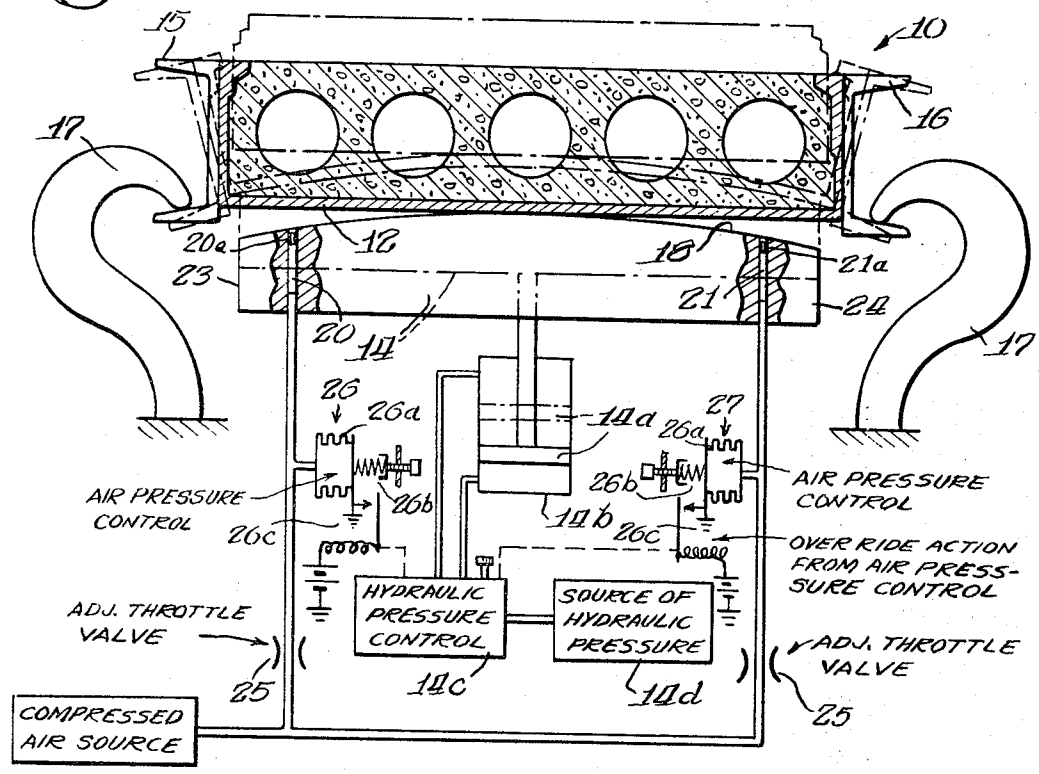
Oct. 24, 1967 T. W. SHOE 3,348,279

STRIPPING SYSTEM FOR CONCRETE SLAB CASTING FORM

Filed Oct. 21, 1965

Fig. 1



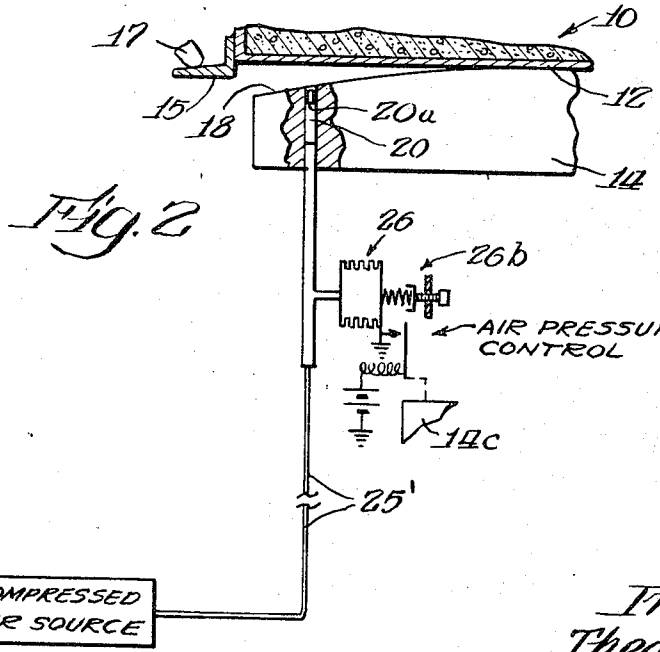
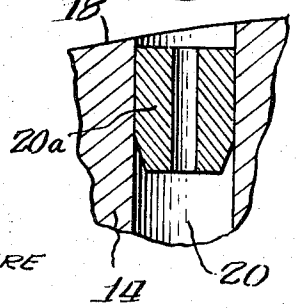


