

[54] **AUTOMATIC MOLD LOCK**

3,806,174 4/1974 Herman 292/DIG. 49

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[22] Filed: **Aug. 7, 1974**

[21] Appl. No.: **495,318**

[57] **ABSTRACT**

[52] U.S. Cl. **425/451.9**; 292/257; 425/450.1;
425/451.5; 292/DIG. 49

An automatic mold parting-line lock for lifting and locking together two sections or elements of a plastic injection mold or the like, comprises anchor and retainer members adapted to be secured to or to secure together the respective elements of the mold, locking means for the members, and a hoist bolt for lifting the mold elements and operating the locking means. The lock is constructed so that lifting the mold elements by the hoist bolt automatically locks the locking means and, consequently, the mold elements together for safe movement.

[51] Int. Cl.² **B29C 1/16**

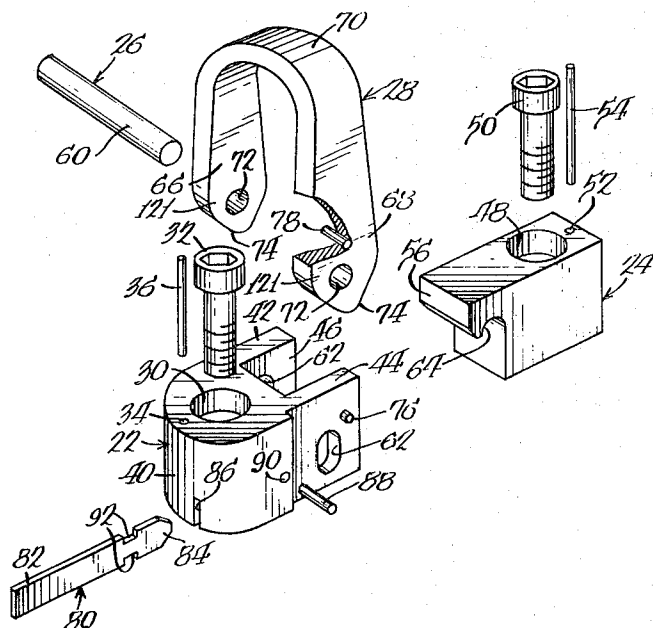
[58] Field of Search 292/65, 257, DIG. 49;
425/451.6, 450.1, 451, 451.9, DIG. 205, 451.5

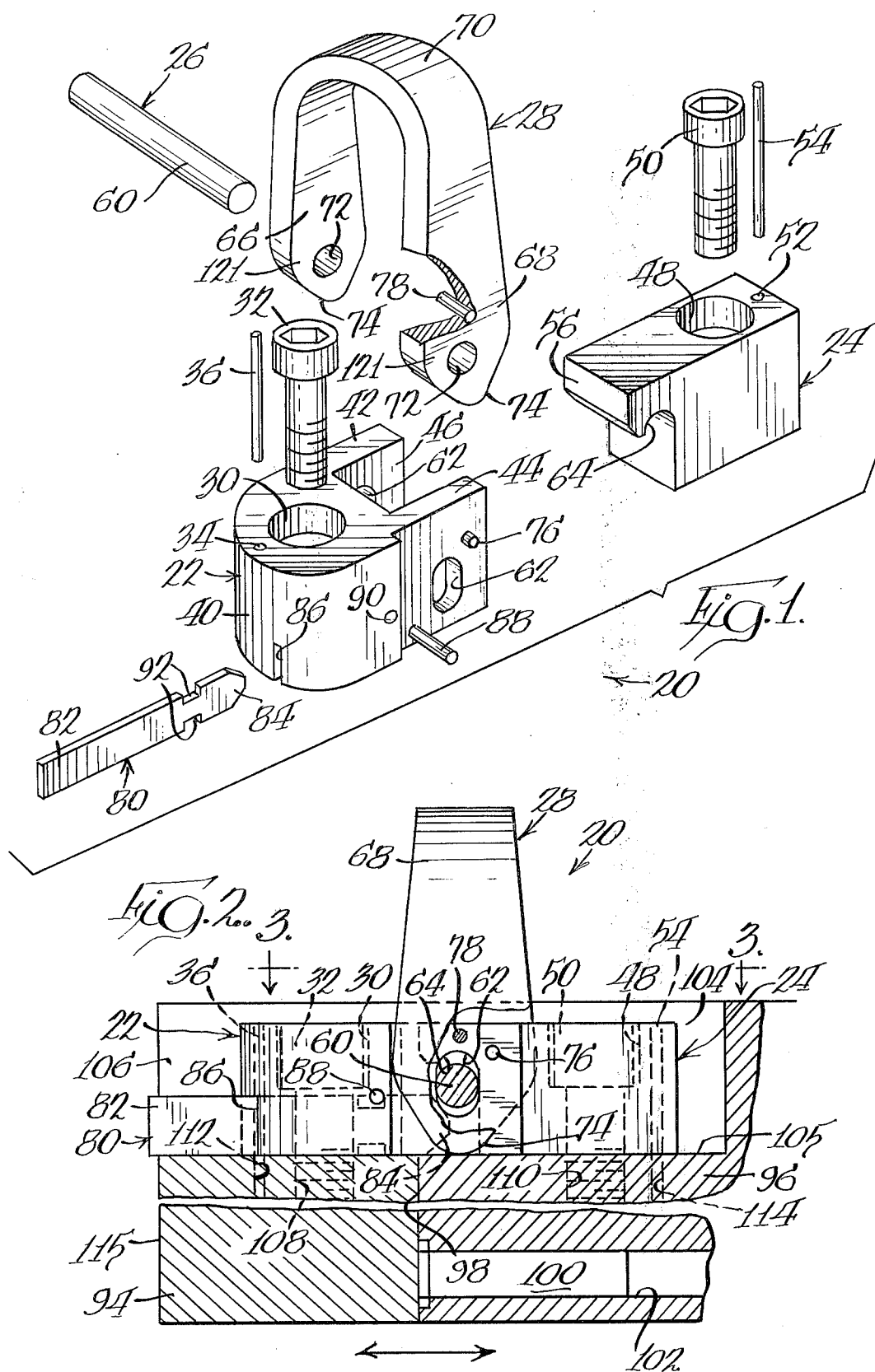
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21 Claims, 17 Drawing Figures





