July 31, 1956 A. W. ANDERSON ET AL 2,756,473

MOLD-SUPPORTING MEANS FOR SHELL MOLDING

Filed May 5, 1954 2 Sheets-Sheet 1

Fig. 1

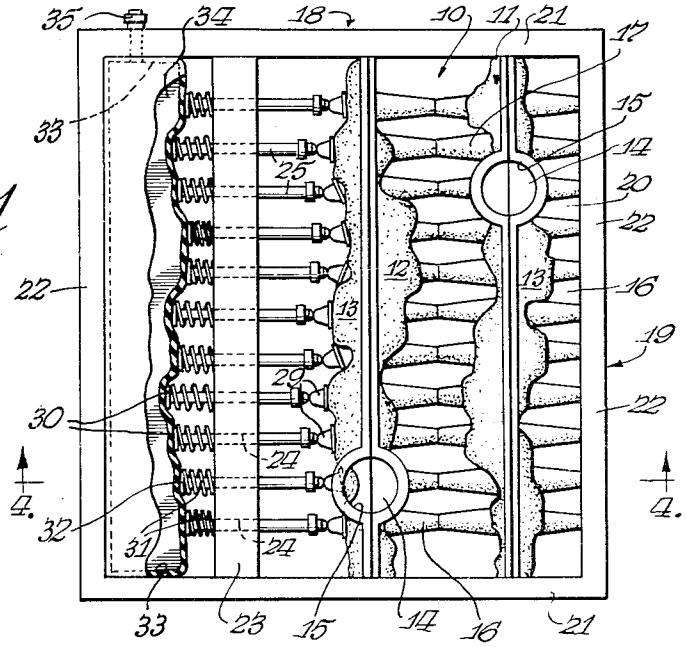
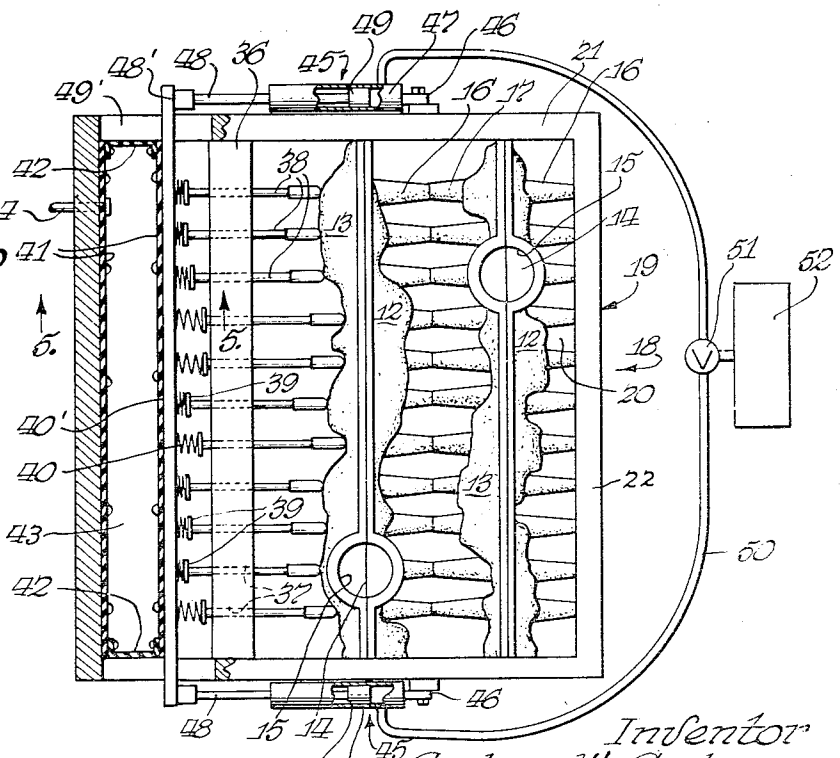


