Feb. 3, 1948. H. J. PATTISON 2,435,507

APPARATUS FOR MAKING MOLDS

Filed April 2, 1943 2 Sheets-Sheet 1

Fig. 1.

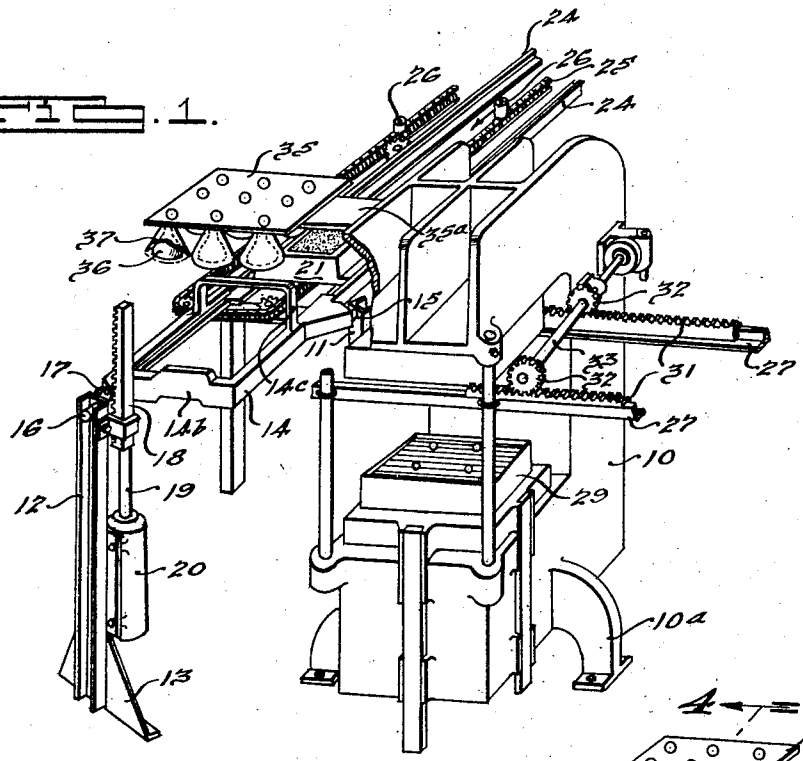


Fig. 2.

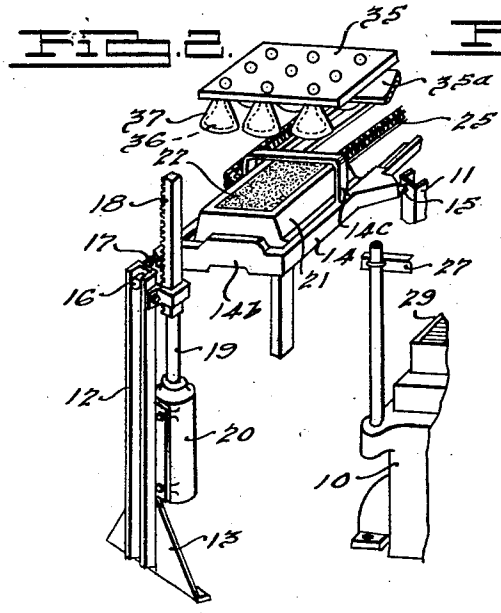
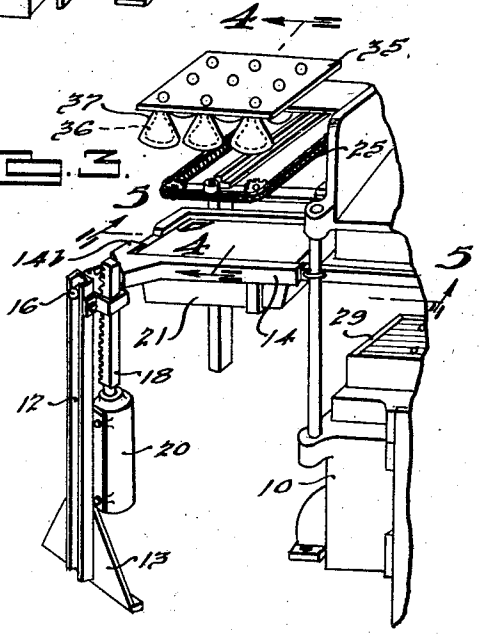


Fig. 3.