Fig. 2

Fig. 3



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STRIPPING SYSTEM FOR CONCRETE SLAB CASTING FORM

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This invention relates to a stripping system for concrete slab casting form and is an improvement upon the means for stripping a concrete slab casting form as disclosed in United States Patent No. 3,061,904, granted Nov. 6, 1962.

The casting forms to which this invention pertains are generally of the type disclosed in said United States patent. These casting forms have a generally U shaped section and are adapted to be stripped by arching the casting form bottom. In said patent, there is disclosed contour plate means providing a curved surface over which the bottom of such a casting form can be arched to secure stripping without overstressing the form. Briefly, the casting form stripping involves the application of force to channels on opposite sides of the casting form to cause the form bottom to conform to the curvature of the contour plate.

Stripping generally is accomplished by hydraulic jack means, an example of such means being disclosed in United States Patent No. 3,142,106, granted July 28, 1964. The forces generated for stripping are powerful and must be controlled to prevent excessive force being applied to the casting forms. While the various stripping means and methods disclosed in the above identified patents permit of a substantial margin of error insofar as the magnitudes of stripping forces are concerned, nevertheless it is desirable to provide means for monitoring the operation of the hydraulic means at the region where stripping forces are applied.

The invention hereinafter disclosed makes possible a simple and effective monitoring system whereby the stripping force applied to a casting form can be limited to that required for arching the bottom of the casting form over the prescribed surface of the contour plate. In general, the invention utilizes the relative positions of a casting form bottom and the arched contour surface for controlling the application of stripping force to the system. The stripping means disclosed in the prior patents referred to have utilized as a control factor, the magnitude of the force applied for stripping. This is generally satisfactory if the hydraulic system being used is controlled to apply a predetermined force for stripping and if the force is properly calibrated for the job. However, where a number of different casting forms are to be stripped or the casting form characteristics change, it may be necessary to apply different stripping forces to prevent damage to the casting forms. In addition, the control equipment must be sensitive enough to respond to small variations in pressure in hydraulic systems.

Pressure responsive control means for hydraulic systems often develop faulty response characteristics and precise response of such control means cannot always be obtained. In the stripping systems disclosed in the above identified patents, a substantial increase in stripping force due to faulty response of controls may cause serious damage to expensive casting forms.

In its more general aspects, the invention contemplates providing one or more air escape passages or ducts at a contour plate and associated control means responsive to large changes in the air passage impedances for control action. The air ducts are located at portions of the contour plate which are normally adjacent to the contour plate edges, these, in turn, being adjacent to the sides of a casting form being stripped. The air ducts rely upon the

bottom of a casting form being stripped to function as a valve element for substantially closing the air ducts at the contour plate surface when the casting form bottom is in proper position for stripping. The invention will now be described in conjunction with the drawing wherein FIG. 1 is a diagrammatic representation of a stripping system employing the invention. FIG. 2 is a detail illustrating a modification in part of the system, and FIG. 3 is an enlarged detail of an end of the duct.