Fig. 2



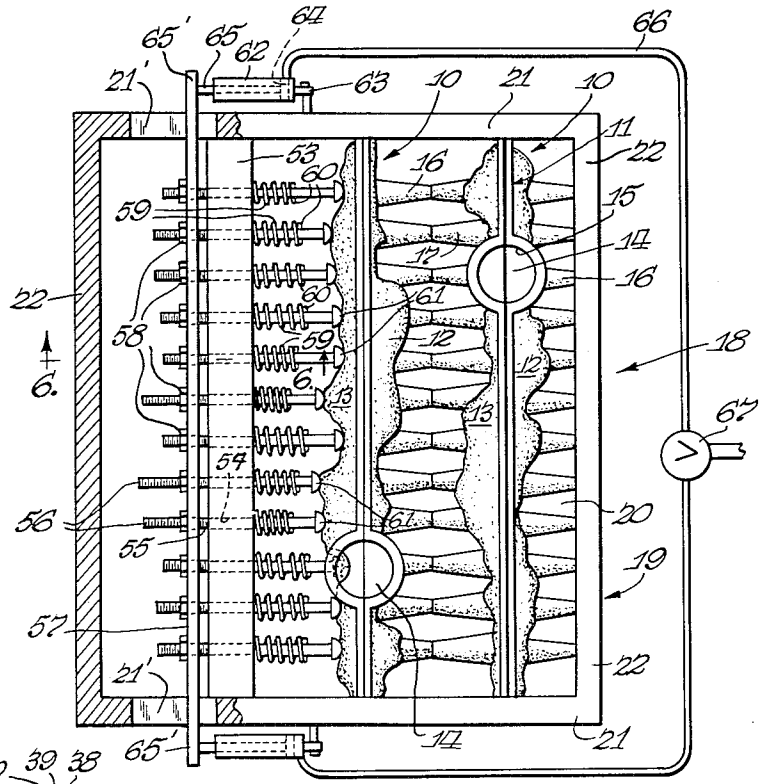
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Fig. 3



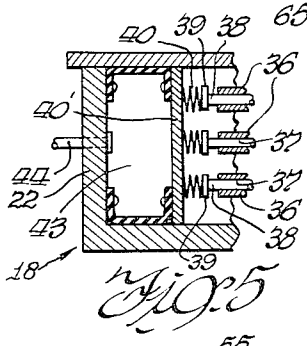


Fig. 5

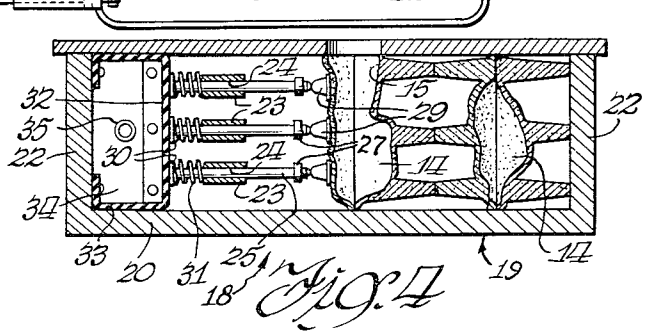


Fig. 4

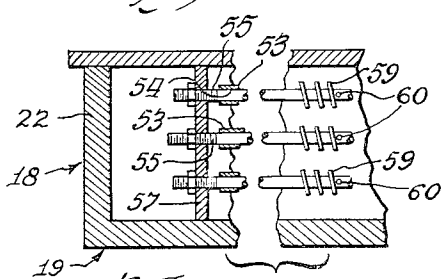


Fig. 6

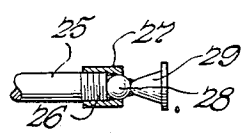


Fig. 7

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MOLD-SUPPORTING MEANS FOR SHELL MOLDING

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Application May 5, 1954, Serial No. 427,773

6 Claims. (Cl. 22—90)

This invention relates to an improved flash or mold-supporting device. More specifically, this invention relates to an improvement in a particular flask designed for supporting shell-type molds.

