SYSTEM FOR PLUGGING PAINT CANS

Inventor: Pentti Airaksinen, Oulu (FI)

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ABSTRACT

The invention relates to a system for plugging paint cans, which system is arranged to press a hollow, cuplike, elastic plug (3) provided with a protruding circumferential rim (5) into a hole (2) made in a paint can lid (1) in a sealed manner by means of the plug's (3) shape, whereby the circumferential rim (5) of the plug (3) mounted in place is supported to the surface of the paint can lid (1), the system comprising a storage container (6) for plugs (3); a picker (7) for picking one plug (3) at a time from the storage container (6); a gripper (8) for gripping the plug (3) picked from the storage container (6) and for carrying it above a container lid (1) to be closed; and means for performing a mutual vertical movement of the gripper (8) and the paint can in order for thereby pressing the plug (3) into place in a sealed manner in the lid (1) of the paint can.
SYSTEM FOR PLUGGING PAINT CANS

BACKGROUND OF THE INVENTION

[0001] The invention relates to a system for plugging paint cans, which system is arranged to press a hollow, cuplike, elastic plug provided with protruding circumferential rim into a hole made in a paint can lid in a sealed manner by means of the plug’s shape, whereby the circumferential rim of the plug mounted in place is supported to the surface of the paint can lid, wherein the system comprises a storage container for plugs; a picker for picking one plug at a time from the storage container; a gripper for gripping the plug picked from the storage container and for carrying it above a container lid to be closed; and means for performing a mutual vertical movement of the gripper and the paint can in order for thereby pressing the plug in place in a sealed manner in the lid of the paint can.

[0002] In connection with paint toning machines several partial tasks associated with paint toning and paint can handling are performed manually, and a paint can must also be transferred manually from one processing step to another. A typical manual operation is the closing of a paint can when toning is completed. In that case the closing involves, more precisely, closing a hole made in the paint can lid before the toning.

[0003] Conventionally, opening and closing of a lid required by an automatic toning system has been very difficult to implement. Automatic opening of a can lid has only been possible in special, purpose-made lids, which have not become widely used because of wide product ranges (tens), various cans (tens), cans of different sizes (typically 5 to 15 sizes) and a plurality of suppliers. Various combinations involve huge investments in toning outlets and paint factories.

[0004] On automatic production lines the cans have often been open, and consequently it has been possible to fill them with basic paint or toning pastes, whereas a lid is pressed thereon by machine. These lines are remarkably large in size and they occupy an entire hall or a large room space. It is natural that the price of a line like this is completely out of proportion for paint stores.

[0005] Attempts have been made to produce smaller lines, where lids have been penetrated and plugging is carried out by large and expensive mechanisms based on vibrating classifiers. The price of these plug processing devices often doubles the starting price in relation to the rest of the actual automation.

[0006] In fully manual toning, the lid has been opened by detaching the lid from the can manually or with a tool and by closing it again manually.

[0007] Any manual operation takes the sales personnel that operates the paint toning machine a lot of time, and they could put the time consumed in waiting and manual work to a better use, for instance, to actual customer service.

[0008] From automation industry are known several solutions to close various other containers, but none of them can be applied as such in connection with actual paint toning machines.

SUMMARY OF THE INVENTION

[0009] The object of the invention is thus to eliminate the above drawback and provide a fully automatic plugging system for paint cans, which is well applicable, as a partial configuration, to substantially fully automated paint toning machines and systems. This is achieved by a system for plugging paint cans in accordance with the invention, which is characterized in that the picker is arranged to move vertically through the storage container and the upper part thereof is shaped to receive a cuplike part of the plug such that the circumferential rim of the plug rests against the upper surface of the upper part of the picker.

[0010] By picking a plug with a vertical movement through a storage container containing plugs a gripper on a picking line may receive the plug and transfer it to the location of a paint can to be closed for inserting the plug into place in the lid of the paint can.

[0011] The plugging system of the invention may be erected in a considerably small space, which enables extremely economical implementation. This opens up an opportunity to provide an automated toning line in paint store premises in an economical manner.

