Dec. 8, 1970 E. P. REBOVICH ET AL 3,545,044

PRESS

Filed July 5, 1968 2 Sheets-Sheet 1

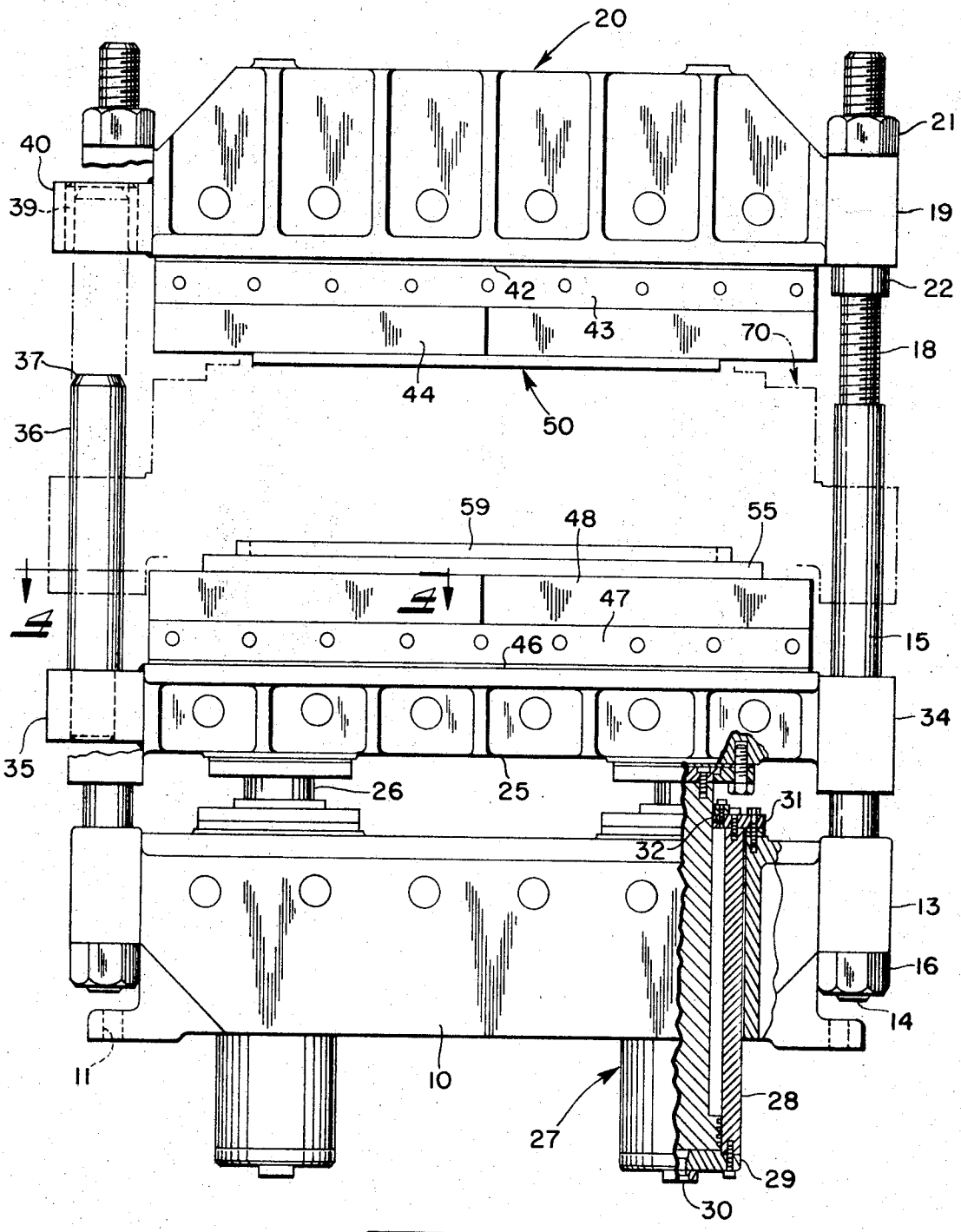


Fig. 1

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PRESS

Filed July 5, 1968 2 Sheets-Sheet 2

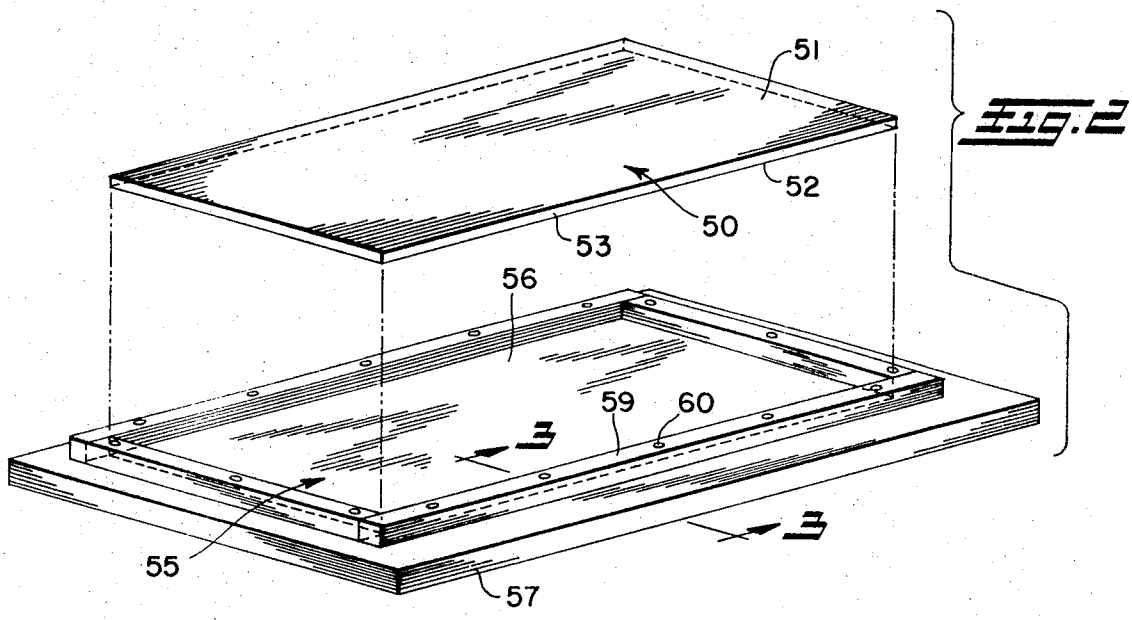


Fig. 2

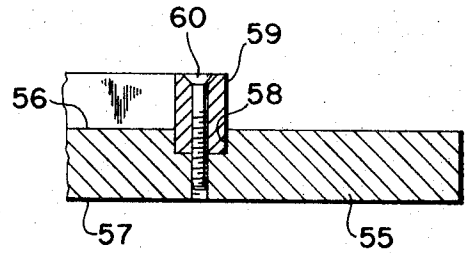


Fig. 3

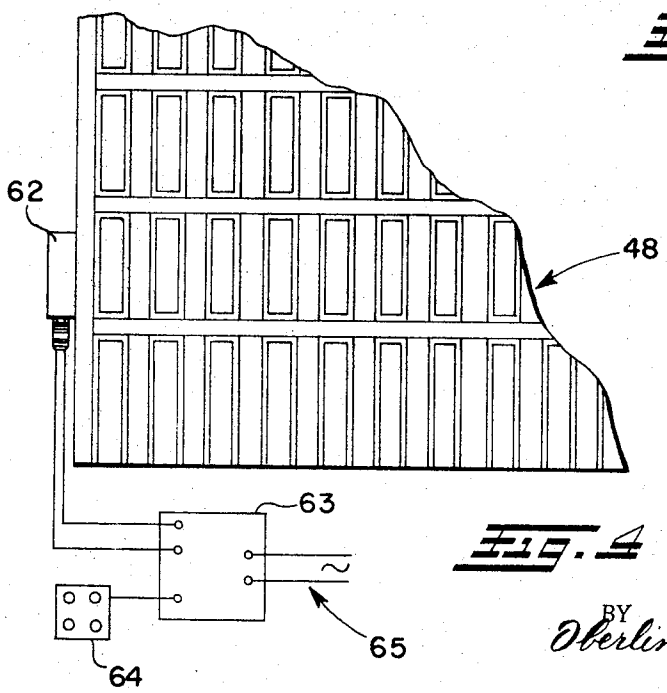


Fig. 4

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United States Patent Office 3,545,044
Patented Dec. 8, 1970

3,545,044

PRESS

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Filed July 5, 1968, Ser. No. 742,885
Int. Cl. B30b 7/02
U.S. Cl. 18—16 8 Claims

ABSTRACT OF THE DISCLOSURE

A press for the molding of panels, sheets and other objects which has a head and table, magnetic chucks secured thereto and a die structure held by said chucks which includes male and female die plates with the female die plate including a ridge acting as a pinch-off bar to embrace the periphery of the male die plate.

This invention relates generally as indicated to a press and more particularly to a press and die structure for matched metal die molding of panels, sheets and other objects. Such matched metal die molding generally requires a large investment in the metal dies. Such dies are generally bulky, heavy, difficult to store, and difficult to secure to and remove from the press. When molding panels, for example, a different set of heated dies would normally be required for each size panel. Such dies are carefully machined, ground, and hardened, being made from relatively massive blocks of metal. If they are heated dies, they require coring. To change such dies requires substantial press down time and storage of such dies is difficult and space consuming.