In the shell-molding process, a process which is finding great acceptance in the foundry industry, a particular type of sand containing a resin binder is placed over a heated pattern. The pattern with the sand and binder material is then heated and baked until a fairly brittle solid shell has been produced. Complementary shell portions having a receiving cavity, which conforms to the part to be cast, are placed in an upright position, generally, and cast material is poured into the shell molds whereupon hardening of the cast-material part is produced. During this operation, the shell molds must be supported in the upright position. Since the baked shell parts are made of a sand and resin material, they are rather frangible and adequate means must be provided to support the outer walls of the shell mold during the casting operation so as to support the walls against distortion and collapse. Any provision for supporting the outer walls of the shell molds must include the arrangement to permit the escape of gases which are incidental to the casting operation as the hot material is poured into the cavity of the supported mold. Previous methods of supporting have included the placing of a container or flask around the mold and filling the container with either a shot or sand material. Many disadvantages are encountered in this practice, and it is a prime object of this invention to provide an improvement and modifications thereof in flasks or supporting devices for supporting shell molds in position for receiving cast material during a casting operation.

Another object is to provide an improved supporting device or flask for shell molds, the device including a plurality of elements which are arranged to flexibly engage the side of a shell mold for supporting the same during the casting operation.

Still another object of this invention is to provide an improvement in a shell-mold flask including flexible elements which will exert a resilient pressure on the sides of a shell mold at laterally spaced points on said mold.

A still further object is to provide a plurality of spring-pressed devices which are reciprocally positioned within a flask, the devices being adapted to exert a resilient pressure along certain portions of the wall of a shell mold, whereby the wall of the mold is supported during the casting operation.

A still further object is to provide a shell-mold flask including a fluid-pressure device adapted to engage the sides of a shell mold and to resiliently support the same in an upright position while cast material is directed to the cavity of the mold.

These and further objects will become more readily apparent from a reading of the specification when examined in connection with the accompanying sheets of drawings.

In the drawings:

Figure 1 is a plan view, with portions in section, of an improved shell-mold supporting device;

Figure 2 is a plan view, partially in section, of another improvement in a supporting device for shell molds;

Figure 3 is another plan view, partially in section, of a supporting device for shell molds;

Figure 4 is a cross-sectional view taken along the line 4—4 of Figure 1;

Figure 5 is a cross-sectional view taken along the line 5—5 of Figure 2;

Figure 6 is a fragmentary sectional view taken substantially along the line 6—6 of Figure 3; and

Figure 7 is an enlarged fragmentary sectional view of a portion of a supporting member of a type shown in Figure 1.

Referring now particularly to Figures 1, 2, 3, and 4, a plurality of shell molds are each generally designated by the reference character **10**. As indicated above, the shell molds are made by the well-known shell process, and include a pair of complementary half portions **11** having irregular outer walls or sides **12** and **13** which are positioned together to provide a cavity **14** adapted to receive molten material which upon hardening will form the desired cast part. Each shell mold **10** is provided with a pouring opening **15**. Laterally extending projections **16** extend outwardly from the shell molds **10**. As indicated also, one of the shell molds is provided with laterally extending projections **17** which extend in a direction to engage the projections **16** of the other shell mold.

As shown particularly in Figures 1 and 4, a mold-supporting device or flask is generally designated by the reference character **18**. The flask **18** comprises a rectangular frame **19** having a bottom **20** connected to vertical side wall members **21**. End wall members **22** are suitably connected to the side wall members **21** and to the bottom **20**.

Referring now particularly to Figures 1, 4, and 7, supports **23** are connected to the side wall members **21**. The supports **23** are vertically spaced with respect to each other and extend substantially parallel to each other and to the bottom **20**. Each one of the supports **23** includes a plurality of laterally spaced bores **24** extending substantially perpendicular with respect to the outer surfaces of the shell molds **10**. As indicated, the shell molds **10** are positioned in vertical relation with respect to the flask **18**. The laterally extending projections **16** of one mold are in abutting or supported relation with respect to one of the wall members **22**. The laterally extending projections **17** of the last-mentioned mold **10** also are engaged in supported relation by the extending projections **16** of the other shell mold **10**. Thus, one of the sides **13** is now unsupported.