INVENTOR
Herbert J. Pattison.
BY
Gray + Smith
ATTORNEYS.

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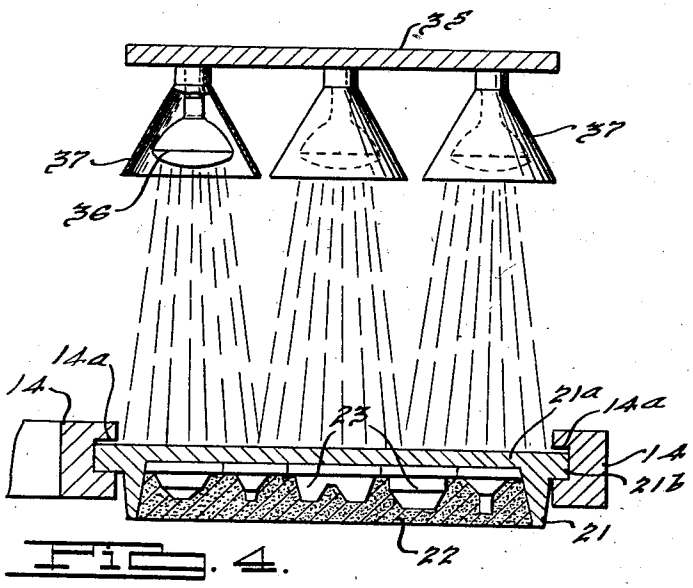


Fig. 4.

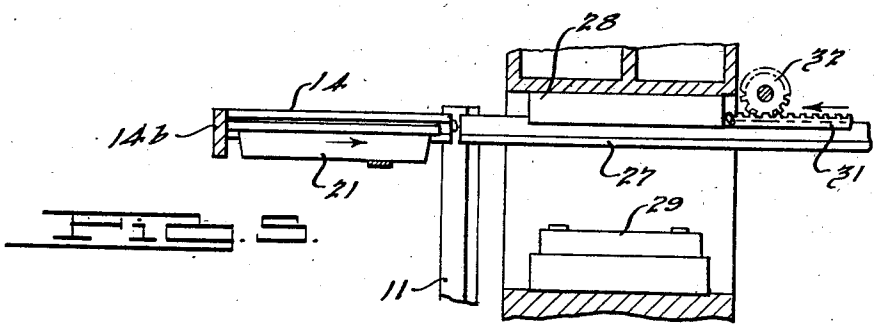


Fig. 5.

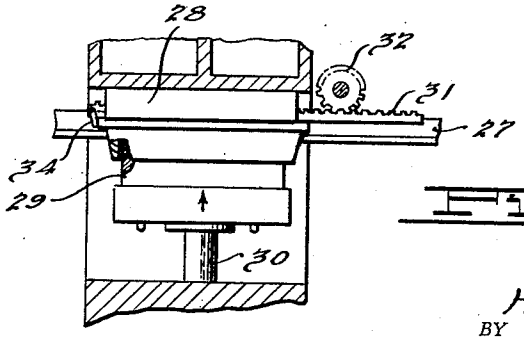


Fig. 6.

INVENTOR
Herbert J. Pattison.
BY
Gray & Smith
ATTORNEYS.

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UNITED STATES PATENT OFFICE

2,435,507

APPARATUS FOR MAKING MOLDS

Herbert J. Pattison, Grosse Pointe, Mich., assignor to Briggs Manufacturing Company, Detroit, Mich., a corporation of Michigan

Application April 2, 1943, Serial No. 481,545

3 Claims. (Cl. 22—34)

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This invention relates to the extraction of molds, such as those formed principally of plaster or calcined gypsum, from flasks or other mold forms.

In the production of plaster or gypsum molds for casting metals it is the practice to prepare a mixture of water and plaster, the plaster or gypsum usually being first mixed with a small quantity of silicate fiber, asbestos pulp, or the like. The plaster-water mix is fed into the mold form or flask within which are mounted the pattern or patterns for forming the casting cavities. The plaster is allowed to set so as to have a sufficient solid consistency to enable the plaster mold to be withdrawn from the flask and then baked in a drying oven, after which the cope and drag portions of the mold are assembled for the pouring operation.