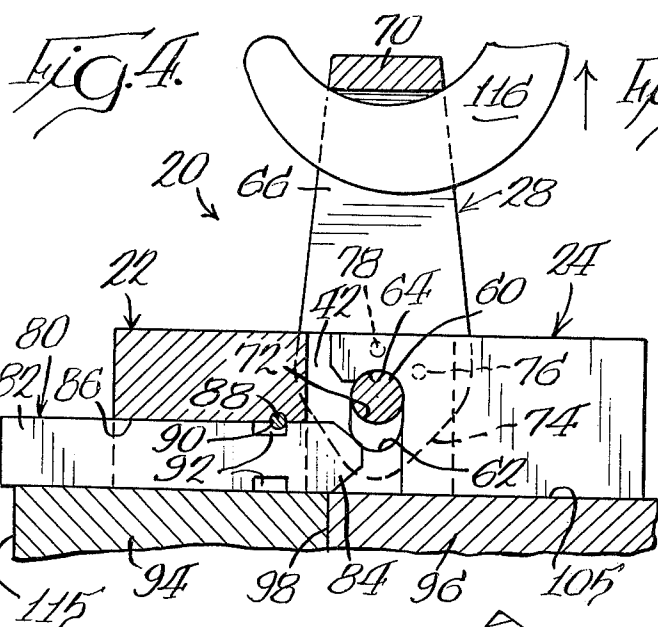
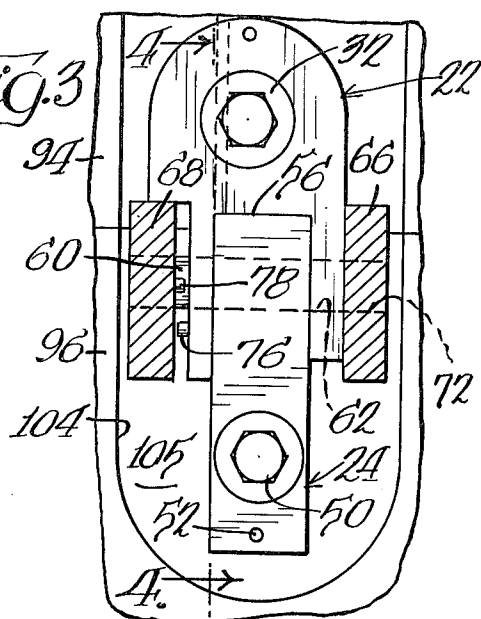
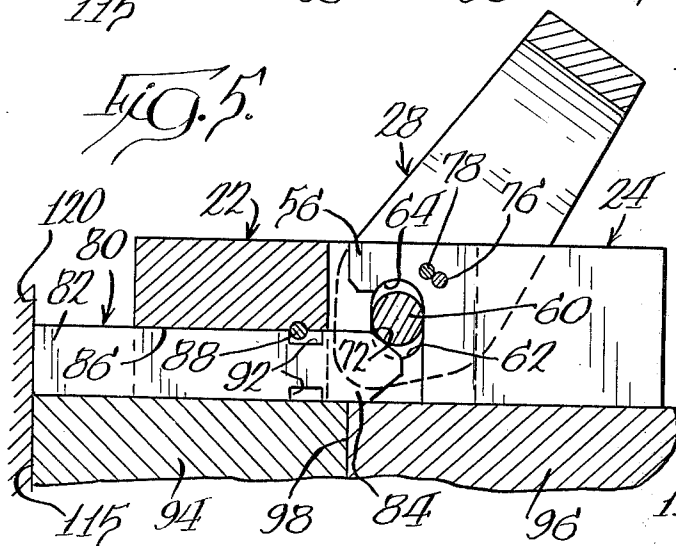
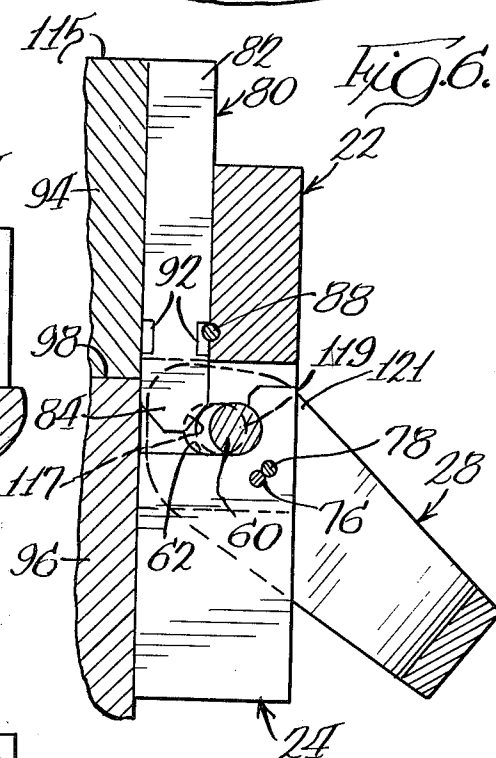
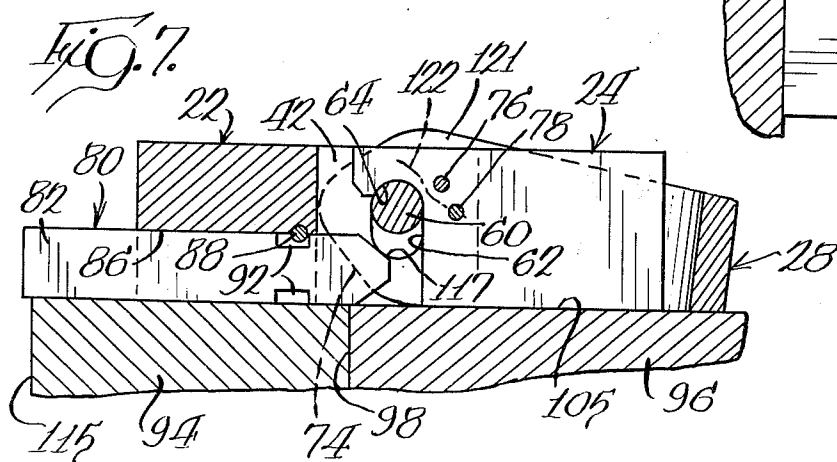


