

Device for locking and unlocking platens

in a moulding machine

This invention relates to an injection mould, particularly a plastics injection mould or a compression mould, comprising a plurality of platens, i.e. mould platens or ejector plates which are movable together and apart in
5 at least two separating regions, at least one device for locking and unlocking the platens, said device comprising a control strip which is fastened, at its one end, rigidly to a first platen, a coupling strip, which extends oppositely
10 to the control strip and which is fastened, at its one end, to a third platen, and a spring-loaded locking bolt which is attached, in a manner rigid against tension and compression in the direction of movement of the platens, to a second platen between the first and third platens and which has at least one complementary locking face, inter-
15 acting with at least one locking face of the coupling strip, and which has at least one complementary control face, interacting with, respectively, a control face of the control strip, which is inclined to the planes of separation of the platens.

20 The above-described known device for locking and unlocking on injection moulds, particularly plastics injection moulds or compression moulds, is described in German Auslegeschrift 2,215,506. In the known device, the coupling strip and the control strip, which is
25 arranged in another vertical plane, pass through a guide slot of a guide block, which is fastened to the second

mould platen, for example to the second mould plate. A rotary bolt, in the basic form of a segment of a circle, with a locking and control lug, and which is fastened in the guide block, projects into the guide slot under spring loading.

For unlocking, one of the control faces of the control strip, which are arranged substantially in an inverted V-shape, presses against the control lug and, upon rotation of the rotary bolt against the spring restoring force, presses said control lug inwards, during which, at the same time, the locking lug can move out of the coupling recess, having the cross-section of a scalene triangle, of the coupling strip, with disengagement of said coupling strip.

The function of the known device can be described as follows: the moving apart of the mould platens is started via the third mould platen, which is set in motion. Thereupon, a first separating region opens, in the first instance, between the first and second mould platens, since the second mould platen is connected in its movement to the third mould platen, via the coupling recess of the coupling strip, by means of the rotary bolt, which is fastened indirectly to said second mould platen. On the other hand, the first mould platen is arranged in a spatially fixed position. The second and third mould platens are connected in their movement to one another, until the control face of the control

strip lies against the complementary control face, which is constituted by the locking lug of the rotary bolt. When the tractively connected second mould platen moves further, the edge which limits the control face of the control strip outwardly, rolls linearly on the complementary control face of the locking lug of the rotary bolt. As the movement continues, the rotary bolt is rotated so far that the locking lug is disengaged from the coupling recess, whereupon the second mould platen is stopped and the third mould platen, together with the coupling strip, can move further, thereby opening the second separating region.

The mould platens are moved together in reverse sequence. In this case, the second, that is to say the middle mould platen, together with its guide block containing the rotary bolt, is, in the first instance, in a spatially fixed position. While, in the first place the second separating region closes during the return stroke, the coupling strip penetrates into the guide slot of the guide block, until the third mould platen abuts against the middle mould platen and pushes the latter before it, with which action a movement of the guide block relative to the control strip is associated. During this relative movement, the outer edge limiting the control face of the control strip rolls on the complementary control face of the locking

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lug, with the spring restoring force being relieved, until the locking lug is engaged into the coupling recess of the coupling strip. As the return stroke continues along the control strip, the first separating region also closes, whereupon the starting point of the description of functioning would be reached again.

The known device is used in conjunction with an injection or die-casting mould, in which, in the first instance, a core is drawn (first separating region) and, thereafter, the upper and lower mould halves are separated from one another (second separating region), in order to eject the article.

In the known device, it is felt to be disadvantageous that the locking lug can be held in the coupling recess of the coupling strip only by applying a considerable spring restoring force. On the other hand, this considerable spring restoring force must be overcome during the above-mentioned control action. Because the edge which limits the control face of the control strip outwardly rolls linearly, with the considerable spring restoring force being overcome, on the complementary control face which is constituted by the locking lug, there arises a disproportionately large Hertzian pressure per unit area, with the disadvantageous consequence of excessive wear.

Starting from the device described in the introduction (German Auslegeschrift 2,215,506), an object of

the invention is, while avoiding the disadvantages of the prior art, to provide a device of this kind for locking and unlocking, which works with as little wear as possible.