Although the plaster mold, when withdrawn or extracted from the flask, is in a solid state, it is quite soft and readily susceptible to breakage, fracture or deformation and, therefore, must be handled with considerable care. Extraction of the soft plaster mold from the flask presents considerable difficulties and should be undertaken carefully and under accurately controlled conditions in order to minimize losses due to breakage, disruption or the like encountered during mold extraction operations.

Heretofore it has been the practice in connection with one commercial plaster molding system to extract the plaster mold from the flask by applying vacuum through a reciprocating head or platen to the exposed face of the mold while supporting the metal base of the flask through the medium of a magnetic chuck. In the use of this type of apparatus the flask containing the plaster mold is inverted and positioned immediately below the magnetic chuck. The vacuum head is shifted upwardly through the medium of a hydraulically operated piston and the ribbed upper face of the vacuum head is pressed tightly against the exposed surface of the plaster mold. Thereupon the travel of the vacuum head was reversed in order to withdraw the mold by suction from the flask.

Considerable difficulty has been experienced, in connection with this method of extraction, in initially loosening the plaster mold in the flask so that withdrawal therefrom could be accomplished without damaging or fracturing the mold. This difficulty, according to my belief, has largely been due to the fact that a partial vacuum or reduced pressure has been created between the juxtaposed bottom surfaces of the mold and metal flask or

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the metal patterns secured to the bottom of the flask, rendering it exceedingly difficult to effect a separation of these surfaces. It has been found desirable in order to reduce the percentage of mold breakage and loss, due to extraction, to initiate withdrawal of the mold from the flask gently and slowly on account of the relatively soft condition of the plaster mold. However, where a vacuum condition exists between the bottom faces of the mold and flask an excessive suction pull of the vacuum head on the exposed face of the mold has been necessary in order to break the mold loose, resulting in frequent damage to the mold.

An object of the present invention is to overcome the foregoing difficulties and provide an apparatus for mold extraction whereby the mold may be sepaarted more easily from the flask during extraction.

A further object of the invention is to provide an apparatus for withdrawing molds, such as plaster or gypsum molds, from metal flasks or mold forms in which the extraction is accomplished by vacuum or suction and in which the tendency to resist withdrawal by reason of the existence of a partial vacuum between the bottom faces of the mold and flask or patterns carried thereby is materially reduced or substantially eliminated.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

Fig. 1 is a perspective view of a portion of a mold forming apparatus embodying the present invention.

Fig. 2 is a fragmentary perspective view of a portion of the apparatus shown in Fig. 1, illustrating a different position of the mold and flask during its travel through the apparatus.

Fig. 3 is a view somewhat similar to Fig. 2, illustrating a succeeding position of the mold and flask.

Fig. 4 is an enlarged section taken substantially through line 4—4 of Fig. 3 looking in the direction of the arrows.

Fig. 5 is an enlarged section taken substantially through lines 5—5 of Fig. 3 looking in the direction of the arrows.

Fig. 6 is a fragmentary sectional view, in part similar to Fig. 5, illustrating a different position of the mold and flask during its progress through the machine.

Before explaining in detail the present inven-

tion it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

In the drawings I have illustrated, by way of example, one embodiment of the invention as applied to an apparatus for extracting molds, such as plaster or gypsum molds, from flasks or mold forms in which vacuum or suction is applied through a reciprocating vacuum or suction head to the exposed face of the mold while at the same time the opposite metallic face of the flask is held by a magnetic chuck. As illustrated in Fig. 1, the apparatus comprises a suitable frame 10 having legs or bracket members 10*a* adapted to be secured to the floor or to a suitable platform or other base. At one side of the frame are mounted a pair of spaced upright standards 11 and 12 which may be in the form of channels secured by means of brackets 13 to the floor or base. Extending between the upper ends of the standards 11 and 12 is a supporting frame 14 for the mold form or flask. This frame is of skeleton construction and substantially rectangular so as to receive and support the flask which contains the plaster or gypsum mold and the patterns. As illustrated in Fig. 4, the parallel side members of the flask supporting frame 14 are formed with grooves or guideways 14*a* to receive and support the flask as hereinafter described. One end 14*b* of the frame 14 is closed and forms an abutment for the end of the flask when it is shifted into position within the frame. The opposite end of the frame is open in order to permit the flask to be shifted into and out of the frame. The side members at the open end of the frame are connected together by means of an arched cross-tie 14*c*.