In the mounting of such dies in the press, considerable care has to be given to the alignment of the matched dies and their position within the press. Moreover, the securing of the male die to the press head is an awkward and difficult task.

It is according a principal object of the present invention to provide a press having matched metal dies which dies can readily be mounted in and remove from the press.

Another principal object is the provision of matched metal dies for the molding of panels, sheets and other like objects of very economical construction not requiring intricate machining of large or massive metal blocks.

An important object also is the provision of such dies which can readily be stored on edge in an assembled condition in a minimum amount of space.

A further important object is the provision of a press utilizing electromagnetic chucks to hold the male and female dies in position.

Yet another object is the provision of an economical press and die structure finding excellent utilization in the molding of reinforced plastic panels and the like.

Other objects and advantages of the present invention will become apparent as the following description proceeds.

To the accomplishment of the foregoing and related ends, the invention, then, comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawings setting forth in detail a certain illustrative embodiment of the invention, this being indicative, however, of but one of the various ways in which the principles of the invention may be employed.

In said annexed drawings:

FIG. 1 is a front elevation partially broken away and in section of a press in accordance with the present invention;

FIG. 2 is an exploded perspective view of the male and female dies shown mounted in the press in FIG. 1;

FIG. 3 is an enlarged fragmentary vertical section of the female die taken substantially on the line 3—3 of FIG. 2; and

FIG. 4 is an enlarged fragmentary horizontal section showing the face of the magnetic chuck and schematically the control therefor.

Referring now more particularly to the drawings and first to FIG. 1, it will be seen that the press includes a base **10** which may be secured to a foundation through bolt holes **11** in projecting lower flanges **12**. At each side of the base, there is provided bosses **13** through which extend the lower reduced diameter ends **14** of strain rods **15**. Such rods are thus provided with shoulders which seat on top of the bosses and the lower ends are threaded to accommodate relatively large nuts **16** securing the rods to the base. There are four such rods, two at each side of the press.

The upper ends of the rods are threaded as indicated at **18** and extend through bosses **19** projecting from the sides of crosshead **20**. The crosshead is secured to each of the rods by means of the large upper nuts **21** and the lower threaded sleeves **22**. In this manner, the vertical position of the head **20** is adjustable.