5 Accordingly, the present invention consists in an injection mould or a compression mould, comprising a plurality of platens, i.e. mould platens or ejector plates, which are movable together and apart in at least two separating regions, at least one device for locking and
10 unlocking the platens, said device comprising a control strip, which is fastened, at its one end, rigidly to a first platen, a coupling strip, which extends oppositely to the control strip and which is fastened, at its one end, to a third platen, and a spring-loaded locking bolt
15 which is attached, in a manner rigid against tension and compression in the direction of movement of the platens, to a second platen between the first and third platens and which has at least one complementary locking face, interacting with at least one locking face of the coupling
20 strip, and which has at least one complementary control face, interacting with, respectively, a control face of the control strip, which is inclined to the planes of separation of the platens, characterised in that the locking bolt is a component which is guided trans-
25 lationally substantially transversely to the direction of movement (x) of the platens and whose complementary

locking face and whose complementary control face respectively extend, independently of the stroke of the mould platens, at all times parallel to the corresponding locking and control faces of the coupling strip and control strip respectively.

A translationally guided locking bolt is provided according to the invention. This locking bolt carries at least one complementary locking face as well as at least one complementary control face, which extend, independently of the stroke of the mould platens, at all times parallel to the respective corresponding locking face of the coupling strip and to the respective corresponding control face of the control strip. The Hertzian pressure per unit area and, consequently, the wear is minimised due to the substantially two-dimensional to fully two-dimensional contact between the respective corresponding locking and complementary locking faces or control and complementary control faces. This advantage becomes noticeable especially when the control and complementary control faces move against one another during the control action, since, due to this control action, the locking bolt must be disengaged, against the spring restoring force, out of the coupling recess of the coupling strip or engaged into the coupling recess.

In principle, it is possible to imagine structural forms of the subject of the invention, in which the

control strip and coupling strip are arranged in different vertical planes (see German Auslegeschrift 2,215,506). To achieve a favourable flat construction, it has, nonetheless, proved appropriate to arrange the control strip and coupling strip, in a way known per se, next to one another in the same vertical plane. In this connection, an especially advantageous embodiment is an embodiment according to which the locking bolt is a U-shaped component, which is guided translationally along its crosspiece and whose two legs carry the complementary locking face and complementary control face respectively, one leg interacting with the control strip and the other leg with the coupling strip. Because the locking and control functions are allocated to two different parts of the locking bolt, that is to the two legs of the U-shaped locking bolt, there arises a favourable force distribution, which is particularly advantageous for the operating reliability and reduction of wear.

In a further embodiment of the invention, the coupling strip has a U-shaped coupling recess, whose side walls extend parallel to the planes of separation and constitute the locking faces. As already mentioned above, it is necessary, in the subject of German Auslegeschrift 2,215,506, that the locking lug of the rotary bolt is pressed into the coupling recess, with the constant application of a relatively large spring

restoring force, in order to maintain the positive locking to obtain a secure tractive connection between the rotary bolt and the coupling strip. By means of the last-mentioned embodiment of the invention, the locking faces of the coupling strip, which run parallel to the planes of separation, and the complementary locking faces, which consequently likewise extend parallel to the planes of separation, are self-locking. Accordingly, in the device of the invention, the spring restoring force is used only to displace the locking and complementary locking faces, with a minimum expenditure of force, into a locking position, which is, however, thereupon maintained substantially automatically by the corresponding pairs of faces interacting with one another.

In order that the invention may be more readily understood, reference is made to the accompanying drawings which illustrate diagrammatically and by way of example an embodiment thereof, and in which:-

Figures 1 to 4 illustrate the function of the device in each case by means of a more schematic partial side view of an injection mould, whose mould platens can be opened and closed in two separating regions, and

Figure 5 shows a sectional view along the line V-V of Figure 3.

In Figures 1 to 4, the lower half of an injection

mould, which is clamped horizontally in an injection moulding machine (not shown), is illustrated in side view and is designated generally by reference numeral 10.

The device for locking and unlocking, hereinafter shortly referred to as coupling device, is designated, in the illustrations according to Figures 1 to 4, generally by reference numeral 11.

The injection mould 10 has a fixedly mountable clamping platen 12 and a clamping platen 13, movable relative to the platen 12.

The spatially fixed clamping platen 12 characterises the gate side and the movable clamping platen 13 characterises the ejection side of the injection mould 10.

Connected firmly to the spatially fixed clamping platen 12 is a mould plate 14, in which, for example, a mould core or several mould cores (not shown) can be held. A further mould plate, the second mould plate 15, adjoins the mould plate 14.

The third mould plate 16 adjoins the mould plate 15 on the ejection side.

