

Improved Mold Lock

The present invention relates to the field of injection molding. More particularly, the present invention relates to a locking device for securing mold plates together.

GB 2067458A discloses an injection mold that includes a plurality of mold platens, at least one device, a coupling strip, and a spring-loaded locking bolt.

In injection molding processes involving three or more mold plates which open and close in sequence, there is a need to secure a set of mold plates forming one or more cavities together after the injection of the molten material into the cavity of the mold plates and during the movement of the set mold plates that have been injected with molten material. The other mold plates are then released in order to effect the removal of the molded article.

An example of such injection molding processes is the tandem injection molding process. In the tandem injection molding process, a first and second set of mold plates are respectively secured and unsecured simultaneously to facilitate the alternate opening and closing of the mold plates. This allows for higher efficiency in the production cycle by utilizing the time taken for cooling phase of a first set of cavities to be used for the removal of the molded article and injection of molten material in a second set of cavities and vice versa.

The securing of the set mold plates together ensures that the mold plates which cavities have been injected with

molten material do not open up prematurely when moving into position, or fall off the guide pin of the mold during production thereby resulting in damage to the mold plates and/or injury to the operator. For similar reasons, there is also a need to secure mold plate sets in non-tandem processes involving three or more mold plates.

While locks for securing mold plates together are known in the prior art, it has been found that the prior art locks may be unintentionally unlocked during production. For example, prior art locks powered by faulty hydraulic actuators may open or close involuntarily during operation. The manual handling of the mold plates by the operator may also result in an accidental opening or closing of the locks or an operator may accidentally activate the controls of the locks. The unintentional unlocking of the locks when the mold plates are held together may result in the separation of the mold plates during opening, and in some situations, may result in the mold plates falling off the guide pin of the mold during production. This may result in damage to the mold plates and/or injury to the operator. Further, the accidental locking of the lock mechanism when the mold plates are separated may result in damage to the lock mechanism when the mold plates move together.

Therefore there is a need for an improved mold lock which cannot be unintentionally locked or unlocked during operation.

The present invention is an improved mold lock for preventing accidental opening or closing of mold plates comprising a latch body moveable between first and second positions, first and second locking tumblers including

first and second locking protrusions respectively attached to the latch body, first and second bolts including first and second locking depressions respectively, and wherein the arrangement of the locking tumblers and the bolts are such that, when the latch body is in a first position, the first locking protrusion of the first locking tumbler engages the first locking depression of the first bolt and secures the first locking tumbler to the first bolt, and when the latch body is in a second position, the first locking protrusion of the first locking tumbler disengages the first locking depression of the first bolt and releases the first locking tumbler from the first bolt.

The first and second bolts are received by the first and second locking tumblers respectively, wherein the locking protrusions of the first and second locking tumblers and the locking depressions of the first and second bolts are configured such that upward or downward vertical movement of the latch body between the first and second positions simultaneously secures the first locking tumbler to the first bolt and releases the second locking tumbler from the second bolt.

Preferably, the improved mold lock includes a safety device comprising a housing having a cavity, and a resilient element positioned in the cavity.

More preferably, the resilient element comprises a compression spring.

Still preferably, the safety device is held in a compressed position by the bolt; and when the bolt is unlocked and moved away from said locking tumbler, the

safety device is released to expand from the compressed position to an expanded position in which expanded position the safety device blocks the locking tumbler whereby the locking tumbler and latch body are prevented from movement.

Preferably, the improved mold lock further includes an actuator attached to the latch body for moving the latch body and said tumbler between first and second positions.

More preferably, the actuator is a hydraulic actuator, a pneumatic actuator, a magnetic actuator, a mechanical actuator, or an electrical actuator.

More preferably, the improved mold lock further includes a guide bar to which the latch body is slidably connected.

Still preferably, the guide bar is configured to move the latch body upwardly and downwardly.

Preferably, when the safety device is released to expand from a compressed position to an expanded position in which expanded position the safety device blocks the locking tumbler whereby the locking tumbler and latch body is prevented from movement along the guide bar.

More preferably, the improved mold lock is combined with first side mold plate, second center mold plate and third side mold plate.

Still preferably, the main latch body is upwardly and downwardly slidably connected to the second center mold plate and at least one said bolt is connected to each or

either of the first side mold plate and third side mold plate.

Preferably, the mold plates open and close relative from each other in a pre-determined sequence.

Figure 1 is a perspective view of one preferred embodiment of the improved mold lock.

Figures 2 to 5 are schematic illustrations of the embodiment of the Figure 1 mold lock incorporated in a tandem type mold, and illustrating the operation of the lock in the sequential operation of the tandem type mold.

Figures 7 to 10 are schematic illustrations of the embodiment of the Figure 6 mold lock incorporated in a 3 plate mold, and illustrating the operation of the lock in the sequential operation of the 3 plate mold in a non-tandem process.