A plurality of pins or supporting members **25** are disposed in the bores **24** in reciprocating relation. As indicated in Figure 7, one end of each pin **25** is threaded as indicated at **26**. A collar **27** is threaded onto each pin **25**, the collar **27** serving to secure a ball **28** which is rigidly secured to a gripping member **29**. Thus a ball joint is effected, and the gripping member **29** may easily swivel on the threaded pin **25**. A flat element **30** is connected to each supporting member **25**. A spring **31** is positioned between each flat element **30** and the supports **23**. A diaphragm **32**, of flexible rubber-like material, is in engagement with the flat element **30** of the supporting members **25**. The diaphragm **32** includes a plurality of side portions **33** which are suitably connected to the flask **18** to provide a diaphragm chamber **34**. The diaphragm chamber **34** is adapted to be placed under pressure by means of a pressure connection **35** which may be suitably connected to any pneumatic-pressure unit or fluid-pressure device.

In operation of the embodiment shown in Figures 1, 4, and 7, the shell molds are placed in position as indicated. The pouring openings 15 are ready to receive molten material. As shown in Figure 1, projections 16 are in engagement with one of the walls 22 of the flask 18. Thus these projections serve to support one of the walls of one of the molds. The projections 17 of this last-mentioned mold also extend laterally outwardly and engage the projections 16 of the other mold. Now if pressure is exerted on the wall 13, of the mold nearest the supports 23, sufficient endwise thrust is exerted so that all of the walls are adequately supported in an upright position during the casting operation. In order to gain this result, pins 25 are moved toward the unsupported wall by virtue of the diaphragm which is expanded as a result of the entrance of air or fluid through the pressure connection 35. The outer wall 13 is, of course, of irregular contour. The pins 25 move only until they engage a particular portion of the wall 13. The gripping member 29 is easily swiveled so that it will conform to the regular contour of the wall. Air or fluid pressure within the diaphragm chamber now is constantly exerting resilient pressure against the outer wall 13 so that it is adequately supported at spaced intervals, and in turn, sidewise thrust on both shell molds is provided so that all of the walls are adequately supported during the pouring operation. The spaced position of the pins 25 provides adequate resilient support, and yet permits the escape of gases which will penetrate through the walls 12 and 13.

In Figures 2 and 5, a modified flask or shell-mold supporting device 18 is disclosed. This flask 18 includes similar parts, as shown in the embodiment in Figure 1, and like reference characters will be applied where the parts are the same. The flask 18 includes laterally extending and vertically spaced supports which are suitably connected to the sides 21. The supports 36 include a plurality of vertically and laterally spaced bores 37 in which a plurality of pins or supporting members 38 are mounted for reciprocation. The supporting members 38 each include a flat base 39 which is in engagement with a spring 40, all of the springs 40 being suitably and rigidly connected to a vertical connecting plate 40'. The connecting plate 40' is mounted for reciprocation within the flask 18. Flexible wall members 41 and 42 are suitably connected to the movable plate 40' and to one of the walls 22 to provide a pressure chamber 43. A pressure connection 44 is attached to one of the walls 22 and in communication with the pressure chamber 43, the said pressure connection 44 being connected to a suitable source of fluid pressure.

In operation, the molds are positioned as indicated. Pressure is applied to the pressure chamber 43 and the plate 40' is moved in a direction toward the shell molds. Pressure is thus exerted through the springs 40 against the flat base 39 of the supporting members 38, these supporting members thus engaging and exerting equal pressure at vertically and laterally spaced portions of the wall 13 of one of the shell molds. Thus, the springs 40 serve to exert a resilient pressure which constantly urges the pins 38 against the wall 13 of one of the shell molds to particularly support it and the other walls during the entrance of molten-casting material into the cavities of the molds.

In order to release the pins 38 from pressure engagement after the casting operation has been completed, fluid-extensible devices 45 are provided at opposite sides of the flask. The fluid-extensible devices are connected, as indicated at 46, to the sides 21 of the flask. The fluid-extensible devices 45 include cylinders 47, each having a ram or piston 48 which is suitably connected to laterally extending arms 48' which form a part of the connecting plate 40'. The arms 48' suitably project through slots 49' disposed in the walls 21. Fluid lines 50 extend to the cylinders 47 from a valve 51 which is in communication with a suitable fluid-pressure source 52. By directing liquid under pressure to the cylinders 47, the piston 49 exerts a thrust against the plate 48', thereby collapsing the chamber 43. During delivery of fluid under pressure to the chamber 43, the valve 51 is suitably connected to permit fluid to leave the cylinders 47. Likewise, the pressure connection 44 may be adapted to permit the escape of fluid during the operation of the cylinders 47.