The flask supporting frame 14 at diagonal corners thereof is provided with projecting studs or pivot pins 15 and 16, the pivot 15 being journalled in the upper end of the standard 11 and the pivot 16 being journalled in the upper end of the standard 12. Fastened to the pivot 16 is a pinion 17 having its teeth in mesh with the teeth of a vertically reciprocable rack 18. This rack is secured to the upper end of a piston rod 19 connected to a piston (not shown) adapted to be reciprocated within a cylinder 20. The piston may be shifted vertically in opposite directions either hydraulically or pneumatically and this mechanism for reciprocating the rack 18 may be of any conventional type. From this construction it will be seen by operating the fluid motor 20 to shift the rack 18 downwardly the flask supporting frame 14 may be swung from its position shown in Fig. 1 to the position shown in Fig. 3, this operation resulting in inverting the frame or turning it upside down. By operating the fluid control mechanism so as to shift the rack 18 in an upward direction the flask supporting frame 14 will be swung from the position shown in Fig. 3 to that shown in Fig. 1. Due to the pivotal mounting of the frame at front and rear diagonal corners the open end of the frame will be positioned in Fig. 3 at right angles to the position shown in Fig. 2 when the rack 18 is shifted downwardly to invert the frame.

A suitable metallic flask or mold form is illustrated at 21, see particularly Fig. 4. This flask is in the form of a container having surrounding side walls and a flat base 21*a* to the inner surface of which are secured any suitable number of patterns 23 which form the casting cavities in the mold 21. Before the extraction operation the flask containing the patterns is charged with a mixture of water and plaster. The flask with its mold mixture is then caused to travel through a setting table within which the temperature is raised sufficiently to cause the mixture to set within the flask. The temperature of the mold 22, when it emerges from the setting table, is preferably about 180° F. The flask containing the plaster mix preferably travels in a continuous direction through the setting table and thence is caused to travel along spaced guides 24 to the mold supporting frame 14. The guides 24 may be in the form of angles, suitably supported, and providing parallel trackways or guideways upon which the side flanges 21*b* of the flask are supported for travel. The flask, after it emerges from the setting table, is shifted along the guides 24 by means of an endless conveyor chain 25 which is provided at suitable intervals with upwardly projecting rollers 26 adapted to engage in succession the rear ends of the flasks and propel them over the guides 24 to the flask supporting frame 14. It will thus be seen that the flask 21 is propelled over the guides 24 by the conveyor chain 25 and thence is shifted through the open end of the frame 14, in its position shown in Fig. 1, into supported position within the frame, the side flanges 21*b* of the flask being received within the grooves or channels 14*a* in the sides of the frame. With the flask thus supported in the frame 14 the rack 18 is shifted downwardly to rotate the frame 14 and invert it in the manner illustrated in Fig. 3.

Suitably supported within the frame 10 are a pair of spaced parallel guide members 27, similar to the guides 24. These guides are so positioned that they will extend in alinement with the channels 14*a* of the frame 14 when in its inverted position illustrated in Fig. 3. Thus, as illustrated in Figs. 5 and 6, the flask 14 may be shifted from the frame onto the guides 27. Carried by the frame 10 and positioned above the guides 27 is a suitable magnetic chuck 28. Beneath the magnetic chuck 28 is a vacuum head 29 supported by a hydraulic ram or piston rod 30 which is adapted to be reciprocated vertically through any suitable hydraulic or fluid control means. Thus, during the extraction operation the inverted flask 21 may be shifted from its position shown in Fig. 5 to a position, as illustrated in Fig. 6, directly beneath the magnet 28. Thus, when the magnet 28 is energized the bottom 21*a* of the flask will be within the magnetic field and, hence, the flask will be elevated a slight distance off the guides 27 into engagement with the magnet and supported thereby. At this time the vacuum head 29 is shifted upwardly to bring its ribbed upper surface into sealing engagement with the mold 22 whereupon a reduced pressure or partial vacuum is created within the vacuum head. Thereafter, downward movement of the vacuum head will cause it to withdraw the mold 22 from the flask by suction. The construction and operation of the magnetic chuck 28 and the vacuum head 29 are more fully shown and described in my copending application Ser. No. 473,983, now Patent No. 2,346,182, granted April 11, 1944.