Fig. 8.

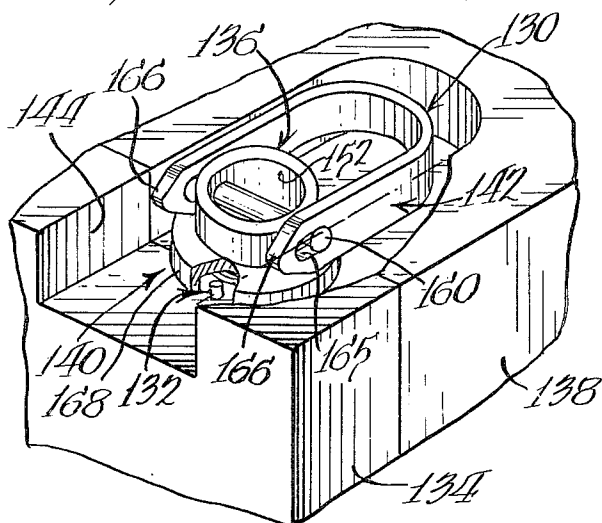


Fig. 9.

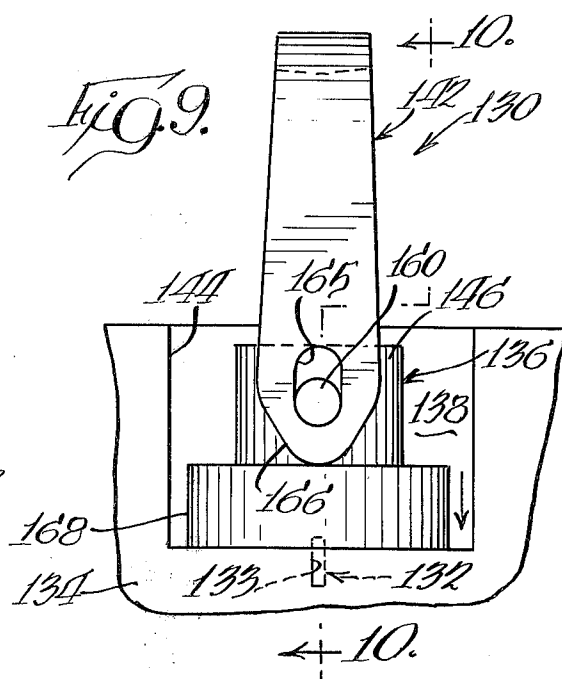


Fig. 10.

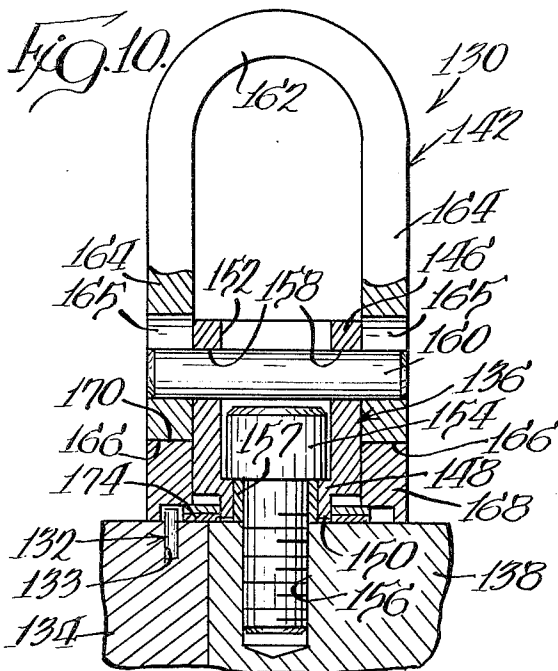


Fig. 11.

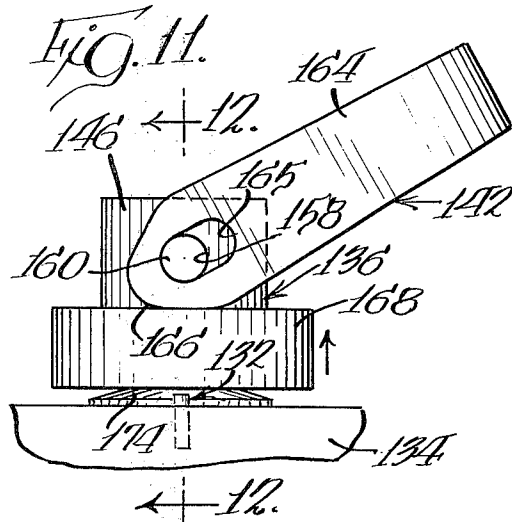


Fig. 12.

