

SPECIFICATION

End closure for a hollow cylindrical extrusion press container

This invention relates to an end closure of resilient material for a hollow cylindrical extrusion press container, particularly for a cartridge, and serving as an expulsion piston head for viscous plastic material in the container.

The end closure comprises a crown plate facing towards a reservoir chamber for the material within the extrusion press container, a hollow skirt portion extending towards the filling aperture of the extrusion press container and guided on the internal wall surface of the container, and at least one resilient sealing lip formed from the material of the hollow skirt portion, encircling the external surface of the skirt portion, and in contact with the internal wall surface of the container.

In the case of extrusion press containers filled with permanently plastic, permanently resilient, hardenable and other similar paste-like materials, particularly sealing compounds, expulsion pistons of this type are used which serve at the same time as end closures for the extrusion press container up to the time that the plastic material is used. With such end closures it is of particular importance that the end closure should allow the escape of the air present ahead of the crown plate on inserting the end closures into the extrusion press container, in order to prevent any adverse influence on the plastic material due to the presence of such trapped air. Additionally, it is necessary to ensure a reliable sealing between the internal wall surface of the extrusion press container and the external wall surface of the end closure or of its hollow skirt portion, when in the driving forward of the end closure as an expulsion piston, the hollow skirt portion is directly subjected to the force of a pressurised medium. If the pressurised medium is allowed to get past the piston head into the reservoir chamber of the extrusion press container this could lead on the one hand to a change in the properties of the enclosed material, possibly to a hardening of the material, and could lead on the other hand to an irregular expulsion of the material from the extrusion press container.

In known end closures or expulsion pistons of the type referred to above, for example as disclosed in German patent specification 20 34 047 and German Gebrauchsmuster 74 00 492, the sealing lips which are used have an approximately triangular cross-section with flanks inclined at an angle to each side of the vertex, with the vertex of the sealing lip being pressed at right-angles against the internal wall surface of the extrusion press container. With this arrangement it is questionable whether one achieves a reliable venting of the air present in the enclosed material upon the insertion of the end closure, since, because of the perpendicular pressure contact of the vertices of the lips one tends to create a seal against the passage of air. On the other hand however, the sealing effect of

these sealing lips is not sufficient to enable one to use a pressurised medium which acts directly against the expulsion piston, since the action of the pressurised medium can easily lead to a lifting of the sealing lip from the internal wall surface of the extrusion press container, since a substantial part of the force exerted by the pressurised medium on the sealing lip acts on the flank of the sealing lip which is inclined towards the reservoir chamber of the extrusion press container and this forces the lip away from the internal wall surface. The situation is further complicated by the fact that the sealing lips used with the known expulsion pistons cannot adapt themselves to a sufficient degree to any variations in the internal diameter of the extrusion press container, and in practice it is not possible to avoid the occurrence of such variations in diameter when one is dealing with the mass production of such extrusion press containers.

It is an object of the present invention to provide an end closure of the type first referred to above in which both of the two aforementioned requirements are fulfilled to the greatest possible extent, i.e. on the one hand one has a satisfactory venting of the reservoir chamber of the extrusion press container upon the insertion of the end closure or expulsion piston, and on the other hand and more importantly one has a secure seal between the internal wall surface of the container and the end closure when the end closure is directly subjected to a pressurised medium for the purpose of driving the piston forwards, while at the same time the end closure is adaptable to take account of manufacturing variations in the internal diameter of the extrusion press container which is used.

This is achieved in accordance with the present invention by an end closure of resilient material for a hollow cylindrical extrusion press container and serving as an expulsion piston head for viscous plastic material within the container, especially for a container formed as a cartridge, the end closure comprising a crown plate facing towards a reservoir chamber for the material within the extrusion press container, a hollow skirt portion extending from the crown plate towards the filling opening of the extrusion press container and guided on the internal wall surface of the container, and at least one resilient sealing lip contacting the internal wall surface of the container, formed from the material of the hollow skirt portion, and extending circumferentially around the external surface of the skirt portion, in which on that face of said at least one sealing lip facing towards the open end of the hollow skirt portion there is provided a circumferentially extending open pressure pocket such that in the event of a build-up of pressure within the reservoir chamber of the extrusion press container the peripheral edge of the sealing lip or lips lifts away from the internal wall surface of the container, while the action of a pressurised medium from the open end of the hollow skirt portion causes the peripheral edge of the sealing lip or lips to be

pressed against the internal wall surface of the container.