LIST OF DRAWINGS

[0012] In the following, the invention will be described in greater detail in connection with preferred embodiments, with reference to the attached simplified schematic drawings, in which

[0013] FIG. 1 is a top view of a plug used for closing a hole made in a paint can lid;

[0014] FIG. 2 is a cross-sectional view of the plug of FIG. 1;

[0015] FIG. 3 shows an embodiment of a storage container and a picker of the system in accordance with the invention;

[0016] FIG. 4 shows another embodiment of a storage container and a picker of the system in accordance with the invention;

[0017] FIG. 5 illustrates plug picking from the storage container of FIG. 4;

[0018] FIG. 6 shows a preferred embodiment of a picker in a system in accordance with the invention;

[0019] FIG. 7 shows an embodiment of a gripper in a system in accordance with the invention together with the picker appearing in the preceding figures;

[0020] FIGS. 8 and 9 show how the plug is placed in the gripper by using the combination of FIGS. 6 and 7; and

[0021] FIGS. 10 and 11 show how the plug is secured to the hole made in the paint can lid by using the combination of FIGS. 6 and 7.

DETAILED DESCRIPTION OF THE INVENTION

[0022] When a paint can to be toned is processed, its lid 1 is first provided with a hole 2. After the hole 2 is made, the paint can is transferred under paste nozzles for toning. After the toning is completed, the paint can is transferred to a plugging station for being processed with a paint can plugging system, which the present invention only concerns.

[0023] With reference to FIGS. 1 and 2, they show a hollow plug 3 made of elastic material, such as rubber or plastic, for instance, to be fitted into the hole 2 (FIGS. 10 and 11) in the paint can lid 1, the plug comprising a cup-like part 4 fitting tight in the hole 2 and a circumferential rim 5 projecting from the upper edge of the cuplike part and intended for being supported to the surface of the lid 1.

[0024] The plugging system of the invention in FIGS. 3 to 11 for mounting the plug 3 into place in a sealed manner in the hole 2 are, provided in the paint can lid 1 comprises a storage container 6 for plugs 3, a picker 7 for picking one plug 3 at a
time from the storage container 6, a gripper 8 for gripping the plug 3 picked from the storage container 6 and for carrying it above the container lid 1 to be closed and means for implementing a mutual vertical movement of the picker 7 and the paint can and for thereby pressing the plug 3 in place in a sealed manner in the paint can lid.

[0025] In accordance with FIGS. 3 to 5, the picker 7 is arranged to move vertically through the storage container 6 and its upper part is shaped to receive the cuplike part 4 of the plug 3 such that the circumferential rim 5 of the plug 3 rests against the upper surface of the upper part of the picker 7. At least the upper part of the picker 7 is tubular. Appropriately, the picker 7 is provided with a spring system, as shown in FIG. 6, which protects the plug 3 while being transferred to the gripper 8. At the same time, the plugs 3 or the mechanisms are prevented from being damaged in case an erroneous picking of several superposed plugs 3 takes place.

[0026] In accordance with FIG. 3, the storage container 6 may have a substantially flat bottom, but it is more advantageous that the storage container comprises a conical lower part 10 as shown in FIGS. 4 and 5 (or it is conical throughout or otherwise downwardly tapering), whereby the picker 7 is arranged to move through the lowest extending zone of the conical lower part 10, or from the conical part 10 there projects a downward-pointing tubular extension 11, through which the picker 7 is arranged to move. In connection with FIGS. 3 to 5, reference M denotes a multitude of plugs in the storage container.

[0027] In order to remove a plug 3 that is in a wrong position in the picker 7 or that is in a correct position in the picker 7, but on top of which extraneous plugs 3 have possibly accumulated, there is additionally arranged a dragging member, a jolter or the like (not shown herein) to cover the travel of the picker 7.