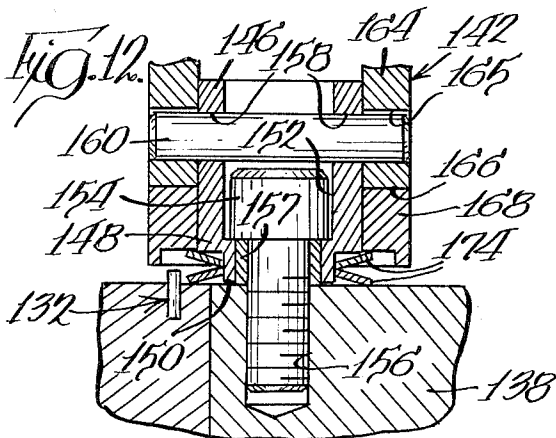


Fig. 13.

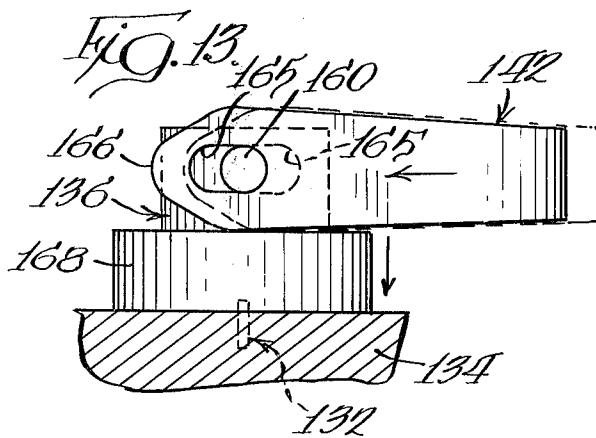


Fig. 15.

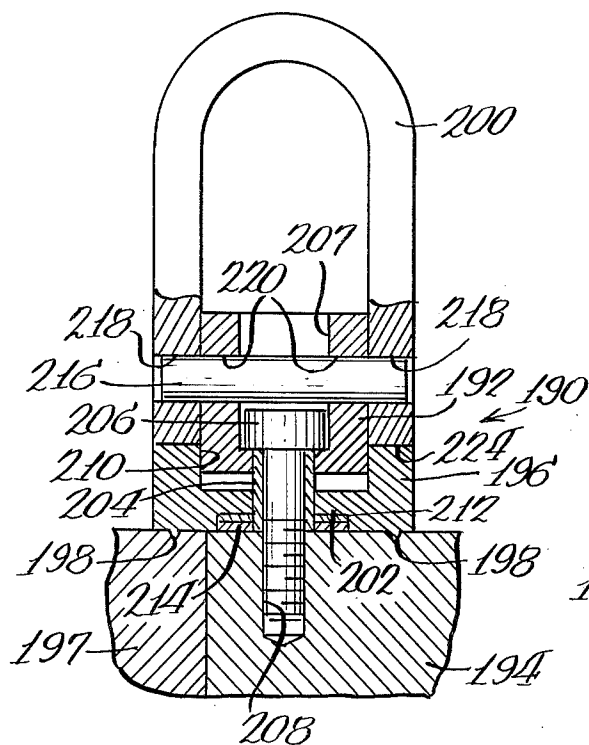


Fig. 14.

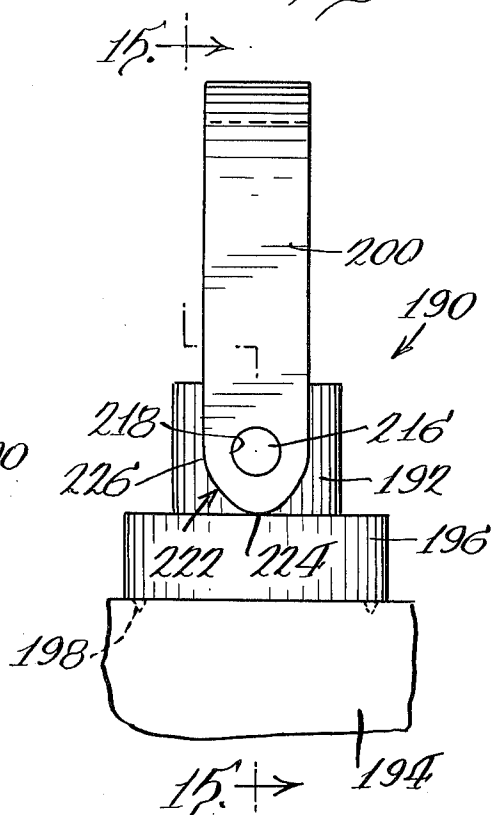


Fig. 16.

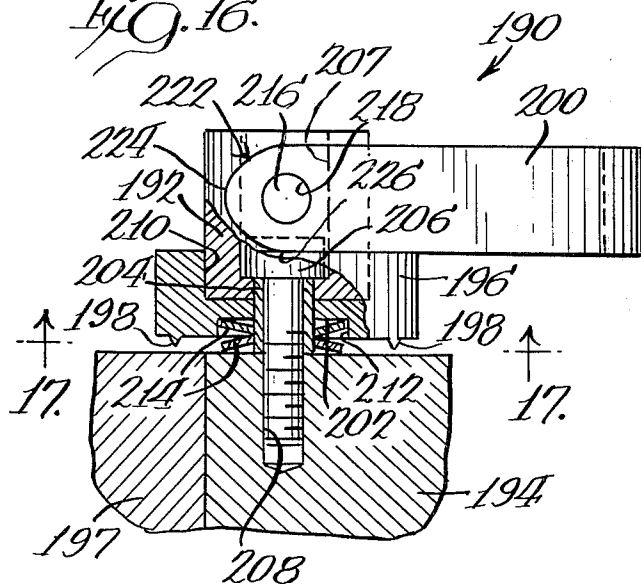
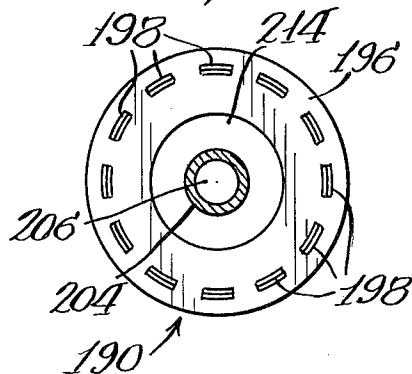


Fig. 17.