By this means one ensures that the sealing lips are permanently maintained in a state such that they can fulfil the desired function. If pressure is exerted on the sealing lips by air trapped within the reservoir chamber, then the sealing lips can deform inwards in the direction to close the pressure pockets, and in this way a venting gap for the air is formed between the peripheral edge of the lip or lips and the internal wall surface of the extrusion press container. If on the other hand the pressurised medium is utilised to force in the end closure or expulsion piston, then this pressurised medium acts on the pressure pockets in the sense to enlarge them and consequently in the sense to cause the peripheral edge of the sealing lips to press against the internal wall surface of the extrusion press container, with the result that a very greatly reinforced sealing effect is achieved. Since, in order to ensure the aforesaid high sealing effect, the sealing lips are able to be comparatively severely deformed, they can adapt well to any variations in the internal diameter of the extrusion press container arising from manufacturing tolerances, and likewise can adapt well to any irregularities in the internal wall surface of the extrusion press container. The provision of the pressure pockets means that one always has available an appropriate sealing deformation of the sealing lips.

The mechanical guidance of the hollow skirt portion can be achieved or aided, with the end closure of the present invention, by the use of only one such sealing lip through a suitable known construction of the hollow skirt portion, for example by providing annular or even axial projections on the external surface of the hollow skirt portion.

A construction of sealing lip and pressure pocket which is particularly simple to manufacture and which additionally and reliably accomplishes the aforesaid functions is achieved in accordance with a preferred embodiment of the invention if both faces of said at least one sealing lip are inclined swept back at an angle from base to apex towards the open end of the hollow skirt portion. With this arrangement the cross-section of the sealing lip is sawtooth-shaped, and it produces a circumferential pressure pocket between the rearward lip face and the external wall surface of the hollow skirt portion which is approximately triangular in axial cross-section. A sealing lip formed in this way can easily move away from the internal wall surface of the container if air is trapped within the reservoir chamber, while on the other hand, because of the circumferential wedge-shaped pressure pocket, the lip is forcefully and reliably pressed against the internal wall surface of the extrusion press container if the pocket is subjected to pressure from the pressurised medium used to drive the end closure inwards. Consequently, one reliably avoids the pressurised medium getting past the sealing lip into the reservoir chamber, and consequentially one also

reliably avoids the pressurised medium coming into contact with the plastic material upon further expulsion of the material from the container and which could lead for example to the spraying out of the material from the container nozzle at the instant when the trapped air and plastic material jointly reach the nozzle.

According to a further preferred embodiment of the invention, a plurality of such sealing lips provided with pressure pockets are arranged one behind the other on the external wall surface of the hollow skirt portion. In this way, on the one hand, the aforesaid sealing effect of the end closure is substantially aided. In addition to the aforesaid venting and sealing effects, by means of this multiple arrangement of sealing lips, one achieves an effective mechanical guidance and support of the hollow skirt portion on the internal wall surface of the extrusion press container such that one can dispense entirely with any separate guide means. This of course leads to a simplification of the structure. Also, at least one of the sealing lips positioned towards the open end of the hollow skirt portion may be provided with peripheral gaps arranged spaced around its circumference, so that these discontinuous sealing lips perform only a supporting and guidance function. The sealing lip or lips positioned further forward towards the crown plate then carry out the aforesaid sealing function.

