield the capsule from the heating action applied thereto, and a lowered, working position, in which it is interposed between resistor 30 and the capsule and shields the capsule from the heating action generated by resistor 30.

[0015] In particular, shield 32 is supported on a frame comprising a bracket 36 which is attached to the operating rod 34a of actuator 34 and supports a pair of vertical rods 38, 40 at its lower end. The rods have their upper ends bolted to bracket 36 and their lower ends bolted to a horizontal ring 42 which is coaxially attached to the upper end of shield 32.

[0016] Frame 22 supports a vertical bush 44, in which a hollow column 46 having a ballast 48 fixed to its upper end is axially slidable. A cooling tube 50 is coaxially supported within hollow column 46 and has its upper end connectable to a cold air feeding pump P (only diagrammatically shown in Fig. 3). The lower end of cooling tube 50 is connected to an air nozzle 52 attached to the lower end of column 46.

[0017] Actuator 34 is operatively connected to a hydraulic pump A controlled by a control unit CU (only diagrammatically shown in Fig. 3). Control unit CU is programmed to raise shield 32 when carousel 18 has reached a predetermined angular position (which is conventionally detected by a sensor, not shown) immediately after the bottle has been trasferred to carousel 18 and the head has been lowered to surround the neck of the bottle, and then to drop shield 32 after a predetermined period of time chosen such as to expire before, or at most at the same time that, the head starts rising again.

[0018] The operation of the bottling line provided with heating heads according to the invention is similar to the operation of lines provided with conventional heads. Auger 14 feeds the bottles to loader device 16, which transfers them to heating carousel 18. Heating heads 20 follow one another in engaging the bottles through a fixed length of the carousel stroke and for a period of time that, accordingly, changes depending on the speed of the carousel. Initially, head 20 is in its resting position of Fig. 4, i.e., it is axially spaced from the bottle neck, and shield 32 is in its lowered position. The heating head 20 according to the invention is improved in that, while the head is lowered on the bottle neck, shield 32 is in its lowered position and therefore the capsule is not subjected to the heating action of the resistor (Fig. 5). As soon as the head has reached its lowermost position, actuator 34 raises shield 32 and the capsule is heated (Fig. 6), with consequent shrinkage of the capsule around the bottle neck. As well known to the person skilled in the art, shrinkage mainly occurs by radiance. After a predetermined time, but before head 20 is raised, actuator 34 drops shield 32 and the capsule is no more subjected to heating. After a variable time depending on the speed of the carousel, head 20 is raised.

[0019] As the person skilled in the art will immediately understand, with the heating head according to the invention the capsule is heated for a fixed, controlled period of time which does not depend on the carousel speed, with considerable reduction, or even elimination, of the rejects resulting from over-radiation or under-radiation of the capsule. Furthermore, the shield and the frame supporting the latter can be manufactured in such a way as to be very light, so that the shield may be driven very quickly and the transient between its upper position and its lower position can be minimized. Consequently, an even heating action is substantially applied for the same period of time upon all the areas of the capsule. To this purpose, the heating action is preferably, but not necessarily, applied for a period of time such that, even when the carousel rotates at its maximum speed, shield 32 is dropped before head 20 starts rising.

[0020] A preferred embodiment of the invention has been described herein but of course many changes may be made by a person skilled in the art within the scope of the claims. For instance, the actuator which operates the shield may be of a different type, e.g., it could be a pneumatic or electric actuator. Moreover, in the preferred embodiment the shield is controlled in such a way that it switches from its working position to its resting position after the head has reached its operative position, and then from its resting position to its working position before the head starts rising again, so that the capsule is not subjected to the heating action while the head moves, in order to prevent the above cited unevennes. However, the timer could be adjusted in a different way, e.g., when the carousel speed is high enough to make this transient irrelevant.

Claims

1. A heating head (20) for thermally shrinking a sealing capsule made of a thermally shrinkable material on the neck of a bottle, comprising a heating member

(30) integral with the head and having a substantially cylindrical heated cavity (30a) in which the bottle neck with capsule is insertable, said head (20) being mountable on a heating machine adapted to movably support the head between a resting position in which the heating member (30) is axially spaced from the capsule, and an operative position in which the heating member (30) surrounds the capsule and heats it, **characterized in that** it comprises a tubular shield (32) which is insertable between the heating member (30) and the bottle neck and is movably supported in an axial direction with respect to the heating member (30) under control of actuator means (34), between a resting position external to the heated cavity (30a), and a working position in which it is interposed between the capsule and the heating member (30) and shields the capsule from the heating action by said heating member (30).