AUTOMATIC MOLD LOCK

BRIEF SUMMARY OF THE INVENTION

This invention relates to a lock for molds and more particularly to a mold lock which automatically locks sections of the mold together when the mold lock is used to hoist the mold.

In the art of plastics manufacturing, many parts are formed by the injection of plastic into a permanent mold which usually has two or more sections or elements separable along a parting-line to facilitate removal of the completed part from the mold. Usually, the elements of the mold are constructed so that one element has a pair of large diameter dowel pins or the like extending into corresponding openings in the other element. This construction insures proper alignment of the mold elements for the injection of plastic to form the part and facilitates separation of the elements for removal of the completed parts.

A mold and its elements are large, heavy, not easily moved manually, and is usually moved with the aid of a hoist. Heretofore, when it was necessary to move a mold, an eyebolt was installed in a threaded opening in the mold; the hoist hook was attached to the eyebolt; and the mold was hoisted and moved. Caution was necessary when moving the mold if the elements were not fastened or secured together since they could easily slide apart and injure a workman. In addition, the ease of removal of the eyebolt usually meant that one was not available when needed. Further, since the eyebolt protruded above the mold, it interfered with the molding machine, made storage of molds difficult, and frequently was broken off.

Sometimes, a makeshift strap was used to fasten the parts of the mold to keep them from separating when being moved. This arrangement was disadvantageous since additional time was required to do and undo the makeshift fastening. Since most movement was into or out of the molding machine this lost time was "machine downtime" and, therefore, very expensive. On occasion, the makeshift fastening was not removed after the mold was installed in the molding machine, and the mold, the machine or both were damaged when the machine tried to separate the still fastened mold parts.

Further, since a convenient means was not available to keep the molds closed, they were frequently stored or left in an open position, thus increasing the risk of being damaged.

The automatic mold parting-line lock of the present invention has overcome the above-mentioned disadvantages and comprises an anchor member adapted to be secured to one part or element of a mold, a retainer member adapted to be secured to or to secure the other part or element of the mold, a hoist bolt having one end adapted to be engaged by a hoist for lifting the mold, and locking means operable by the hoist bolt so that whenever the mold is lifted by the hoist bolt, the sections or elements of the mold are automatically locked together. The disadvantages of the prior art eyebolt have been eliminated since the lock of the present invention is permanently installed on the mold and therefore always available for safely lifting and for locking the sections together for storage. Further, the lock is installed in a non-protruding manner so as not to interfere with the molding machine or the storage rack, or be subject to being broken off.

In addition, the lock of the present invention may be provided with automatic safety means for disabling the locking means to prevent locking when the mold is installed in a molding machine.

Further, the lock of the present invention may be constructed so that hoist bolt can swivel completely about a vertical axis to facilitate hoisting.

These and other advantages of the automatic mold parting-line lock of the present invention will become apparent from the following description and the accompanying figures of the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an exploded perspective view of one embodiment of a mold parting-line lock of the present invention;

FIG. 2 is an elevational view, with portions broken away, of the lock shown in FIG. 1 installed on two elements of a mold and in an unlocked position;

FIG. 3 is a cross-sectional view taken substantially along the line 2—2 of FIG. 2;

FIG. 4 is a cross-sectional view taken generally along the 4—4 of FIG. 3, but showing the lock in a different and locked, hoisting position;

FIG. 5 is a cross-sectional view similar to FIG. 4 with the mold elements installed in a molding machine and the lock in another unlocked position;

FIG. 6 is a cross-sectional view similar to FIG. 4 with the lock and mold elements vertically rotated 90° and the lock in yet another unlocked position;

FIG. 7 is a cross-sectional view similar to FIG. 4 with the lock in another locked position;

FIG. 8 is a perspective view of a second embodiment of a mold parting-line of the present invention;

FIG. 9 is an elevational view of the lock shown in FIG. 8 with a portion thereof vertically pivoted 90° and horizontally rotated 90° and in a locked, hoisting position;

FIG. 10 is a cross-sectional view taken substantially along line 10—10 of FIG. 9;

FIG. 11 is an elevational view similar to FIG. 9 but with the lock in a different and unlocked position;

FIG. 12 is a cross-sectional view taken substantially along the line 12—12 of FIG. 11;

FIG. 13 is an elevational view similar to FIG. 9 but with the lock in another locked position;

FIG. 14 is an elevational view of a third embodiment of a mold parting line lock of the present invention in a locked, hoisting position;

FIG. 15 is a cross-sectional view taken substantially along the line 15—15 of FIG. 14;

FIG. 16 is an elevational view, with portions broken away, of the lock of FIG. 14 in an unlocked position; and

FIG. 17 is a cross-sectional view taken substantially along the line 17—17 of FIG. 16.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. 1 through 7, one embodiment of an automatic mold parting-line lock 20 of the present invention comprises an anchor member or block 22, a retainer member or block 24, locking means 26 for locking the blocks 22 and 24 together, and a lift or hoist bolt 28 for hoisting and automatically operating or locking the lock.

The anchor block 22 is made of metal, is adapted to be secured to one separable section or element of a mold and has a large countersunk opening 30 therein to receive a fastener or self-locking cap screw 32 which secures the anchor block to its associated section of the mold. Near the opening 30, a smaller opening 34 is provided for receiving a dowel pin 36 to hold the block 22 in alignment on its associated mold element. One end 40 of the block 22 is rounded, and the other end is bifurcated into two relatively vertical, longitudinally extending flanges or webs 42 and 44 with a space 46 therebetween for receiving the retainer block 24.