In accordance with a further preferred feature of the invention, in front of the sealing lip or lips, there is provided a wiping lip extending circumferentially around the outer edge of the crown plate. By this means, in addition to the action of the sealing lips, one achieves a wiping of the material from the internal wall surface of the extrusion press container at the immediate junction with the crown plate upon the forward movement of the end closure or expulsion piston. With this arrangement it is particularly advantageous if, according to a further preferred feature of the invention, an annular lip is provided within the hollow skirt portion, projecting towards the open end of the hollow skirt portion, and at the junction between the hollow skirt portion and the internal surface of the crown plate, and if the crown plate also carries an annular buffer of lesser depth than the said annular lip and positioned on the surface of the crown plate internally of the hollow skirt portion. The annular lip and annular buffer function jointly with the wiping lip when a mechanical advance of the end closure is effected by inserting a ram or feed plate into the end closure or expulsion piston. Such a ram or pressure plate first contacts the annular lip and as a consequence spreads the wiping lip out into contact with the internal wall surface of the extrusion press container. When the ram or pressure plate reaches the annular buffer ring the actual forward movement of the end closure or expulsion piston begins. In this way one achieves an extremely reliable wiping effect in addition to the venting and sealing effects created by the sealing lips. Additionally, the end closure or

expulsion piston formed in this way is suited in the best possible manner to achieve the aforesaid advantages when it is powered exclusively by pressurised medium.

5 A further particularly advantageous embodiment of the invention is achieved if the open end of the hollow skirt portion is flared outwards conically to form a further sealing lip. On the one hand this flared end can then perform a further venting, sealing and/or guiding function just like one of the other sealing lips, and on the other hand one has the advantage that with mechanical powering of the end closure or expulsion piston with the aid of a mechanical driving means, for example a ram or pressure plate of an expulsion gun, even in the case where the driving means is not accurately aligned, for example if the pressure plate is not accurately aligned, this always ensures that the mechanical driving means can slide into the piston head along the conical face of the open end of the hollow skirt portion, and one therefore ensures that this mechanical driving element does actually reach the crown plate or the aforesaid buffer means and cannot be caught up on the end wall of the piston head as might happen with a blunt end face on the hollow skirt portion which would thereby cause the piston head to be tilted when expulsion of the plastic material takes place.

30 Further features, advantages and details of the invention will become apparent from the following description of two preferred embodiments of end closure in accordance with the present invention. These embodiments are described by way of example and with reference to the accompanying drawings. In the drawings, for the sake of simplification, only a portion of the extrusion press container is shown in each case. In the drawings:

40 Fig. 1 is a longitudinal sectional view through a first embodiment of end closure in accordance with the invention formed to be rotationally symmetrical about the central longitudinal axis;

45 Fig. 2 is a partial sectional view through a filled extrusion press container fitted with the end closure shown in Fig. 1, but before it is subjected to the force of a pressurised medium;

50 Fig. 3 is a longitudinal sectional view similar to Fig. 2, but after the end closure has been subjected to the pressurised medium;

55 Fig. 4 is a longitudinal sectional view through a second embodiment of end closure in accordance with the invention formed to be rotationally symmetrical about the central longitudinal axis;

60 Fig. 5 is a longitudinal sectional view through a portion of a filled extrusion press container fitted with the end closure of Fig. 4, but before it is subjected to the force of a pressurised medium or of a mechanical driving means;

65 Fig. 6 is a longitudinal sectional view similar to Fig. 5, but after the end closure has been subjected to a mechanical driving element which is not shown but which is to be understood as abutting the annular lip and annular buffer ring and having spread the wiping lip; and,

Fig. 7 is a detail sectional view through an end

closure in accordance with the present invention in the region of one of the sealing lips in order to clarify the lip shape.

70 The end closures shown in Fig. 1 and Fig. 4 serve as expulsion piston heads for viscous plastic material contained within a hollow cylindrical extrusion press container 3, particularly one formed as a cartridge.