Another modification is shown in Figures 3 and 6. In this particular modification, laterally extending supports 53 are suitably connected to the side members 21, the supports 53 including a plurality of vertically and laterally extending bores 54, which have positioned therein for reciprocation, a plurality of pins or supporting members 55. Each supporting member 55 is provided with a threaded end 56 which extends through a connecting plate 57 and is held relative thereto by means of nuts 58. A spring 59 is provided on each pin 55, each spring being in abutment with a support 53 and with a pin 60 provided on each supporting member 55. A contact head 61 is provided at one end of each supporting member 55.

Fluid cylinders 62 are connected to opposite sides of the walls 21, as indicated at 63. Piston 64 is mounted for reciprocation within each cylinder 62, each piston 64 being connected to a piston rod 65 which in turn is suitably connected to projecting arms 65' of the pressure connecting plate 57. The arms 65' are movable within slots 21' provided in the sides 21. Fluid lines 66 extend to a valve 67, the valve in turn being connected to a suitable source of pressure. It must, of course, be realized that any type of fluid pressure is contemplated and air or hydraulic fluid may be adequate.

In the operation of the device shown in Figures 3 and 6, the shell molds are positioned in an upright position. The springs 59 exert a pressure against each of the pins 60 to urge the same into contact with the unsupported wall 13 of one of the shell molds. When it is desired to remove the shell molds, the valve 67 permits the entrance of fluid under pressure into the cylinders 62 whereupon the pressure plate 57 moves all of the pins away from supporting relation with respect to the shell molds.

Thus it can be seen that in each of the modifications and in the preferred embodiment, effective devices have been disclosed for supporting the shell molds in position for pouring. By virtue of the novel arrangements disclosed, gases may readily escape without hindrance and quick placement of the molds in position is possible. Adequate and positive support is provided for each of the mold walls and the mold walls can be observed during the casting operation. It is contemplated that resilient supporting members can be positioned on opposite sides of the same mold for adequately supporting the same.

It can now be appreciated that all of the objects of the invention have been fully achieved and it must be understood that further changes and modifications may be made without departing from the spirit of the invention from the scope thereof as defined in the appended claims.

What is claimed is:

1. A device for supporting a shell mold in position for casting, said mold including separable members positioned in complementary relation to form a material receiving cavity, said mold having first and second opposite sides; comprising first and second laterally spaced supports positioned on opposite sides of a mold, means associated with said first support and said first side for supporting said first side, means engaging said second side for supporting the same comprising; a fluid pressure chamber connected to said second support, said fluid pressure chamber including a flexible diaphragm wall movable in response to fluid pressure in said chamber, a third support disposed between the first and second supports, a plurality of supporting elements reciprocally mounted on said third support, each of said supporting elements including a tip portion and a base portion, said tip portion including a cup-shaped member adapted to engage and adjust to the contour of the first side of a mold, said

supporting elements being horizontally and vertically spaced on said supports, and resilient means associated with each supporting element for urging each element in a direction toward the flexible wall, said wall being movable to engage the base portion of the supporting elements for moving the same whereby the tip portions engage the first side of the mold to resiliently support the same.

2. A device for supporting a shell mold in position for casting, said mold including separable members positioned in complementary relation to form a material receiving cavity, said mold having first and second opposite sides; comprising first and second laterally spaced supports positioned on opposite sides of a mold, means associated with said first support and said first side for supporting said first side, means engaging said second side for supporting the same comprising; a fluid pressure chamber connected to said second support, said fluid pressure chamber including a flexible diaphragm wall movable in response to fluid pressure in said chamber, a third support disposed between the first and second support, a plurality of supporting elements reciprocally mounted in spaced relation on said third support, each of said supporting elements including a tip portion and a base portion, said tip portion including a gripping member adapted to engage and adjust to the contour of the first side of a mold, and resilient means associated with each supporting element for urging each element in a direction toward the flexible wall, said wall being movable to engage the base portion of the supporting elements for moving the same whereby the gripping members engage the first side of the mold to resiliently support the same.