The retainer block 24 is also made of metal and has a large countersunk opening 48 therein for receiving a fastener or self-locking cap screw 50 to secure the retainer block to the other separable section of the mold, and a smaller opening 52 is provided for receiving a dowel pin 54. One end 56 of the retainer block 24 is adapted to extend into the space 46 in the anchor block 22 and be secured thereto by lock means 26 cooperating with the blocks 22 and 24.

Lock means 26 for holding or locking the anchor and retainer blocks 22 and 24 includes an intermediate member or pivot pin 60 cooperating with portions of the anchor and retainer blocks 22 and 24 to selectively lock the blocks together. The pivot pin 60 is movable or slidable in a pair of slots 62 extending through the flanges 42 and 44 of the anchor block 22. The pivot pin 60 is movable to a locked position wherein the pin engages with a downwardly opening hook 64 formed on the end 56 of the retainer block 24, and to an unlocked position wherein it disengages from the hook. The pivot pin 60 is operated or moved by the hoist bolt 28 into and out of its locked and unlocked positions.

The hoist bolt 28 is U-shaped, having a center portion 70 for receiving a hook of a hoist and a pair of arms 66 and 68 with openings 72 for receiving and holding, by press fit, the ends of the pivot pin 60. The outer end of the arms 66 and 68 are provided with means or cam surfaces 74 for moving the pivot pin 60 between its locked and unlocked positions, as will be hereafter described.

Safety means are also provided to limit the movement of the hoist bolt 28 to prevent locking when the mold is installed in a molding machine or press. To this end, the flange 44 of the anchor block 22 and the arm 68 of the hoist bolt have limit means or pins 76 and 78, respectively, for selectively controlling the travel of the hoist bolt 28. The limit projections or pins 76 and 78 extend out approximately 1/10th of an inch from the surfaces of the flange and arm and under certain conditions are engageable or abut each other. In addition, safety means or pin 80 assists in disabling or preventing the locking means 26 from locking when the lock 20 and its associated mold elements are installed in a molding machine or press. The safety pin 80 has one end 82 adapted to be engaged by a wall portion of a molding machine or press so as to move the other beveled end 84 of the safety pin into engagement with the pivot pin 60 to prevent locking. The safety pin 80 is slidably mounted in a bottom opening slot 86 formed in the anchor block 22 and is kept from sliding out of the slot by a cross pin 88 which fits in an opening 90 in the block and in one of the wide notches 92 in an intermediate portion of the pin 80. The width of the notch 92 is such to permit the pin to move far enough

to block movement of the pivot pin from its unlocked position to its locked position.

Assembly of the lock 20 is apparent from the exploded view of FIG. 1 and will be briefly described. The slots 62 in the anchor block 22 are aligned with the openings 72 in the hoist bolt 28, and the pivot pin 60 is pressed into the openings 72. The pin 88 is pressed into the hole 90, the safety pin 80 being insertable in the slot 86 any time prior to installation of the lock 20 on a mold.

In FIG. 2 the mold lock 20 is installed on a mold having segments or elements 94 and 96 which are separable along a parting-line 98 and slide relative to one another on large dowel pins (one being shown) 100 on the element 94 fitting in openings 102 (one being shown) in the element 96. The lock 20 is preferably located in a large recessed cut out or slot 104 formed in the mold elements 94 and 96, as by machining, so as not to protrude, the slot 104 having a flat bottom wall 105 and an open end 106 through which the safety pin 80 may extend. With locking means 26 locked (as shown in FIG. 7), the lock 20 is positioned in the slot 104 across the parting-line 98 and the threaded openings 108 and 110 for the cap screws 32 and 50 and openings 112 and 114 for the dowel pins 36 and 54 are made in the mold elements 94 and 96. The safety pin 80 is installed in the slot 86, and the members 22 and 24 are temporarily fastened to the mold with conventional cap screws. The safety pin 80 is pushed inward as far as possible so that its inner end 84 contacts the pivot pin 60 causing it to move upward, and the end 82 of the safety pin 80 is then marked and cut off flush with edge 115 of the mold element 94. After the installation has been checked for operation, the conventional cap screws may be removed and special one-way screws 32 and 50 are installed to prevent removal of the lock from the mold. Later, should it be desired to remove the lock, the screws 32 and 50 may be drilled out.

The lock 20 in FIG. 2 is in an unlocked position with the hoist bolt vertical preparatory to lifting the mold elements. Note that the cam surfaces 74 contact the mold and raise the pivot pin 60 to an intermediate position in the slots 62 but not high enough to engage with the hook 64 of the retainer block 24 so that the elements 94 and 96 are unlocked and still relatively slidable on the dowel pins 100. In FIGS. 3 and 4, after a hook 116 of the hoist engages and slightly raises or lifts the hoist bolt 28, the pivot pin 60 lockingly engages the hook 64 to lock the anchor and retainer blocks 22 and 24 and, consequently, the mold elements 94 and 96 together. The lock 20 will remain locked until the upward force imposed by the hoist is released, such as when the move has been completed. Thus, any time the mold is lifted and moved by the hoist bolt 28, the mold elements are automatically locked together.

Referring to FIG. 5, the mold elements 94 and 96 and lock 20 have been installed in a molding machine or press, such as by bolting the mold elements to appropriate portions of the machine so that the machine can open and close the mold. One wall portion 120 of the press engages the end 82 of the safety pin 80 and forces the other end 84 into position to block movement of the pivot pin 60 into a bottom portion 117 of the slot 62. In addition, the limit pins 76 and 78 on the anchor block 22 and arm 68 engage each other so that the hoist bolt 28 cannot move to a relatively lower position

than shown in FIG. 5. While the hoist bolt is free to pivot between the position of FIG. 2 and that of FIG. 5, the lock remains disabled and unlocked.