75 Each of the end closures shown in Figs. 1 and 4 is made of a resilient plastics material produced by an injection moulding process. The end closure or piston head in each case comprises a crown plate 1 facing towards the reservoir chamber of the extrusion press container 3, and a hollow skirt portion 2 extending back towards the filling aperture of the extrusion press container and which, as can be seen from Figs. 2 and 3 and Figs. 5 and 6, is guided on the internal wall surface of the extrusion press container 3.

85 In each of the embodiments shown in Figs. 1 to 3 and Figs. 4 to 6 resilient sealing lips 4 are provided, formed from the material of the hollow skirt portion 2, extending circumferentially around the external wall surface of this skirt portion, and in contact with the internal wall surface of the extrusion press container. Each sealing lip 4 is provided with a circumferentially extending open pressure pocket 5 on that face which faces towards the open end of the hollow skirt portion 2. In order to achieve this, both faces of the sealing lip 4 are formed at an inclined angle to the longitudinal axis and are swept back towards the open end of the hollow skirt portion 2 from the base of the lip towards the apex. As is shown particularly clearly in Fig. 7, this results in an annular conical or annular wedge-shaped pocket which is substantially triangular in axial cross-section, and which is open towards the open end of the hollow skirt portion 2 and thus in the direction towards the filling end of the extrusion press container 3. The sealing lips 4 are arranged behind one another on the outside of the hollow skirt portion 2, as is clearly shown in the drawings.

100 Both in the embodiment shown in Figs. 1 to 3 and in the embodiment shown in Figs. 4 to 6 a circumferential wiping lip 6 is also provided around the outer edge of the crown plate 1 and formed from the material of the end closure. Moreover, in the case of the end closure shown in Figs. 4 to 6, an annular lip 7 is provided within the hollow skirt portion 2 and projecting inwardly towards the open end of the hollow skirt portion from the junction between the skirt portion and the internal wall surface of the crown plate 1. On the wall surface of the crown plate 1 which is within the hollow skirt portion 2 there is provided an annular buffer ring 7a which is of lesser depth than the annular lip 7. This construction of the end closure enables it to be used in conjunction with a mechanical driving member, particularly a pressure plate or expulsion ram. If such a driving member is inserted into the end closure, then it first deforms the annular lip 7, with the result that the external wiping lip 6 is spread outwards into contact with the internal wall surface of the

extrusion press container 3, until the driving member comes up against the buffer ring 7a (Fig. 6), whereupon the actual advance movement of the end closure or expulsion piston begins. By this means the plastic material 8 within the reservoir chamber of the extrusion press container 3 is reliably wiped away from the internal wall surface of the extrusion press container.

If the end closure described above and shown in the drawings, in each of its two embodiments, is inserted into the extrusion press container after the filling of the container with the plastic material 8, then, as is shown in Fig. 2 and Fig. 5, the sealing lips 4 are resiliently deformed inwards with consequential compression of the respective pressure pockets 5, and those faces of the sealing lips which face towards the reservoir chamber of the extrusion press container 3 are pressed inwards. Any air trapped in the reservoir chamber by the material 8 can easily escape from the reservoir chamber by further resilient deformation of the sealing lips 4 towards the pressure pockets 5.

If the end closure is now subjected to the force of a pressurised medium from the open end of the hollow skirt portion to drive it forward, then the material contained within the extrusion press container will be expelled, and the pressurised medium acts on that face of the sealing lip 4 which is directed towards the open end of the hollow skirt portion, i.e. exerts pressure in the pressure pockets 5, such that the peripheral edge of the sealing lip 4 is pressed firmly against the internal wall surface of the container. Fig. 3 shows in comparison to Fig. 2 the deformation of the sealing lip 4 which is thereby achieved with the accompanying reduction in size of the pressure pockets 5. The increased pressure of the pressurised medium leads, as is shown clearly from the drawings, to a lasting increase in the contact pressure of the circumferential edge of the sealing lips 4 against the internal wall surface of the extrusion press container 3, and thus to an increase in the sealing force.