2. The heating head of claim 1, **characterized in that** said actuator means (34) are controlled by a control unit (CU) which is programmed to drive said shield (32) from said working position to said resting position after the head (20) has reached said operative position and, after a predetermined period of time, from said resting position to said working position again.

3. The heating head of claim 1 or 2, **characterized in that** said shield (32) is supported on a ring (42) which is coaxially attached to the shield and is connected to said actuator means (34) by a frame.

4. The heating head of any of claims 1 to 3, **characterized in that** said acuator means consist of a cylinder (34) arranged with its axis parallel to the axis of the shield (32).

5. The heating head of claim 4, **characterized in that** said frame comprises a bracket (36) attached to the operating rod (34a) of said actuator (34) and supporting a pair of vertical bars (38, 40) having their upper ends anchored to the bracket (36) and their lower ends anchored to said ring (42).

6. The heating head of any of claims 1 to 5, **characterized in that** said heating member is arranged within a shell (24) open to receive said bottle neck.

7. The heating head of any of claims 1 to 6, **characterized in that** said heating member consists of a spiral-shaped resistor (30) connectable to power supply means.

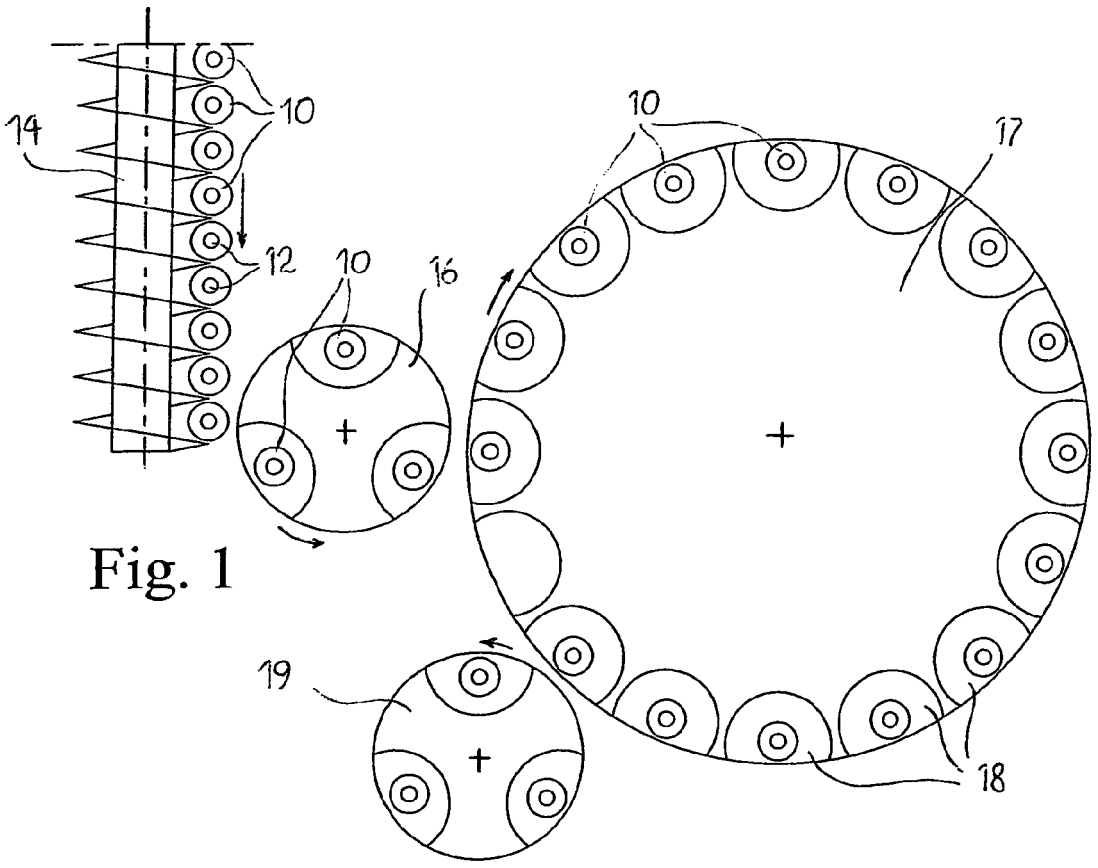

Fig. 1

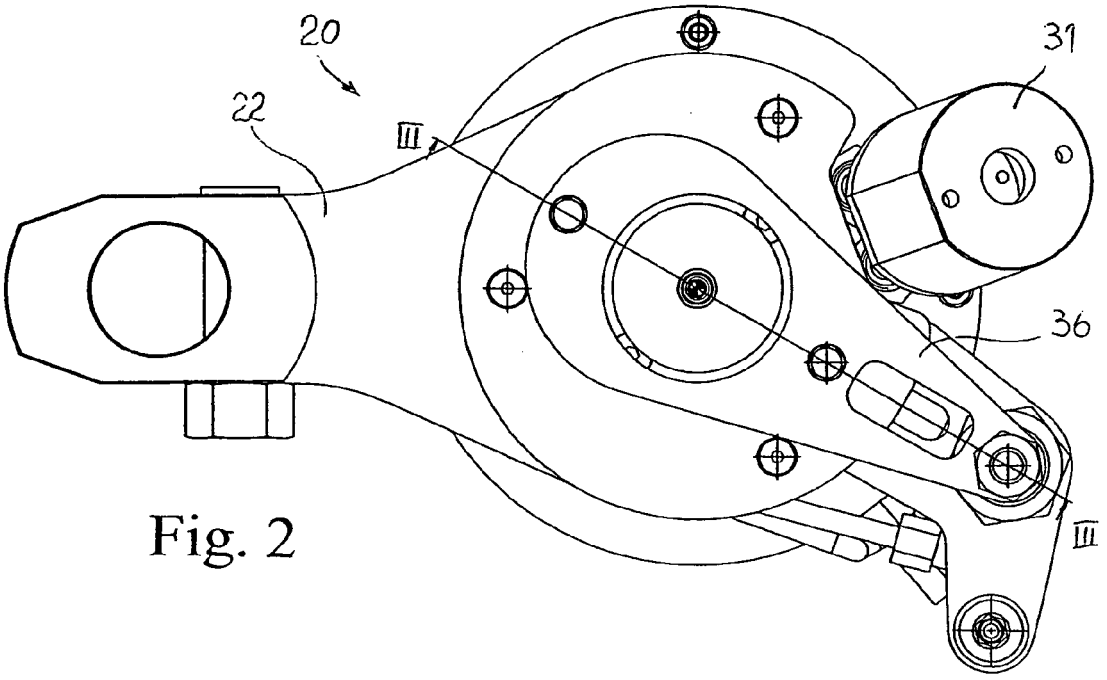

Fig. 2

Fig. 3

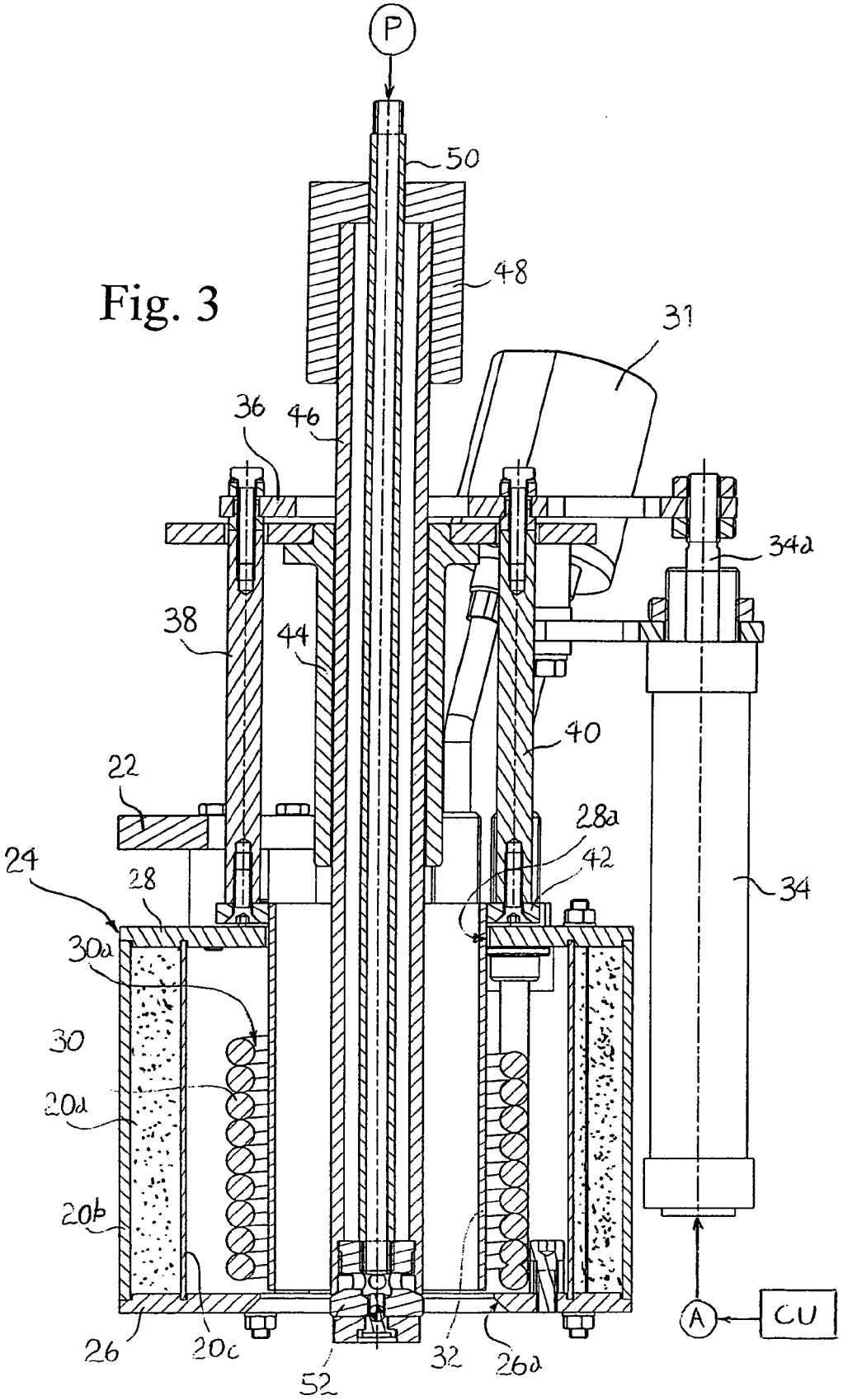
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Fig. 4

