

June 6, 1972

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3,667,890

PRESS

Filed May 5, 1970

4 Sheets-Sheet 1

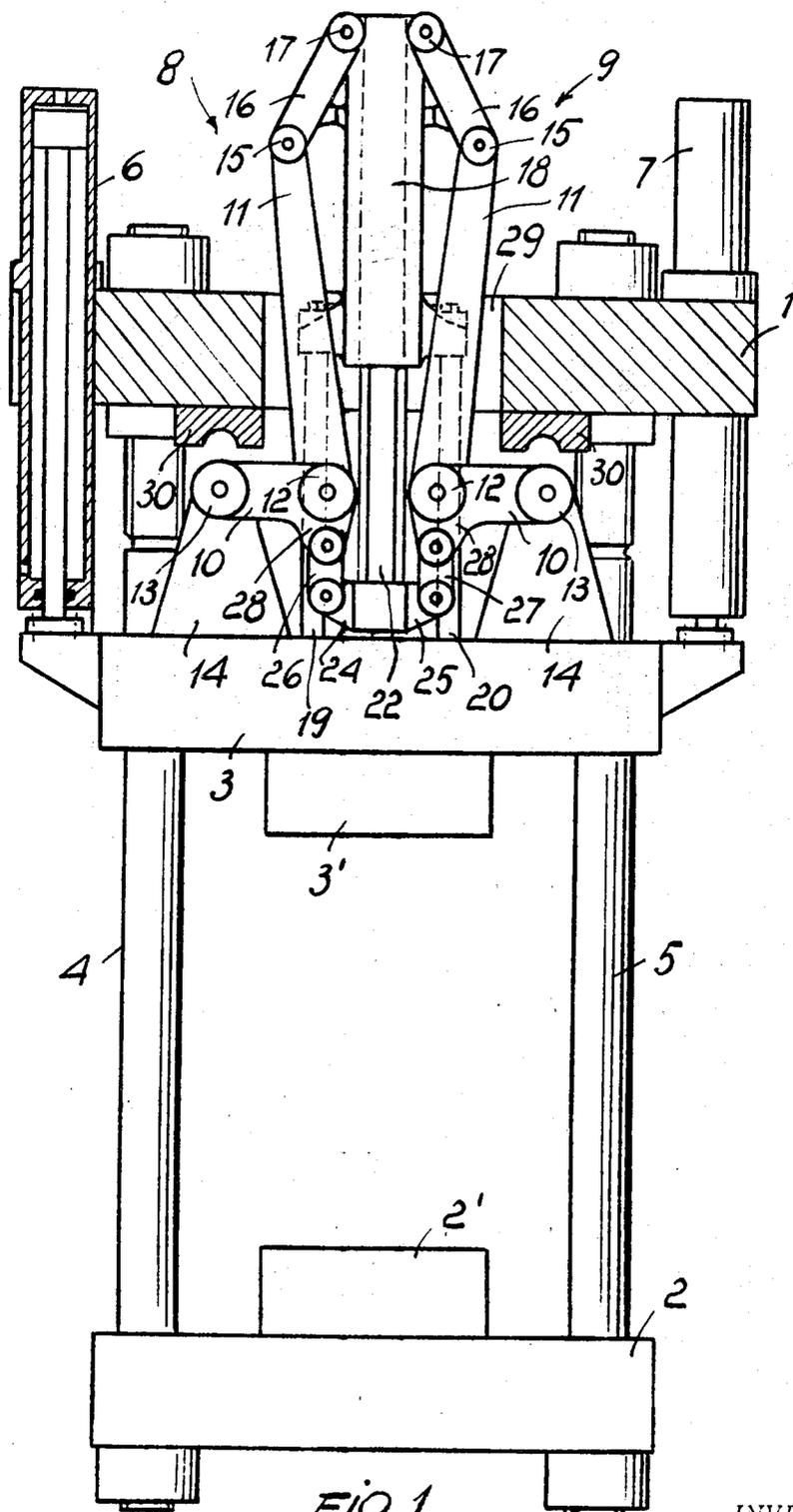


FIG. 1

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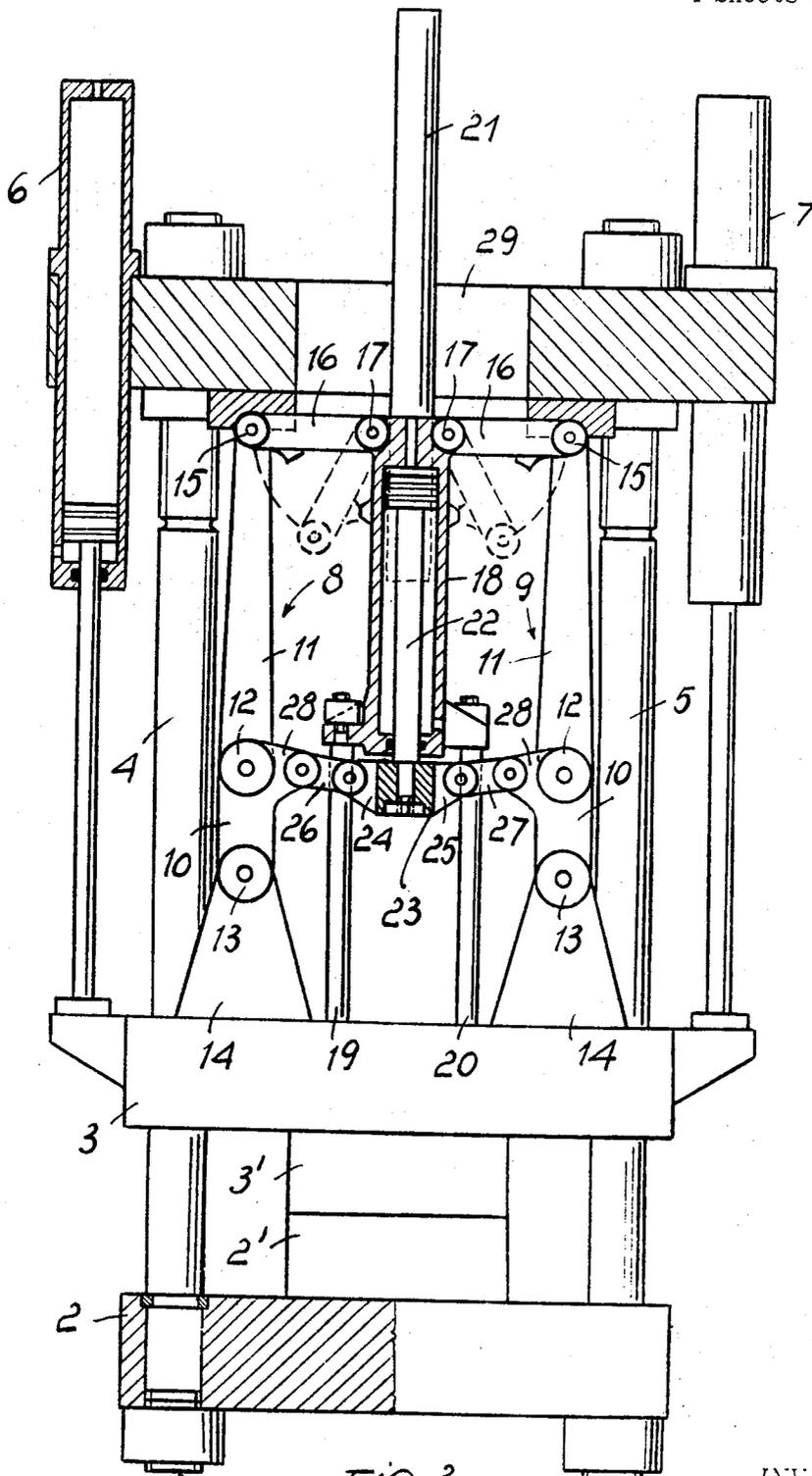