A casting form generally indicated by **10** can be of the type disclosed in the first patent previously referred to. The exact structure of the casting form for use with the present invention is not important except that for stripping, bottom **12** of the casting form must be arched as illustrated to conform to the curvature of contour plate **14**. Contour plate **14** is disclosed in the second patent previously identified. Casting form **10** has channels **15** and **16** on opposite sides thereof, these channels being used to obtain the stripping action. As more fully disclosed in said patents, stripping is accomplished by restraining the channels with hooks **17** and applying force to cause bottom **12** of the casting form to bow or arch about surface **18** of the contour plate. Normally, prior to the application of stripping force to channels **15** and **16**, bottom **12** of the casting form is generally flat (see, for example, FIG. 7 of the second patent), and rests upon the crown or high part of contour plate **14**. In the final stripping position, bottom **12** is arched so that it bears against substantially the entire transverse extent of surface **18** of the contour plate. This may be accomplished by pulling down on the channels, or urging the contour plate up or both.

A simple means for accomplishing the stripping is illustrated. Contour plate structure **14** can be urged upwardly by hydraulic piston **14*a*** working in hydraulic cylinder **14*b***. Cylinder **14*b*** is coupled through hydraulic pressure control **14*c*** to hydraulic pressure source **14*d***. It is understood that control **14*c*** is an automatic control to limit the amount of stripping force applied to urging contour plate structure upwardly. Control **14*c*** can cause damage to the casting form if, for some reason, hydraulic pressure on piston **14*a*** exceeds the value necessary for accomplishing the stripping.

In accordance with the present invention, contour plate structure **14**, which may be one or a number of blocks of metal, is provided with air ducts **20** and **21** adjacent edges **23** and **24** of a contour plate. Air ducts **20** and **21** terminate at contour surface **18**.

The dimensions of air ducts **20** and **21** insofar as cross section are concerned are not important except that once determined, these dimensions should remain substantially constant for various installations. This is to permit precalibrated controls to be used. However, it is desirable to avoid having to provide ducts **20** and **21** with fine tolerances. The contour plates are massive and thick and cannot be accurately drilled unless precautions are taken. It is preferred, therefore, to have air ducts **20** and **21** of substantial diameter such as, for example, about the order of 3/16" and provide an orifice insert for each duct. Thus, inserts **20*a*** and **21*a*** are inserted into the top or contour face end of each duct. These inserts are of steel or any other suitable material and can be about 3/8" long and have a bore of the order of about 1/16". It is quite simple to manufacture such inserts to a tolerance of the order of about .001" or .002", both in regard to the diameter of the bore and length. Thus, an accurate insert may be provided for each duct. The free end of each insert is preferably disposed just a bit below the level of the contour surface to avoid the possibility of interference and damage when the bottom of the casting form comes down against the contour plate.

Connected between ducts **20** and **21** and compressed air source **28** are adjustable throttle valves **25** for providing a high resistance to substantial air flow.

Air pressure responsive means **26** and **27** are connected in the air lines adjacent air ducts **20** and **21**. Compressed air at any desired air pressure such as about 30 or 40 lbs./sq. in. is usually available and can be used. Instead of throttle valves, capillary tubing **25** of suitable length may be used as illustrated in FIG. 2.

Each air pressure responsive means may be conventional and, as an example, may have expansible bellows **26***a* whose interior communicates with the air pipe line going to throttle valve **25**. Bellows **26***a* is associated with an adjustable spring loading means **26***b* and has electrical contacts **26***c*. Each air pressure control thus has an electric switch which is open or closed, as the case may be, and which controls the condition of hydraulic pressure control **14***c*. The arrangement is such that in the event that air duct **20** or **21**, or both of them, is substantially closed by the bottom of the casting form, the increased air pressure within bellows **26***a* changes the condition of switch **26***c* and actuates hydraulic pressure control **14***c* to prevent the application of further hydraulic pressure to the piston **14***a*.