[0028] A preferred embodiment of the gripper 8 shown in FIGS. 7 to 11 is a vertical structure that is movable in a lateral direction and comprises a frame 12 and, arranged in the lower part thereof, a sleeve-type annular part 13, the inner side of the downwardly-pointing end of which ends in a downwardly-widening, conical inner rim 14, whose smallest inner diameter is inferior to the outer diameter of the circumferential rim 5 of the plug 3 and the inner diameter of the annular part 13 thereabove is at least equal to the outer diameter of the circumferential rim 5 of the plug 3 for the height of the circumferential rim 5 of the plug 3. This means that the conical inner rim 14 forms above a point where its inner diameter is narrowest a support shoulder 15 for the circumferential rim 5 of the plug 3 to rest on. The lower part of the frame 12, whose lower surface has a shape that corresponds substantially to the shape of the upper surface of the plug 3, is in turn located inside the annular part 13 for the relative vertical movement of the annular part and the lower part of the frame 12 so as to press the plug 3 into the paint can lid 1.

[0029] In order to detect the can lid 2 when fitting the plug 3, there is arranged a spring system 16 between the lower part of the frame 12 of the picker 8 and the annular part 13 arranged therein for providing vertical elasticity between the lower part of the frame 12 and the annular part 13. This spring system appears only in FIG. 10 and, for the sake of clarity, it is omitted in FIGS. 7 to 9 and 11. For detecting the can lid 2 it is also possible to mount a sensor in the sleeve 13.

[0030] In the described example, in the lower part of the frame 12 of the picker 8 there are arranged means 17 for detecting the plug 3 and its location at any particular time. These detecting means comprise a probe 17 arranged in the lower part of the frame 12 and moving in a vertical direction into and out of said frame, the end of the probe being provided with a detecting sensor (not shown). For instance, an optical sensor, a capacitive sensor, a distance-measuring laser or compressed air may also be used as the detecting means.

[0031] The means for implementing the mutual vertical movement of the gripper 8 and the paint can and thereby pressing the plug 3 into place in the paint can lid 1 are here simply comprised by a vertically movable base (not shown) of the paint can. Alternatively, a vertically movable picker 8 could also be considered.

[0032] The above-described system for plugging paint cans in accordance with the invention operates as follows:

[0033] First, in accordance with FIGS. 3 to 5, the objective is to pick just one plug 3 that is in a correct position from a multitude M of plugs 3 with different orientations in order to carry out plugging. In particular, in the case of FIGS. 3 and 5, plugs poured into the storage container 6 gravitate to a tubular extension 11 belonging to the conical lower part 10 of the storage container, in which extension a plug 3 that is centrally in a correct position will drop. Now that the picker 7 is pushed through the storage container 6 and the multitude M of plugs, it is likely that the desired one plug 3 that is in correct position will be caught by the upper surface of the picker 7 as shown in FIG. 5 such that the cuplike part 4 of the plug is inside the picker 7. It is also possible that at first a plug 3 is in a wrong position on the picker 7, or on top of a plug 3 that is in correct position there are extra plugs 3. The dragging member, jolter or the like that is described above, but not shown, removes these misplaced or extra plugs 3 off the picker 7.

[0034] Next, in accordance with FIGS. 7 to 9, the plug 3 locating in the picker 7 is pushed to a gripper 8 that is moved to be vertically aligned with the picker 7. The plug 3 penetrates through the conical inner rim 14 of the annular part 13 of the gripper 8 bypassing the upper part of the inner rim 14, which is more reduced than the circumferential rim 5 of the plug 3, and remaining supported through its circumferential rim 5 by a support shoulder 15 above the inner rim 14. This takes place with the proviso that the plug 3 is in correct position in the picker. The detecting probe 17 with its sensors checks here the situation. If the plug 3 is upside down or several plugs are in superposition, a spring system 16, or the earlier described spring system 9, will yield. Spring forces of the spring systems 16 and 9 are selected such that they will not harm the plugs. Only the plug 3 that is caught in the gripper 8 by its circumferential rim 5 is able to press the detecting probe 17 after the picker 7 has left the vicinity of the gripper and to tell that the plug 3 is reliably held by the gripper 8. If the picking and the subsequent gripping fail, these steps are repeated until they succeed in an appropriate manner.