If it is found that in particular applications the use of a single sealing lip with pressure pockets is sufficient, then the sealing lip 4 which is shown positioned towards the open end of the hollow skirt portion 2 can be provided with peripheral gaps arranged spaced around its circumference so that this lip or lips only performs a supporting function, while the forward sealing lip 4 positioned closer or closest to the crown plate 1 carries out the aforesaid sealing function.

The embodiments shown in the drawings also clearly show that by means of the construction of the sealing lips 4 in accordance with the invention one achieves a particularly good and substantial adaptation to different internal diameters of the extrusion press container 3 and also to any unevenness or irregularity in this internal wall surface. This is particularly so when one compares these sealing lips with the known sealing lips referred to earlier which are made for example with a shape similar to that which is used for the

wiping lip 6 on the piston head of the present invention.

Figs. 4 to 6 show a further advantageous feature of an end closure in accordance with the invention. Here, the open end of the hollow skirt portion 2 is outwardly flared conically to form a further sealing lip 9. This flared end on the one hand performs the function of a sealing lip and on the other hand ensures the trouble-free introduction of a mechanical driving member, for example a pressure plate or ram of an expulsion gun or the like, into the piston head.

CLAIMS

1. An end closure of resilient material for a hollow cylindrical extrusion press container and serving as an expulsion piston head for viscous plastic material within the container, especially for a container formed as a cartridge, the end closure comprising a crown plate facing towards a reservoir chamber for the material within the extrusion press container, a hollow skirt portion extending from the crown plate towards the filling opening of the extrusion press container and guided on the internal wall surface of the container, and at least one resilient sealing lip contacting the internal wall surface of the container, formed from the material of the hollow skirt portion, and extending circumferentially around the external surface of the skirt portion, in which on that face of said at least one sealing lip facing towards the open end of the hollow skirt portion there is provided a circumferentially extending open pressure pocket such that in the event of a build-up of pressure within the reservoir chamber of the extrusion press container the peripheral edge of the sealing lip or lips lifts away from the internal wall surface of the container, while the action of a pressurised medium from the open end of the hollow skirt portion causes the peripheral edge of the sealing lip or lips to be pressed against the internal wall surface of the container.

2. An end closure according to claim 1, in which both faces of said at least one sealing lip are swept back at an inclined angle towards the open end of the hollow skirt portion from the base to the apex of the or each lip.

3. An end closure according to claim 1 or 2, in which a plurality of said sealing lips with pressure pockets are provided behind one another on the external surface of the hollow skirt portion.

4. An end closure according to claim 3, in which at least one of said sealing lips positioned towards the open end of the hollow skirt portion is provided with peripheral gaps arranged spaced around its circumference.

5. An end closure according to any preceding claim, in which a wiping lip extending circumferentially around the outer edge of the crown plate is provided in advance of the sealing lip or lips.

6. An end closure according to claim 5, in which an annular lip is provided within the hollow

4



extrusion press container 3, until the driving member comes up against the buffer ring 7a (Fig. 6), whereupon the actual advance movement of the end closure or expulsion piston begins. By this means the plastic material 8 within the reservoir chamber of the extrusion press container 3 is reliably wiped away from the internal wall surface of the extrusion press container.

If the end closure described above and shown in the drawings, in each of its two embodiments, is inserted into the extrusion press container after the filling of the container with the plastic material 8, then, as is shown in Fig. 2 and Fig. 5, the sealing lips 4 are resiliently deformed inwards with consequential compression of the respective pressure pockets 5, and those faces of the sealing lips which face towards the reservoir chamber of the extrusion press container 3 are pressed inwards. Any air trapped in the reservoir chamber by the material 8 can easily escape from the reservoir chamber by further resilient deformation of the sealing lips 4 towards the pressure pockets 5.