The bolster or table **25** is mounted on the rods **26** of piston-cylinder assemblies **27**, the cylinders **28** of which are mounted in the base **10**. The blind end of each cylinder is closed by a plate **29** in which there is centrally provided a port **30** to which a source of hydraulic pressure is connected. The upper end of each cylinder is closed by ported plate **31** by means of which the cylinder is connected to the top of the base **10** by suitable fasteners and which confines the rod **26** with a suitable rod packer as shown at **32**. In the illustrated press there may be four such piston-cylinder assemblies.

The table **25** is provided with bosses **34** through which the strain rods **15** extend guiding the table for vertical movement. The table is also provided with laterally extending bosses seen at **35** upwardly from which project alignment pins **36**. These pins are provided with a beveled or pilot top edge **37** and fit within guide bushings **39** mounted within bosses **40** projecting laterally from the head **20**. The guide pins and bushings serve accurately to align the head and table when the press closes by elevation of the table through actuation or extension of the hydraulic piston-cylinder assemblies **27**.

Secured to the underside of the head **20** is a layer of heat insulation **42** separating the head from a steam platen **43**. Mounted on the underside of the steam platen **43** are a series of magnetic chucks **44**. The magnetic chucks may cover the entire underside of the steam platen and both the chucks and platen are secured to the underside of the head, the latter being provided with tapped holes for such purpose.

Mounted on the top of the table is a layer of heat insulation **46** separating from the table the steam platen **47** mounted thereon. On top of the steam platen **47** there is mounted a series of magnetic chucks **48**, the details of which are seen more clearly in FIG. 4. Again, the magnetic chucks may cover substantially the entire upper surface of the steam platen. Such steam platens are cored in the usual manner so that steam passing therethrough will heat the same to the desired temperature. Such heat is transferred through the magnetic chucks to the dies hereinafter described so that the work being molded may also be cured.

Referring now additionally to FIG. 2, it will be seen that the metal die or mold structures for the press may comprise a flat male die plate **50** which may be on the order of 5/16 inch to 1 inch thick. The top surface **51** and the bottom surface **52** are ground to the desired finish and

the undersurface **52** may be provided with an etched pattern if desired. The peripheral edges **53** of the male die or plate **50** are flame hardened.

The female die includes a flat steel plate **55**, the top and bottom surfaces **56** and **57** of which may be ground. The top surface **56** is provided with a milled slot **58** in which are secured pinch-off bars **59** by the fasteners indicated at **60** as seen more clearly in FIG. 3. The pinch off bars may be flame hardened and it can be seen that such pinch-off bars form a peripheral upstanding ridge projecting from the plate **55**. The clearance betweent he flame hardened edge of the male die plate **50** and the flame hardened pinch-off bars **59** may be on the order of 0.001 to 0.003 inch. Thus the pinch-off bar closely embraces the edge of the male die plate as the press closes. The upper surface of the plate **55**, like the lower surface of the plate **50**, may be provided with an etched pattern if desired.

The electromagnetic chucks **44** and **48**, which are secured to the underside of the steam platen **43** and the top surface of the platen **47**, respectively, may be provided with terminal boxes **62** as seen more clearly in FIG. 4. The grid style electromagnetic chucks are low wattage and produce a low magnetic flux pattern which will readily firmly grip the male and female die components. Such electromagnetic chucks can be obtained in various sizes and can be installed in tandem or end-to-end mounting to obtain the desired area coverage.

The terminal boxes **62** may be connected to units **63** which are combination AC line switch transformer rectifiers and motor driven control switches. A manual switch may be provided on the unit **63** or alternatively a remote control unit **64** can be connected to the unit **63**. The unit **63** converts the AC supply source **65** to a DC output. The motor driven switching device of unit **63**, when actuated, automatically reverses the DC input to the magnetic chucks while simultaneously reducing the DC input voltage. This facilitates the release of the die structures by de-magnetizing both the chuck and such die structures. Such grid style electromagnetic chucks are commercially available and may, for example, be obtained from Hanchett Magna-Lock Corp. of Big Rapids, Mich.