The lock 20 is constructed to facilitate inspection of a mold stored in a position with a parting-line 98 horizontal. In FIG. 6 with the mold sections and lock 20 removed from the molding machine or press and rotated 90° clockwise so that the parting-line 98 is horizontal, the hoist bolt 28 and safety pin 80 fall downward due to their weight. The safety pin 80 blocks movement of the pivot pin 60 in the slot 62 to a locked position, and the hoist bolt 28 is held in the angularly extending position by the contacting limit pins 76 and 78. Though the pivot pin 60 is shown in contact with the hook 64, the anchor and retainer members 22 and 24 are not locked together since the pin 60 is not held or confined in position but is free to slide, as shown in dotted lines indicated by the reference numeral 119, and will do so as soon as the mold elements are separated, the shape of the hook and pin being such to cam the pin out of the hook. Should the mold be inverted 180°, the lock 20 still remains unlocked since the portion 121 of the arms 66 or 68 has insufficient width or depth to cam or force the pivot pin 60 into locking engagement with the hook 64.

In FIG. 7, the lock 20 is shown in a permanently locked position, such as for storage, and due to its non-symmetrical shape automatically falls into this locked position upon release of the hoist hook. With the safety pin 80 free to slide to the left, the pivot pin 60 may move into the portion 117 of the slot 62 so that the limit pin 78 on the hoist bolt 28 can slip past or beneath the limit pin 76 on the anchor block 22, as shown by the dotted line 122, and the hoist bolt 28 can be lowered to a horizontal position. The shape of the cam surface 74 is such that after the hoist bolt falls to its horizontal position, the outer edge cams or lifts the pivot pin 60 upward slightly so that it engages the hook 64 to secure the blocks 22 and 24 and, consequently, the mold elements together. The lock 20 may be unlocked simply by pivoting the hoist bolt to the position shown in FIGS. 2 or 6.

Referring to FIGS. 8 through 13, a second embodiment of automatic mold parting-line lock 130 of the present invention comprises an anchor member or pin 132 adapted to be secured to one mold element 134, a retainer member 136 adapted to be secured to the other mold element 138, locking means 140 for the members 132 and 136, and a hoist bolt 142 for lifting the mold elements and operating the locking means 140. Though not essential, preferably the lock 130 is installed in a groove or slot 144 formed in the mold elements 134 and 138 so that the lock does not protrude or interfere with the molding machine or storage rack.

As is better shown in FIG. 10, the anchor pin 132 is a short section of rod press fitted in an opening 133 in the element 134, and the retainer member 136 is a tubular bushing having an enlarged head portion 146 at one end, an intermediate shoulder portion 148 and a smaller end portion 150. A center opening 152 is formed in the member 136 and receives a sleeve 157 and a self-locking fastener 154 which threads into an opening 156 in the element 138. The head of the fastener 154 bears against the end of the sleeve 157 to permit the fastener to be tightened. The axial length and inner diameter of the small end 150 is such to permit the retainer member 136 to rotate on the sleeve

157. The large end 146 of the retainer member 136 has a pair of openings 158 therein, in which a pivot pin 160 is press fit, making removal of the pin 160 and fastener 154 difficult.

The hoist bolt 142 has a center portion 162 for engagement by a hook of a hoist, and a pair of extending arms 164 having elongated slots or openings 165 to receive the pivot pin 160. The outer ends of the arms 164 have means or cam surfaces 166 for operating locking means 140, as will now be described. Locking means 140 includes an intermediate member or retainer sleeve 168 that is slidably mounted on the retainer member 136, located between that member and the mold elements, and cooperates with the retainer and anchor members. A pair of disc spring washers 174 are located between the mold elements and the sleeve 168 and bias the sleeve upwardly to an unlocked position.

The operation of the lock 130 will now be described. As shown by a comparison of FIGS. 8 and 9, the retainer 136 and hoist bolt 142 can rotate about the bolt 154, and the hoist bolt can pivot on the pin 160. With the hoist bolt vertical, as during lifting, the cam surfaces 166 forces the retainer sleeve 168 down over the anchor pin 132 to lock therewith. Consequently, the mold elements are automatically locked together any time the mold is lifted by the hoist bolt.

As shown in FIGS. 11 and 12, the lock 130 may be released or unlocked by tipping the hoist bolt 142 over generally 45°, the cam surface 166 being shaped so that the springs 174 force the sleeve 168 upward and free the pin 132 and the elements 134 and 138, and the hoist bolt remains in such position until manually moved.

As shown in FIG. 13, the lock 130 may be permanently locked by first forcing the hoist bolt 142 relatively horizontal so that the cam surface 166 forces the sleeve 168 to engage the pin 132 and then pushing the hoist bolt from the position shown in dotted lines to the position shown in solid lines to relatively slide the pivot pin 160 from one end of the slot 165 to the other end. In this position the lock is held closed until normally released by reversing the above steps.

Referring to FIGS. 14 through 17, a third embodiment 190 of automatic mold lock of the present invention comprises an anchor member 192 adapted to be secured to one portion or element 194 of a mold, a retainer member 196 cooperating with the anchor member and adapted to engage or secure the other element 197 of the mold, locking means 198 for securing the elements 194 and 197 of the mold together, and a hoist bolt 200 for lifting the mold and for automatically operating or locking the locking means 198 when the mold is lifted by the hoist bolt.

The anchor member 192 is a tubular sleeve having at one end an inwardly extending radial lip 202 which slidably and rotatably engages the outer surface of a sleeve 204. A self-locking type cap screw 206 extends through a center opening 207 in the anchor member 192, abuts against the top surface of the sleeve 204, extends radially outwardly over the surface of lip 202, and engages a threaded opening 208 in the element 194 to secure the anchor member 192 to the mold.