As shown in Figure 1, numeral 100 generically designates one preferred embodiment of the improved mold lock of the present invention. Improved mold lock 100 includes a latch body 22, which is connected to and carries an actuator 20 such that the actuator 20 and latch body 22 both move vertically upwardly and downwardly as indicated by arrow A. Actuator 20 includes an actuator rod 21 which is connected to a stationary head 38 having head screws 36, the latter of which are connected to the center mold plate 204 as shown in Figure 2. The actuator 20 may be any type of actuator, such as a hydraulic, pneumatic, magnetic or mechanical actuator.

As further shown in Figure 1, latch body 22 includes a pair of locking tumblers 24 and 26 which receive bolts 28 and 30. Bolts 28 and 30 terminate in bolt screws 40 which, as shown in Figure 2, are connected to side mold plates 202 and 206. As further shown in Figure 2, the locking tumblers 24 and 26 are configured and shaped with locking protrusions 24a and 26a for alternately being received by and locking in locking depressions 28a and 30a provided on bolts 28 and 30 when the actuator 20 moves the latch body 22 vertically upwardly and downwardly. As shown in Figure 2, a movement of the latch body 22 to the downward vertical position secures bolt 28 to locking tumbler 24 and releases bolt 30 from locking tumbler 26. Conversely, a movement of the latch body 22 to the upward vertical position, as shown in Figure 4, secures bolt 30 to locking tumbler 26 and releases bolt 28 from locking tumbler 24.

Claims

1. An improved mold lock for preventing accidental opening or closing of mold plates comprising:
a latch body moveable between first and second positions,
first and second locking tumblers attached to the latch body,
the first and second locking tumblers including first and second locking protrusions respectively,
a first and a second bolts,
the first and second bolts including first and second locking depressions, respectively,
wherein the first and second bolts are received by said first and second locking tumblers respectively,
wherein said locking protrusions of the first and second locking tumblers and said locking depressions of said first and second bolts are configured such that upward or downward vertical movement of said latch body between the first and second positions simultaneously secures the first locking tumbler to the first bolt and releases the second locking tumbler from the second bolt
wherein the arrangement of the locking tumblers and the bolts are such that, when the latch body is in a first position, the first locking protrusion of the first locking tumbler engages the first locking depression of the first bolt and secures the first locking tumbler to the first bolt,
when the latch body is in a second position, the first locking protrusion of the first locking tumbler disengages the first locking depression of the first bolt and releases the first locking tumbler from the first bolt.

2. The improved mold lock as claimed in claim 1, further including a safety device, the safety device comprising a housing having a cavity, and a resilient element positioned in the cavity.
3. The improved mold lock as claimed in claim 2 wherein the resilient element comprises a compression spring.
4. The improved mold lock as claimed in any one of claims 2 and 3 wherein said safety device is held in a compressed position by said first bolt, and when said first bolt is unlocked and moved away from said first locking tumbler, said safety device is released to expand from the compressed position to an expanded position in which expanded position said safety device blocks said first locking tumbler whereby said first locking tumbler and latch body are prevented from movement.
5. The improved mold lock as claimed in any one of claims 1 to 4 wherein the improved mold lock further includes an actuator attached to the latch body for moving the latch body and said first and second tumblers between first and second positions.
6. The improved mold lock as claimed in claim 5 wherein the actuator is a hydraulic actuator.
7. The improved mold lock as claimed in claim 5 wherein the actuator is apneumatic actuator.
8. The improved mold lock as claimed in claim 5 wherein the actuator is a magnetic actuator.

9. The improved mold lock as claimed in claim 5 wherein the actuator is a mechanical actuator.
10. The improved mold lock as claimed in claim 5 wherein the actuator is an electrical actuator.
11. The improved mold lock as claimed in claim 1 wherein the improved mold lock further includes a guide bar to which the latch body is slidably connected.
12. The improved mold lock as claimed in claim 11 wherein the guide bar is configured to move the latch body upwardly and downwardly.
13. The improved mold lock as claimed in any one of claims 2 to 10 wherein the improved mold lock further includes a guide bar to which the latch body is slidably connected.
14. The improved mold lock as claimed in any one of claims 2 to 10 wherein the improved mold lock further includes a guide bar slidably connected to the latch body for moving the latch body upwardly and downwardly,
wherein when said safety device is released to expand from a compressed position to an expanded position in which expanded position said safety device blocks said first locking tumbler whereby said first locking tumbler and latch body is prevented from movement along the guide bar.

15. The improved mold lock as claimed in any one of claims 1 to 10 in combination with three or more mold plates.
16. The combination of lock and mold plates as claimed in claim 15, wherein said main latch body is upwardly and downwardly slidably connected to said second center mold plate, and at least one said bolt is connected to each of said first side mold plate and third side mold plate.
17. The combination of lock and mold plates as claimed in claim 16, wherein the said mold plates open and close relative to each other in a pre-determined sequence.
18. The improved mold lock as claimed in any one of claims 11 to 14 in combination with three or more mold plates.
19. The combination of lock and mold plates as claimed in claim 18, wherein said main latch body is upwardly and downwardly slidably connected to said second center mold plate, and at least one said bolt is connected to either of said first side mold plate or third side mold plate.
20. The combination of lock and mold plates as claimed in claim 19, wherein the said mold plates open and close relative to each other in a pre-determined sequence.