If the end closure is now subjected to the force of a pressurised medium from the open end of the hollow skirt portion to drive it forward, then the material contained within the extrusion press container will be expelled, and the pressurised medium acts on that face of the sealing lip 4 which is directed towards the open end of the hollow skirt portion, i.e. exerts pressure in the pressure pockets 5, such that the peripheral edge of the sealing lip 4 is pressed firmly against the internal wall surface of the container. Fig. 3 shows in comparison to Fig. 2 the deformation of the sealing lip 4 which is thereby achieved with the accompanying reduction in size of the pressure pockets 5. The increased pressure of the pressurised medium leads, as is shown clearly from the drawings, to a lasting increase in the contact pressure of the circumferential edge of the sealing lips 4 against the internal wall surface of the extrusion press container 3, and thus to an increase in the sealing force.

If it is found that in particular applications the use of a single sealing lip with pressure pockets is sufficient, then the sealing lip 4 which is shown positioned towards the open end of the hollow skirt portion 2 can be provided with peripheral gaps arranged spaced around its circumference so that this lip or lips only performs a supporting function, while the forward sealing lip 4 positioned closer or closest to the crown plate 1 carries out the aforesaid sealing function.

The embodiments shown in the drawings also clearly show that by means of the construction of the sealing lips 4 in accordance with the invention one achieves a particularly good and substantial adaptation to different internal diameters of the extrusion press container 3 and also to any unevenness or irregularity in this internal wall surface. This is particularly so when one compares these sealing lips with the known sealing lips referred to earlier which are made for example with a shape similar to that which is used for the

wiping lip 6 on the piston head of the present invention.

Figs. 4 to 6 show a further advantageous feature of an end closure in accordance with the invention. Here, the open end of the hollow skirt portion 2 is outwardly flared conically to form a further sealing lip 9. This flared end on the one hand performs the function of a sealing lip and on the other hand ensures the trouble-free introduction of a mechanical driving member, for example a pressure plate or ram of an expulsion gun or the like, into the piston head.

CLAIMS

1. An end closure of resilient material for a hollow cylindrical extrusion press container and serving as an expulsion piston head for viscous plastic material within the container, especially for a container formed as a cartridge, the end closure comprising a crown plate facing towards a reservoir chamber for the material within the extrusion press container, a hollow skirt portion extending from the crown plate towards the filling opening of the extrusion press container and guided on the internal wall surface of the container, and at least one resilient sealing lip contacting the internal wall surface of the container, formed from the material of the hollow skirt portion, and extending circumferentially around the external surface of the skirt portion, in which on that face of said at least one sealing lip facing towards the open end of the hollow skirt portion there is provided a circumferentially extending open pressure pocket such that in the event of a build-up of pressure within the reservoir chamber of the extrusion press container the peripheral edge of the sealing lip or lips lifts away from the internal wall surface of the container, while the action of a pressurised medium from the open end of the hollow skirt portion causes the peripheral edge of the sealing lip or lips to be pressed against the internal wall surface of the container.

2. An end closure according to claim 1, in which both faces of said at least one sealing lip are swept back at an inclined angle towards the open end of the hollow skirt portion from the base to the apex of the or each lip.

3. An end closure according to claim 1 or 2, in which a plurality of said sealing lips with pressure pockets are provided behind one another on the external surface of the hollow skirt portion.

4. An end closure according to claim 3, in which at least one of said sealing lips positioned towards the open end of the hollow skirt portion is provided with peripheral gaps arranged spaced around its circumference.

5. An end closure according to any preceding claim, in which a wiping lip extending circumferentially around the outer edge of the crown plate is provided in advance of the sealing lip or lips.

6. An end closure according to claim 5, in which an annular lip is provided within the hollow



16

- 5 skirt portion projecting towards the open end of the hollow skirt portion and at the junction between the crown plate and the skirt portion, and in which an annular buffer ring is provided within the hollow skirt portion on the internal wall surface of the crown plate and with an axial depth which is less than that of said annular lip.
7. An end closure according to any preceding

- 10 claim, in which the open end of the hollow skirt portion is flared outwards to form a further sealing lip.
8. An end closure for a hollow cylindrical extrusion press container substantially as hereinbefore described with reference to Figs. 1 to 3 and 7 or Figs. 4 to 7 of the accompanying drawings.
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