The retainer member 196 is tubular in shape, being axially slidable and rotatable on the sleeve 204, and has a first opening 210 receiving an end of the anchor member 192, and a second opposite facing opening 212 receiving a pair of spring washers 214.

The surface of the retainer member 196 adjacent the mold elements has lock means 198 in the form of a plurality of sharpened points which can engage in the surface of the mold element 197 to hold the mold closed. Since the mold is usually made of soft metal, penetration of the mold by the points 198 is not difficult. As shown in FIG. 17, the points 198 are spaced about the circumference of the sleeve 196.

The hoist bolt 200 is pivotally secured to the anchor member 192 by a pivot pin 216 press fit into one of the two pair of openings 218 in the bolt or openings 220 in the anchor member 192 making removal of the cap screw 206 difficult. The lower end of the hoist bolt 200 has means or cam surfaces 222 for selectively forcing the retainer member 196 downward so that the points 198 engage with the mold element 197. The cam surfaces 222 have large radii, indicated at 224, which contact the retainer member 196 and force it downward when the hoist bolt 200 is vertical to lock the mold elements 194 and 197 together, such as when lifting the mold with a hoist.

The hoist bolt 200 can pivot on the pin 216 so that smaller radii portions, indicated at 226, of the cam surfaces 222 are in contact with the retainer member 196 permitting it to move upward a small amount to unlock the elements as shown in FIG. 16, such as when the mold is to be inspected or installed in a molding machine.

What is claimed is:

1. A mold parting-line lock for use in hoisting and locking together two separable sections of a mold, comprising an anchor member adapted to engage one of the sections, a retainer member adapted to engage the other of the sections, locking means for locking said sections together, and hoist bolt means for hoisting the sections and automatically locking said locking means when the sections are hoisted by said hoist bolt means.

2. A lock as in claim 1, wherein said hoist bolt means is positionable to a first, hoisting position to lock said locking means and to a second position to unlock said locking means.

3. A lock as in claim 2, wherein said hoist bolt means is positionable to a third position to unlock said locking means.

4. A lock as in claim 3, wherein said second position is between said first and third positions.

5. A lock as in claim 1, further comprising means for preventing locking of said locking means when the sections are installed in a molding machine.

6. A lock as in claim 5, wherein said means for preventing locking comprises a movable element having one portion for cooperating with said locking means and a second portion for engaging a portion of the molding machine, whereby when said second portion engages the molding machine said movable element prevents locking of said locking means.

7. A lock as in claim 1, wherein said locking means includes a pivot pin, said anchor member and hoist bolt means having openings therein receiving said pivot pin, said retainer member having hook means for cooperating with said pivot pin to lock said members together.

8. A lock as in claim 7, further comprising a movable member for preventing locking of said locking means, said movable member being slidable in said anchor member and having one portion for engaging a molding machine and another portion for blocking movement of said pivot pin to a locking position.

9. A lock as in claim 8, wherein said openings in said anchor member are elongated, said movable member preventing movement of said pivot pin into portions of said elongated openings.

10. A lock as in claim 9, further including means for limiting the travel of said hoist bolt between a relatively vertical unlocked position and a relatively angular unlocked, intermediate position.

11. A lock as in claim 10, wherein said means for limiting the travel includes cooperating projections on said hoist bolt means and said anchor member.

12. A lock as in claim 10, wherein said hoist bolt means has cam surface means for causing said hoist bolt to fall in one direction to a locked position.

13. A lock as in claim 1, wherein said hoist bolt means is rotatably secured on said lock so that the relative position of said hoist bolt means can be altered.

14. A lock as in claim 13, wherein said retainer member is adapted to be secured to its associated mold section by a fastener, said retainer member being rotatable about said fastener and carrying said hoist bolt means.

15. A lock as in claim 14, further comprising a retainer sleeve carried on said retainer member, spring means for biasing said retainer sleeve in one direction, and cam means for moving said retainer sleeve in the opposite direction, said retainer sleeve being movable by one of said cam means and spring means for locking said sections together.

16. A lock as in claim 13, wherein said hoist bolt means is movable between a relatively vertical, locked, hoisting position and a relatively horizontal, unlocked position.

17. A lock as in claim 16 wherein said locking means comprises at least one sharpened point adapted to engage the other of the mold sections.

18. A lock as in claim 1, further comprising a pivot pin on which said hoist bolt means pivots and a fastener for securing one of said members to its associated mold section, said pivot pin preventing access to said fastener to make removal of said fastener difficult.

19. A mold parting-line lock for use in hoisting and locking together two separable sections of a mold, comprising an anchor member adapted to be secured to one of the sections by fastener means and having an elongated slot therein, a retainer member adapted to be secured to the other of the sections by second fastener means and having a hook thereon, a hoist bolt having a pivot pin movable in said elongated slot,

said hoist being relatively movable with respect to said members to a hoisting position with said pivot pin engaging with said hook to lock said members together, and to a horizontal position with said pivot pin engaging with said hook to lock said members together said hoist bolt being movable to a position intermediate said hoisting position and said horizontal position with said pivot pin being out of engagement with said hook to unlock said members.

20. A lock as in claim 19, further comprising an elongated element movable in said anchor member to one position to prevent movement of said pivot pin into a locking position, said elongated element being adapted to be moved upon engagement with a portion of a molding machine, whereby locking of said lock is automatically prevented whenever said lock and its associated mold sections are installed in a molding machine.

21. A lock as in claim 20, further comprising cooperating pin means on said hoist bolt and said anchor member for selectively preventing said hoist bolt falling from said hoisting position to said horizontal position, so that said lock is in its unlocked intermediate position immediately after hoisting.

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