Located between the mould plate 14 and the mould plate 15 and characteristic of a first separating region is a plane of separation I indicated by a dot-and-dash line, whilst a plane of separation II, likewise indicated by a dot-and-dash line, characteristic

of the second separating region, extends between the second mould plate 15 and the third mould plate 16 on the ejection side.

An intermediate platen 17 is connected fixedly both to the third mould plate 16 on the ejection side and to the movable clamping platen 13 on the ejection side.

The coupling device 11 has, among other things, a control strip 18, a coupling strip 19 and a guide block 20, with a U-shaped locking bolt 22, which is displaceable translationally in a U-shaped guide slot 21 transversely to the direction of movement x of the platens and which has two legs 23, 24 and a crosspiece 25.

The control strip 18 is fastened rigidly, in its region pointing to the left in Figures 1 to 4, to the mould plate 14, the so-called first mould plate.

The coupling strip 19, which is located, with the control strip 18, in one and the same vertical plane, is fastened rigidly, with its region pointing to the right in Figures 1 to 4, to the mould plate 16, the so-called third plate.

The guide block 20 is fastened rigidly by means of screws 26 to the mould plate 15, the so-called second mould plate.

The screw fastenings of the control strip 18 and of the coupling strip 19 are provided, in general, with

the reference numeral 27 in Figures 1 to 4.

As may be seen from Figure 5, the guide block 20 is engaged by a base plate 28 and is fastened, together with the latter, to the mould plate 15 by means of the screws 26. For a better illustration of the function of the device, a part of the guide block 20, namely its bridge region 29, has been partly cut away in Figures 2 to 4, so that (also in conjunction with Figure 5) lateral guide pieces 30, 31 can be seen.

The control strip 18 has, at its free end, along a part region of its thickness, a control lug 32 with oblique control faces 33, 34 and with a parallel holding face 35. A matching control face 36 is provided, to correspond to the control face 34, on the leg 23 of the locking bolt 22. The control face 34 and matching control face 36 extend at an angle of inclination of approximately 45° , preferably less than 45° , to the direction of movement x of the platens or to the planes of separation I and II.

The coupling strip 19 is provided with a coupling recess 37, substantially in the form of a U-shaped slot, whose slot walls 38 extend parallel to the planes of separation I, II. The slot walls 38 constitute locking faces, which correspond to matching locking faces 39 on the leg 24 of the locking bolt 22. The matching locking faces 39, also, extend parallel to the planes of separation I, II.

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On the outside of the leg 24 of the locking bolt 22, a compression spring 40 is provided within the guide piece 31 of the guide block 20 and is held adjustably in its compression by means of a screw 41.

According to Figure 1, the injection mould 10 is in its closed position. When the clamping platen 13 on the ejection side is moved to the right (Fig.2), the first separating region opens according to the plane of separation I, so that, for example, the cores (not shown) can be withdrawn. Here, a guide pin 42, among other things, can be seen. Up to the state according to Figure 2, the flat face 43 of the control strip 18 slides on the likewise flat face 44, parallel thereto, on the leg 23 of the locking bolt 22. Moreover, it may be seen from Figure 2 that the oblique control face 34 of the control lug 32 lies against the matching control face 36 of the leg 23 of the locking bolt 22.

When the movement coupled mould plates according to Figure 2 move further to the right away from the spatially fixed mould plate 14 (first mould plate), there finally arises the state according to Figure 3. The illustrations according to Figures 2 and 3 show, in conjunction with one another, that, because of the relative movement between the oblique control face 34 and the corresponding matching control face 36, the locking bolt 22 has been moved against the restoring

force of the spring 40 in the direction of the arrow y. This movement has, at the same time, facilitated the disengagement of the matching locking faces 39 of the leg 24 of the locking bolt 22 from the locking faces 38 of the coupling recess 37. The coupling strip 19 can, consequently, move to the right, together with the platens 13, 17, 16, whilst the second (middle) mould platen 15 has come to a standstill and remains in this position, the holding face 35 of the control lug 32 holding the locking bolt 22, against the restoring force of the compression spring 40, in its disengaged position.

The return stroke into the closed position of the injection mould 10 is effected by the platens 13, 17, 16 being moved to the left, together with the coupling strip 19 fastened rigidly thereto, that is until the platen 16 abuts against the middle mould plate 15 and pushes the latter before it in the manner of a buffer, whereupon the flat face 44 of the leg 23 of the locking bolt 22 is disengaged from the holding face 35 of the locking lug 32, so that the restoring force of the compression spring 40 can push the locking bolt 22 by its leg 24 into the coupling recess 37. As the return stroke continues to the left, the starting state according to Figure 1 is finally reached.