FIG. 3

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PRESS

Filed May 5, 1970

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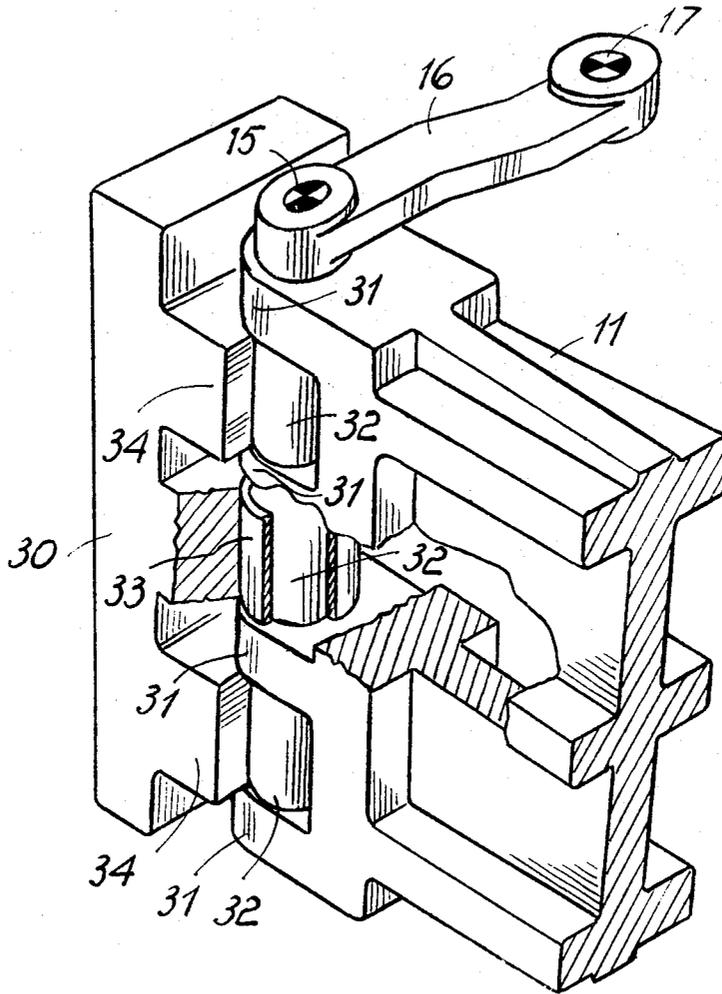


FIG. 4

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3,667,890

PRESS

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Filed May 5, 1970, Ser. No. 34,687

Claims priority, application Italy, Apr. 16, 1969,

19,696/69

Int. Cl. B29f 1/00; B30b 1/16

U.S. Cl. 425—406

8 Claims

ABSTRACT OF THE DISCLOSURE

A press having two stationary plates arranged spaced from each other. This press includes a mobile plate arranged between said stationary plates and a plurality of toggles. Each of these toggles includes a shorter arm pivotally connected to the mobile plate and a longer arm which is hinged on its free end to a guide member.

This invention relates to a press including a closing device; particularly a press for plastic injection or for light-metal or light alloy die-casting.

Presses of this type generally include a stationary plate through which plastics or molten metal may be injected into a first die-member supported on the plate; a stationary reaction plate parallel to and spaced from the stationary plate; and a mobile plate mounted between the above mentioned plates, the mobile plate supporting a second die-member and being movable towards and away from the stationary plate to enable engagement of the die members. The stationary plate and the reaction plate are held apart by parallel pillars which also act as guides for the mobile plate.

Closing devices for moving the mobile plate along the guides and also for applying the rigid closing force to the die are necessary for the operation of these processes.

Closing devices proposed for these purposes generally include a pair of toggle members which are fixed to and movable with the mobile plate and which are operable by means of a hydraulic ram. Each of the toggle members has a shorter and a longer arm. When the toggle is extended the longer arm rests with one end against the reaction plate and when the toggle is retracted and the mobile plate is spaced from the stationary one the toggle is passed through a hole in the reaction plate.

One of the major difficulties which is apparent in many of the proposed devices is the problem of ensuring accurate engagement of the free ends of the longer arms with the reaction plate.

One proposal envisages the toggle arms which are sloped with respect to the longitudinal axis of the press and which have hinged feet designed to co-operate with oblique surfaces on the reaction plate.

However, the use of hinged feet represents manufacturing difficulties both in balancing the eccentric forces imparted to the feet and in preventing rotation of the feet about the hinges. Attempts at overcoming these difficulties by guiding the longer arms in a direction parallel to the direction of movement of the mobile plate by means of guide holes in the reaction plate have been proposed. The guide holes were equipped with retractable wedges which, at the end of the die closing stroke, moved into the mouth of the guide holes to form supports for the longer toggle arms. In this device difficulties and expense arose in equipping the press with equipment for automatically operating the wedges.

The present invention aims to reduce manufacturing problems by providing a press which has a toggle closing device of simple construction.