During stripping, the casting form bottom approaches the free ends of air ducts **20** and **21** and in the final stripping position function to provide an air seal. Even though a perfect air seal may not be obtained, the reduction in air flow through ducts **20** and **21** and their orifices is so great that escape of air at the casting form bottom is practically cut off. This will result in a sharp jump in air pressure and permits such pressure changes to be used as an actuating means for controlling the power to the stripping means. Thus, when casting form bottom **12** reaches its final position over contour plate surface **18**, the control action comes into play. By having the air ducts **20** and **21** close to the contour edges, the control action is delayed until full stripping position is reached. By locating the air ducts further from the edges, the control action may be initiated earlier. The control of the stripping means is thus determined by the position of the casting form bottom rather than by the magnitude of the stripping force. It will be understood that the control is for the purpose of preventing any increase in the stripping force magnitude beyond that required for stripping. After the casting form is in position for stripping, the form must be retained in such position to permit actual removal of the casting. The stripping condition may be maintained by keeping the hydraulic pressure of the stripping means constant or by mechanical means for retaining the form in stripping position (as by hooks, etc.) After stripping has occurred, the form is released and permitted to straighten out.

The air control ducts may be provided at intervals along the length of an entire stripping system.

While compressed air is preferred, suction may be used to reverse the air flow. Compressed air is preferred and not only keeps the passages clean but can provide a much greater pressure differential for operation.

The control over hydraulic jacks by pressure responsive means **26** may be exercised in a number of ways. Thus, one or more controls **26** alone may be used to shut off power or two operate in series relation as by connecting switches in series. The control action of pressure responsive means **26** can be applied to hydraulic pressure control **14***c* to hold the hydraulic pressure fixed and prevent increase in hydraulic pressure or to cut-off the pressure for a short time (as a second or two) and then re-apply the same pressure. In general, the air pressure control can be set to operate and cut-off stripping action only after the predetermined setting of automatic control **14***c* has failed to act, or can be used as a primary control without regard to automatic control **14***c*.

In connection with the pipe between throttle valve **25** and ducts **20** and **21**, while considerable latitude in the pipe diameter is possible, it is desirable to observe the following: If the pipe connections are too small in diameter in comparison to the rest of the system, the fluid flow resistance may be great enough to create an undesired back pressure and reduce the sensitivity of the system. For example, diameters of about ⅛" to ¼" are satisfactory. On the other hand, if the pipes are too large in diameter or too long in length, the pipes will act as a fluid reservoir and create an undesirable time delay before the air pressure control will function. This, of course, is a consideration in the overall engineering of a system embodying the present invention. It is clear that the response characteristics of the hydraulic pressure control **14***c* as well as the size of bellows **26***a* will also have to be considered.

In general, the determination of the pipe connections is simple and, as a rule, not critical within a substantial range of values.

What is claimed is:

1. In a system for stripping casting forms having normally flat bottoms, said system having contour plate means to define a curved surface over which a casting form bottom is arched to conform to said curved surface and power means are provided for arching the casting form bottom, the improvement comprising air duct means having a free air discharge end lying generally in the curved surface defined by the contour plate means, means including a connection between said air duct means and a source of compressed air and normally providing substantial air flow resistance to said air duct means, said free duct end being adapted to be substantially closed as the bottom of said casting form approaches the desired arch stripping shape and means responsive to the rise in air pressure incident to the substantial blockage of air discharge from the normally free duct end for controlling the power means for arching the casting form bottom.

2. The system according to claim **1** wherein said connection between said air duct means and source of compressed air comprises a throttle valve.

3. The system according to claim **2** wherein said air duct means includes an orifice for said air duct, said orifice being located to provide a termination for said air duct.

4. The system according to claim **3** wherein said orifice terminates just below the contour plate surface.

5. The system according to claim **1** wherein said connection between said air duct means and source of compressed air comprises capillary tubing.

6. The system according to claim **1** wherein said power means for arcing the casting form bottom includes means energized by hydraulic pressure and control means responsize to the hydraulic pressure to provide a hydraulic power system, said means responsive to the change in air pressure controlling said hydraulic system for monitoring the operation of said hydraulic system to insure that said casting form is not overstressed after reaching its stripping position.

7. The system according to claim **1** wherein the piping between the ducts at the contour plate means and the air responsive means is selected so that the overall response characteristics are not deleteriously affected with regard to sensitivity on the one hand and speed of response on the other hand.

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