Diverging from the normal operating cycle described above, it is possible that, due to a haphazard

handling of the injection mould, a state according to Figure 4 is reached, according to which the holding face 35 of the control lug 32 is disengaged from the flat face 44 of the leg 23 of the locking bolt 22. In order, nevertheless, to guarantee satisfactory functioning during the return stroke, the coupling strip 19 is provided, at its free end facing the leg 24 of the locking bolt 22, with an additional oblique control face 45, which can interact with a matching control face 46, parallel thereto, on the leg 24, so that, during the closing stroke (movement of the coupling strip 19 to the left), the locking bolt 22 can be displaced, against the restoring force of the compression spring 40, back into its retracted position. Furthermore, the invention provides, as a counterpart to the oblique control face 33 of the control lug 32, a matching control face 47 (indicated by a broken line in Figure 4), parallel to the control face 33, on the leg 23 of the locking bolt 22. During the closing stroke (movement of the middle mould plate 15 to the left), insertion of the locking bolt 22 against the restoring force of the compression spring 40 is guaranteed, for safety's sake, by means of an interaction of the faces 33, 47.

Finally, it may also be mentioned that both the control strip 18 and the coupling strip 19 can work with ample play s transversely to the direction of

movement x of the platens, provided that it is guaranteed that the control lug 32 disengages the leg 24 of the locking bolt 22 from the coupling recess 37 of the coupling strip 19. Such a play s,
 5 which would not be possible in the arrangement of the above-mentioned German Auslegeschrift 2,215,506, makes it considerably easier for the mould builder to assemble the device of the invention.

The device described can not only be used in
 10 conjunction with the mould plates of the injection or compression mould, as illustrated with reference to the exemplary embodiment, but can also be employed, with the same advantages, in the case of a two-stage ejector device of the mould, in which two separating
 15 regions, to be opened and closed in succession, are present, for example, between two ejector plates and a further plate in the mould.

CLAIMS

1. An injection mould or a compression mould, comprising a plurality of platens, i.e. mould platens or ejector plates, which are movable together and apart in at least two separating regions, at least one device
5 for locking and unlocking the platens, said device comprising a control strip, which is fastened, at its one end, rigidly to a first platen, a coupling strip, which extends oppositely to the control strip and which is fastened, at its one end, to a third platen, and a
10 spring-loaded locking bolt which is attached, in a manner rigid against tension and compression in the direction of movement of the platens, to a second platen between the first and third platens and which has at least one complementary locking face, interacting with at least
15 one locking face of the coupling strip, and which has at least one complementary control face, interacting with, respectively, a control face of the control strip, which is inclined to the planes of separation of the platens, characterised in that the locking bolt is a
20 component which is guided translationally substantially transversely to the direction of movement (x) of the platens and whose complementary locking face and whose complementary control face respectively extend, independently of the stroke of the mould platens, at
25 all times parallel to the corresponding locking and control faces of the coupling strip and control strip respectively.



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2. An injection mould as claimed in claim 1, wherein the control strip and coupling strip are arranged next to one another in the same vertical plane.

3. An injection mould as claimed in claim 1 or 2, wherein the locking bolt is a U-shaped component which is guided translationally along its crosspiece and whose two legs carry the complementary locking face and the complementary control face respectively, one leg interacting with the control strip and the other leg with the coupling strip.

4. An injection mould as claimed in any of the preceding claims, wherein the coupling strip has a U-shaped coupling recess, whose side walls extend parallel to the planes of separation (I, II) and constitute the locking faces.

5. An injection mould as claimed in any of the preceding claims, wherein the coupling strip has, additionally, at its free end an oblique control face which extends at an inclination to the planes of separation (I, II) and which interacts with a complementary control face, parallel thereto, on the locking bolt.

6. An injection mould as claimed in any of the preceding claims, wherein the locking bolt is guided to slide in a guide slot, which extends with its longitudinal axis transversely to the direction of



movement (x) of the platens and which is arranged fixedly at least indirectly on the second platen.

7. An injection mould as claimed in claim 6, wherein the guide slot is an integral part of a guide block which is fastened to the second platen.

8. An injection mould or compression mould, substantially as herein described with reference to and as shown in the accompanying drawings.

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