According to the invention there is provided a press having a stationary plate, a stationary reaction plate, a mobile plate movable between the stationary plates, and a plurality of toggles movable with the mobile plate and disposed to transmit force to the mobile plate, each toggle having a retracted position and a force applying position and including a shorter arm pivotally connected to support means on the mobile plate and a longer arm which has a free end hinged to a guide member for guidance of the free end through an arc to and from a seat on the reaction plate, the guide member being pivotally connected to a support element on the mobile plate. According to one form of the invention, the free end of each longer arm is equipped with a guide member, or crank, hinged both at the free end and at a pivot on the stationary cylinder of a hydraulic ram. The ram, which operates the toggles, is preferably mounted on the mobile plate with the ram axis perpendicular thereto. The seats are preferably in the form of concave depressions in which the free end of each longer arm can rest.

Thus the free ends of the longer rods are accurately guided to and from the seats. The balancing of the eccentric forces acting on the longer arms is also achieved, since the components of force transverse to the longer arms act on the guide members.

According to a preferred embodiment of the invention, a ram which controls the extension of the toggles is held perpendicular to the mobile plate by supporting elements and the guide members which engage the longer arms of the toggles are hinged on the cylinder of the ram.

Preferred and illustrative embodiments of the invention will now be particularly described with reference to the accompanying drawings, in which:

FIG. 1 is a view of a press in a completely open position;

FIG. 2 shows the same press in a closed position before the toggles are extended;

FIG. 3 shows the same press in a closed position with the toggles extended; and

FIG. 4 shows a seat and part of a rod.

FIGS. 1, 2 and 3 show a press having a reaction plate 1, a stationary plate 2 supporting a die-member 2' and a mobile plate 3 supporting a die-member 3' which faces the die-member 2'. The plates 1 and 2 are connected by means of parallel pillars 4 and 5 which pass through holes in the mobile plate 3.

The mobile plate 3 can be moved between the position shown in FIG. 1 and the position shown in FIG. 2 by means of hydraulic ram 6 and 7. The arms 6 and 7 are only provided for moving the mobile plate 3 between the closed and the open positions of the die-members.

Closing pressure for the die-members is supplied by two parallel toggles 8 and 9. This pressure opposes the internal working pressure set up in the die. The toggles 8 and 9 are symmetrically mounted and are identical in design, and therefore only one of the toggles will be referred to in detail.

Each toggle has a shorter arm 10 and a longer arm 11 which are hinged at 12. The arm 10 is also hinged at 13 to a support bracket 14 connected to the mobile plate 3.

The free end of the arm 11 is pivoted at a hinge 15 on the end of a guide member or crank 16. The other end of the crank 16 is pivoted at a stationary hinge 17 on the cylinder of a hydraulic ram 18. The ram 18 is rigidly connected to the mobile plate 3 by two rods 19 and 20 and supports a slide 21. The ram 18 has a rod 22 which is equipped with a cross-shaped head 23 having opposed bosses 24 and 25. Two small links 26 and 27 are hinged at one end of the bosses 24 and 25 and at the other end to extensions 28 of the arms 10.

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As shown in the figures, when the ram 18 is entirely extended the toggles 8 and 9 are retracted and the arms 11 and the crank 16 are moved towards the ram 18 thus reducing the area occupied by the closing device. The closing device can thus pass through a central hole 29 of the reaction plate 1 when the mobile plate 3 is moved into the position shown in FIG. 1.

When the mobile plate 3 is moved towards the position shown in FIG. 2, the two toggles 8 and 9 pass completely through the hole 29.

When the mobile plate 3 is in the position shown in FIG. 2 the ram 18 is operated and the rod 22 is drawn into the cylinder. The two toggles then move towards the extended position shown in FIG. 3. In the course of this movement, the cranks 16 are rotated about the hinged 17 and the hinges 15 rotate until they rest in the seats 30 on the reaction plate 1. The cranks 16 attain a position approximately perpendicular to the axis of the press. When the hinges 15 are seated, the toggles are able to apply pressure to the mobile plate and thus to cause rigid closing of the die-members.

In FIG. 3, the arms 10 and 11 form two sides of a quadrilateral, the third side being formed by the cranks 16 and a straight line connecting the axes of the hinges 17, and the fourth side being formed by a straight line connecting the axes of the hinges 13.