3. A device for supporting a shell mold in position for casting, said mold including separable members positioned in complementary relation to form a material receiving cavity, said mold having first and second opposite sides; comprising first and second laterally spaced supports positioned on opposite sides of a mold, means associated with said first support and said first side for supporting said first side, means engaging said second side for supporting the same comprising; a fluid pressure chamber connected to said second support, said fluid pressure chamber including a flexible diaphragm wall movable in response to fluid pressure in said chamber, a third support disposed between the first and second support, a plurality of supporting elements reciprocally mounted on said third support, each of said supporting elements including a tip portion and a base portion, said tip portion including a gripping member pivotally mounted on said tip portion and adapted to engage and adjust to the contour of the first side of a mold, and means associated with each supporting element for urging each element in a direction toward the flexible wall, said wall being movable to engage the base portion of the supporting elements for moving the same whereby the gripping members engage the first side of the mold to resiliently support the same.

4. A device for supporting a shell mold in position for casting, said mold including separable members positioned in complementary relation to form a material receiving cavity, said mold having first and second opposite sides; comprising first and second laterally spaced supports positioned on opposite sides of a mold, means associated with said first support and said first side for supporting said first side, means engaging said second side for supporting the same comprising; a fluid pressure chamber connected to said second support, said fluid pressure chamber including a flexible diaphragm wall movable in response to fluid pressure in said chamber, a third support disposed between the first and second support, a plurality of supporting elements reciprocally mounted on said third support, each of said supporting elements including a tip portion and a base portion, said tip portion including a gripping member, means pivotally connecting said gripping members to said tip portion, said gripping members being adapted to engage and self-adjust to the contour of the first side of a mold, said supporting elements being horizontally and vertically spaced on said supports, and resilient means associated with each supporting element for urging each element in a direction toward the flexible wall, said wall being movable to engage the base portion of the supporting elements for moving the same whereby the gripping members engage the first side of the mold to resiliently support the same.

5. A device for supporting a shell mold in position for casting, said mold including separable members positioned in complementary relation to form a material receiving cavity, said mold having first and second opposite sides; comprising first and second laterally spaced supports positioned on opposite sides of a mold, means associated with said first support and said first side for supporting said first side, means engaging said second side for supporting the same comprising; a fluid pressure chamber associated with said second support, said fluid pressure chamber including a wall movable in response to fluid pressure in said chamber, a third support disposed between the first and second support, a plurality of supporting elements reciprocally mounted on said third support, each of said supporting elements including a tip, said supporting elements being horizontally and vertically spaced on said supports, and resilient means associated with each supporting element and being disposed between said wall and said third support to urge the supporting elements in one direction, said wall being movable toward said mold to move said supporting elements whereby the tip portions engage the first side of the mold to resiliently support the same.

6. A device for supporting a shell mold in position for casting, said mold including separable members positioned in complementary relation to form a material receiving cavity, said mold having first and second opposite sides; comprising first and second laterally spaced supports positioned on opposite sides of a mold, means associated with said first support and said first side for supporting said first side, means engaging said second side for supporting the same comprising; a fluid pressure chamber connected to said second support, said fluid pressure chamber including a flexible wall movable in response to fluid pressure in said chamber, a third support disposed between the first and second support, a plurality of supporting elements reciprocally mounted on said third support, each of said supporting elements including a tip portion and a base portion, said tip portion including a gripping member pivotally connected to said tip portion and being adapted to engage and self-adjust to the contour of the first side of a mold, said supporting elements being horizontally and vertically spaced on said supports, and resilient means associated with each supporting element for urging each element in a direction toward the flexible wall, said wall being movable to engage the base portion of the supporting elements for moving the same whereby the gripping members engage the first side of the mold to resiliently support the same.

References Cited in the file of this patent

UNITED STATES PATENTS

1,499,989	Lehmann	July 1, 1924
2,192,133	Hagemeyer	Feb. 27, 1940
2,336,931	Fellows	Dec. 14, 1943
2,660,770	Davis	Dec. 1, 1953

OTHER REFERENCES

Pages 112 to 116, incl., The Iron Age, June 26, 1952.
Page 53, Foundry Trade Journal, July 9, 1953.
Page 371, Foundry Trade Journal, September 17, 1953.