[0035] Then the gripper 8, or the paint can in relation thereto, is transferred (either with an integrated or separate transfer device, not shown) to the location of the hole 2 in the paint can lid 1 waiting for plugging (FIGS. 10 and 11). The plug 3 is mounted in place such that the gripper 8 with the plug 3 adhering thereto is held in place and the paint can is pushed by means of its base (not shown) against the gripper 8 and the plug 3 (FIG. 10) and it is pressed so hard that the annular part 13 of the gripper 8 is pushed upwardly against the spring force of the spring system 16, whereby the lower part of the frame 12 of the gripper 8, by means of the shape of its lower surface, presses the plug 3 into the hole 2 in the paint can lid 1. When
pressing is completely performed, the plug 3 is swapped from the gripper to the lid 1. Now that the paint can is lowered (FIG. 11), the detecting probe 17 of the gripper 8 detects on a given travel that the plug 3 is reliably attached to the paint can lid 1. The time, in which the paint can is shifted away in relation to the reaction point of the detecting probe 17, indicates whether the plug 3 is adhered to the lid 1.

[0036] After plugging the paint can is transferred to a mixer and after mixing the can is handed over to the customer.

[0037] The above description of the invention is only intended to illustrate the basic idea of the invention. Thus, a person skilled in the art may implement the details of the invention in a variety of ways within the scope of the attached claims.

1-12. (canceled)

13. A system for plugging paint cans, which system is arranged to press a hollow, cuplike, elastic plug provided with protruding circumferential rim into a hole made in a paint can lid in a sealed manner by means of the plug's shape, whereby the circumferential rim of the plug mounted in place is supported to the surface of the paint can lid, wherein the system comprises:

- a storage container for plugs;
- a picker for picking one plug at a time from the storage container;
- a gripper for gripping the plug picked from the storage container and for carrying it above a container lid to be closed; and
- means for performing a mutual vertical movement of the gripper and the paint can in order for thereby pressing the plug in place in a sealed manner in the lid of the paint can;

wherein:

- the picker is arranged to move vertically through the storage container and the upper part thereof is shaped to receive a cuplike part of the plug such that the circumferential rim of the plug rests against the upper surface of the upper part of the picker; and
- at least the upper part of the picker is tubular.

14. The system of claim 13, further comprising a vertical spring system arranged in the picker.

15. The system of claim 13, wherein the storage container has a substantially flat bottom.

16. The system of claim 13, wherein the storage container comprises a conical lower part, the picker being arranged to move through a lowest extending area of the conical lower part.

17. The system of claim 16, further comprising a downwardly pointing tubular extension which protrudes from the conical part, through which downwardly pointing tubular extension the picker is arranged to move.

18. The system of claim 13, wherein the picker comprises a vertical structure that is movable in a lateral direction and which in turn comprises a frame and a sleeve-type annular part arranged in a lower part of the frame, an inner side of a downwardly-pointing end of which ends in a downwardly-widening, conical inner rim, whose smallest inner diameter is inferior to an outer diameter of the circumferential rim of the plug, the inner diameter of the annular part thereafter being at least equal to the outer diameter of the circumferential rim of the plug for the height of the circumferential rim of the plug, the lower part of the frame, whose lower surface substantially corresponds in shape to that of the upper surface of the plug, extending inside the annular part for mutual vertical movement of the annular part and the lower part of the frame in order for pressing the plug into the paint can lid.

19. The system of claim 18, further comprising a spring system located between the lower part of the frame of the gripper and the annular part arranged thereto, the spring system being configured for vertical elasticity between the lower part of the frame and the annular part.

20. The system of claim 18, further comprising means for detecting the plug and its location arranged in the lower part of the frame of the gripper.

21. The system of claim 20, wherein the detecting means comprise a detecting probe arranged in the lower part of the frame and moving in the vertical direction into and out of the frame, the head of the detecting probe being provided with a sensor.

22. The system of claim 20, wherein the detecting means comprises one of an optical sensor, a capacitive sensor, a distance-measuring laser, and compressed air.

23. The system of claim 18, wherein the sleeve is provided with a sensor for detecting the can lid.

24. The system of claim 13, wherein the means for performing the mutual vertical movement of the gripper and the paint can comprise a vertically movable base of the paint can.

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