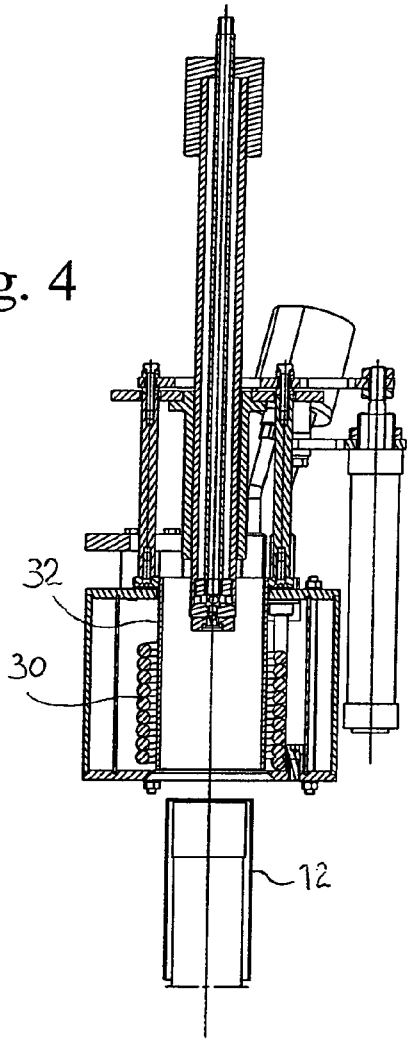

Fig. 5

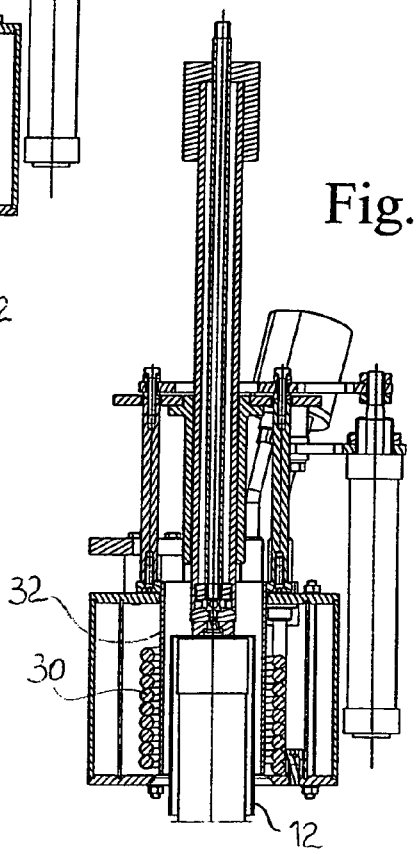

Fig. 6