The flask 21 may be shifted from the supporting frame 14 onto the guides 27 and beneath the magnetic chuck 28 by any suitable means. In the present instance this is accomplished by

means of a pair of reciprocating racks 31 which may be supported for travel on the guides 27. Meshing with the teeth of the racks 31 are a pair of pinions 32 carried by a shaft 33 which may be rotated in opposite directions by any suitable means. The racks 31 carry at their forward ends a pair of spring controlled pivoted fingers 34. When the flask 21 is in the position shown in Fig. 5 the racks 31 are shifted forward until the spring fingers 34 engage over the far end of the flanged edge of the flask, as shown in Fig. 6. Thereupon the operating mechanism for the racks is reversed and they are shifted rearwardly to draw the flask onto the guides 27 beneath the magnetic chuck 28.

As heretofore stated, considerable difficulty has been encountered in withdrawing the mold 22 from the flask by suction and at the same time avoiding danger of damaging or fracturing the mold. This difficulty has been largely overcome and the danger of thus damaging the mold has been greatly minimized by virtue of the present invention. Mounted on the frame 10 through the medium of a bracket 35a above the flask supporting frame 14, when in its inverted position shown in Fig. 3, is a canopy or supporting head 35 for a group of lamps 36. In the present instance nine lamps are mounted on the canopy 35 and are connected in conventional manner by conductors to a source of electricity. The lamps 36 provide a source of radiant energy and give off infra-red rays of high heat intensity. Embracing each lamp is a reflector 37 for assisting in concentrating the rays.

Thus, as illustrated in Fig. 4, when the flask supporting frame 14 has been inverted and is in the position shown in Fig. 3, the metallic base or bottom 21a of the flask is disposed directly beneath the lamps 36 and is subjected to the heat rays from these lamps. The flask is held in this position for a suitable interval of time to permit the rays from the lamps to heat the bottom 21a of the flask, which heat is conducted to and through the metallic patterns 23, thereby raising their temperature slightly. Since the plaster of the mold is extremely porous, the air trapped between the mold 22 and the adjacent surfaces of the patterns or flask will be subjected to the heat transmitted from the infra-red lamps 36. Thus, the temperature of the air at the bottom surfaces of the mold 22 will be raised, hence increasing the pressure at these areas. The presence of moisture at this locality, due to the moist condition of the mold, assists the withdrawal of the mold. As the withdrawal of the mold is initiated a rise in temperature of several degrees will occur resulting in the production of steam and a consequent increase in pressure. With the mold and flask in this condition the latter is then shifted by the racks 31 into the position shown in Fig. 6 and the vacuum head 29 is operated to engage the mold 22 and withdraw it by suction from the flask. When the vacuum is applied to the head 29 and the latter is shifted to withdraw the mold, the latter will be broken loose from the flask immediately since there will be no partial vacuum condition along the bottom surface of the mold tending to resist withdrawal

of the mold. Thus, when the mold is broken loose from the flask no vacuum or reduced pressure condition will exist at the bottom of the mold and, therefore, the mold may be withdrawn by the vacuum head smoothly and gently with a minimum danger of damage to the mold.

I claim:

1. An apparatus for extracting a plaster mold from a metal flask having a metal pattern secured therein against the bottom of the flask, comprising a rotatable frame, means for conveying the flask into supported position on said frame with the mold exposed within the open top of the flask, means for rotating said frame to invert the flask and position the bottom thereof uppermost, means for directing heat rays against the bottom of the flask to initiate separation of the mold from the pattern within the flask, and means for thereafter withdrawing the mold in a downward direction from the flask.

2. An apparatus for extracting a plaster mold from a metal flask having a metal pattern secured therein against the bottom of the flask, comprising a rotatable frame, means for conveying the flask into supported position on said frame with the mold exposed within the open top of the flask, means for rotating said frame to invert the flask and position the bottom thereof uppermost, means for directing heat rays against the bottom of the flask to initiate separation of the mold from the pattern within the flask, and means for withdrawing the mold from the flask.

3. An apparatus for extracting a plaster mold from a metal flask having a metal pattern secured therein against the bottom of the flask, comprising a rotatable frame, means for conveying the flask into a supported position on said frame with the mold exposed within the open top of the flask, means for rotating said frame to invert the flask and position the bottom thereof uppermost, means for subjecting the bottom of the flask to heat sufficient to initiate separation of the mold from the pattern within the flask, and means for thereafter withdrawing the mold in a downward direction from the flask.

HERBERT J. PATTISON.

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