The die structure illustrated has been found particularly useful in the manufacture of fibrous glass plastic encapsulated plywood panels as seen in the copending application of Robert S. Morrison, Ser. No. 727,808, filed May 9, 1968, entitled "Fibrous Glass Plastic Encapsulated Plywood Panel and Method of Making Same." It will, however, be appreciated that other panel, sheet or like products can economically be made in varying sizes with the press and die structure of the present invention.

The male and female die are, when not in use, ordinarily stored in an interfitted position with the male die plate **50** situated within the confines of the pinch-off bar **59**. In this assembled condition, the dies may be stored in a vertical plane in vertically oriented racks consuming little floor space.

To assemble the dies within the press, the male and female dies in such assembled storage position are placed upright on the bottom electromagnetic chucks **48**. The press, of course, will be open and the chucks de-magnetized. The particular position of the male and female die on the lower chucks **48** is not important although it should be reasonably centered in the press. The steam platens and the magnetic chucks serve to stiffen the head **20** and bolster or table **25**. With the assembled dies on the magnetic chucks of the table, that is with the male die plate sitting within the pinch-off bar of the female die plate, the press is now closed by actuation of the hydraulic piston-cylinder assemblies **27**. The table moves up to the phantom line position **70** seen in FIG. 1. In this position, the electromagnetic chucks are now energized and the press is then opened. The male die plate **50** will thus be secured to the crosshead **20** while the female die plate **55** is secured to the table or bolster. The die elements are, of course, automatically vertically aligned at the same time.

It will, of course, be appreciated that shapes other than the rectangular die shape illustrated may be employed. Moreover, transverse pinch-off bars may be provided on the female die plate providing a plurality of female die cavities. In this case a corresponding number of male die plates may be provided which would be stored and secured in the press in the same manner.

It can now be seen that there is provided a unique press and die structure resulting in the convenience of being able to change the molds quickly and to store them economically. Moreover, a minimal investment in molds is required.

Other modes of applying the principles of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims or the equivalent of such be employed.

We, therefore, particularly point out and distinctly claim as our invention:

1. A press for the manufacture of panels and like molded parts comprising a relatively movable head and table, male and female dies, and magnetic chuck means operative releasably to secure said dies to said head and table said magnetic chuck means comprise grid style electrical magnetic chucks.

2. A press as set forth in claim **1** wherein there are a plurality of said grid style electrical magnetic chucks forming a planar surface on the underside of the head and the top of the table.

3. A press as set forth in claim **1** including means to reverse the DC input to the magnetic chucks while simultaneously reducing the DC input voltage to facilitate the release of said dies.

4. A press as set forth in claim **1** including heating platens interposed between said magnetic chuck means and said head and table, respectively.

5. A press as set forth in claim **1** wherein said female die comprises a plate including an upstanding ridge adapted closely to embrace the periphery of said male die.

6. A press as set forth in claim **1** wherein said female die comprises a plate including an upstanding ridge adapted closely to embrace the periphery of said male die, said ridge forming a pinch-off bar, said ridge and the peripheral edge of said male die being flame hardened.

7. A press for the manufacture of panels and like molded parts comprising a relatively movable head and table, male and female dies, and magnetic chuck means operative releasably to secure said dies to said head and table, said female die comprising a plate including an upstanding ridge adapted closely to embrace the periphery of said male die when said press is closed, said ridge forming a pinch off bar, a milled slot in said female die, and means to secure said pinch-off bar in said milled slot.

8. A press as set forth in claim **1** wherein said dies comprise male and female die plates, said female die plate including an upstanding ridge forming a pinch-off bar adapted closely to embrace the periphery of said male die plate.

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U.S. Cl. X.R.

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