The use of the crank 16 enables safe operation of the toggles since the ends of the rods 11 are guided directly into the seats 30. The movement is thus substantially free from oscillations or hard impacts.

Generally, the guide members 16, will be weaker than the rods 11 since the guide members act mainly as guides for hinges 15 while the rods 11 have greater cross-sectional dimensions and are designed to withstand the stresses to which they are subjected.

FIG. 4 shows a preferred embodiment of a hinge 17 and a supporting element 30.

The end of the arm 11 has a set of parallel bosses 31 extending outwardly from the arm and having coaxial holes through which a gudgeon pin 32 passes to form a hinge 15.

In the space between the bosses 31 the gudgeon pin 32 is encircled by rotatable steel sleeves 33, which act as rollers.

When the toggle is extended the sleeves enter concave seats on the supporting elements 30. The seats are formed in projections 34 which are arranged to co-operate with the rollers 33. Thus sliding of the gudgeon pin 32 against the walls of the seats is prevented.

What we claim is:

1. A press comprising a stationary plate; a stationary reaction plate formed with an opening therethrough; a mobile plate between said stationary plates and movable between open and closed positions; a plurality of seat means on said stationary reaction plate; a support member fixed to said mobile plate and projecting in the open position of the latter through said opening in said reaction plate; a plurality of toggle means carried by said mobile plate about said support member and each comprising a shorter arm pivotally connected at one end to said mobile plate for tilting movement about a pivot axis, a longer arm pivotally connected at one end to the other end of said shorter arm, and a guide member pivotally connected at one end to the other end of said longer arm and pivotally connected at said other end thereof to said support member; first moving means connected to said toggle means for moving the same between an inactive position and an active force applying position in which the arms of each toggle means extend substantially colinear with each other and in which said other end of the longer arm of each toggle means engages the respective seat means on said reaction plate, said guide member of each toggle means guiding said other end of the respective longer arm along an arc to and from said seat means during movement of the toggle means between said posi-

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tions thereof; and second moving means independent of said first moving means and acting between one of said stationary plates and said mobile plate for moving the same between said positions thereof.

2. A press as defined in claim 1, wherein said first moving means comprise a hydraulic ram including a cylinder spaced from and fixedly connected to said mobile plate, a piston reciprocable in said cylinder, a piston rod connected at one end to said piston and having a free end, and means connecting said free end of said piston rod to said shorter arm of each of said toggle means for tilting the respective shorter arm about its pivot axis during reciprocation of said piston.

3. A press as defined in claim 2, wherein said opening in said reaction plate is a central opening, and wherein said ram is substantially coaxially arranged with said opening and extends in said open position of said mobile plate through said opening beyond said stationary reaction plate.

4. A press as defined in claim 2, wherein said connecting means comprise an extension on each of said short arms, a cross head fixed to said free end of said piston rod, and link means pivotally connected at the opposite ends to said extension and said cross head.

5. A press as defined in claim 2, wherein said support member is constituted by said cylinder of said hydraulic ram.

6. A press as defined in claim 1, wherein said guide member in said active position of said toggle means is substantially normal to said arms.

7. A press as defined in claim 1, wherein each of said seat means is formed with a seat each forming part of a substantially cylindrical surface and including a gudgeon pin pivotally connecting said other end of said longer arm to said one end of said guide member, said longer arm having at said other end a plurality of portions spaced in axial direction of said pin from each other and formed with aligned bores through which said pin extends, and a plurality of sleeves turnably arranged about the pin portion located between said bored portions at said other end of said longer arm, said sleeves engaging respectively said seats, when said toggle means are in said active position.

8. A press as defined in claim 1, and including a pair of substantially parallel pillars extending between and being fixed in the region of opposite ends to said stationary plates, said mobile plate being guided on said pillars, said second moving means comprising a pair of hydraulic rams each comprising a cylinder fixed to one of said stationary plates, a piston reciprocably arranged in said cylinder and having a piston rod connected to a respective outer portion of said mobile plate.

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U.S. Cl. X.R.

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,667,890 Dated June 6, 1972

Inventor(s) Sergio Rusmini

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the heading to the specification, line 5, column 1,

"April 16, 1969" should read -- July 16, 1969 --.

Signed and sealed this 20th day of March 1973.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents