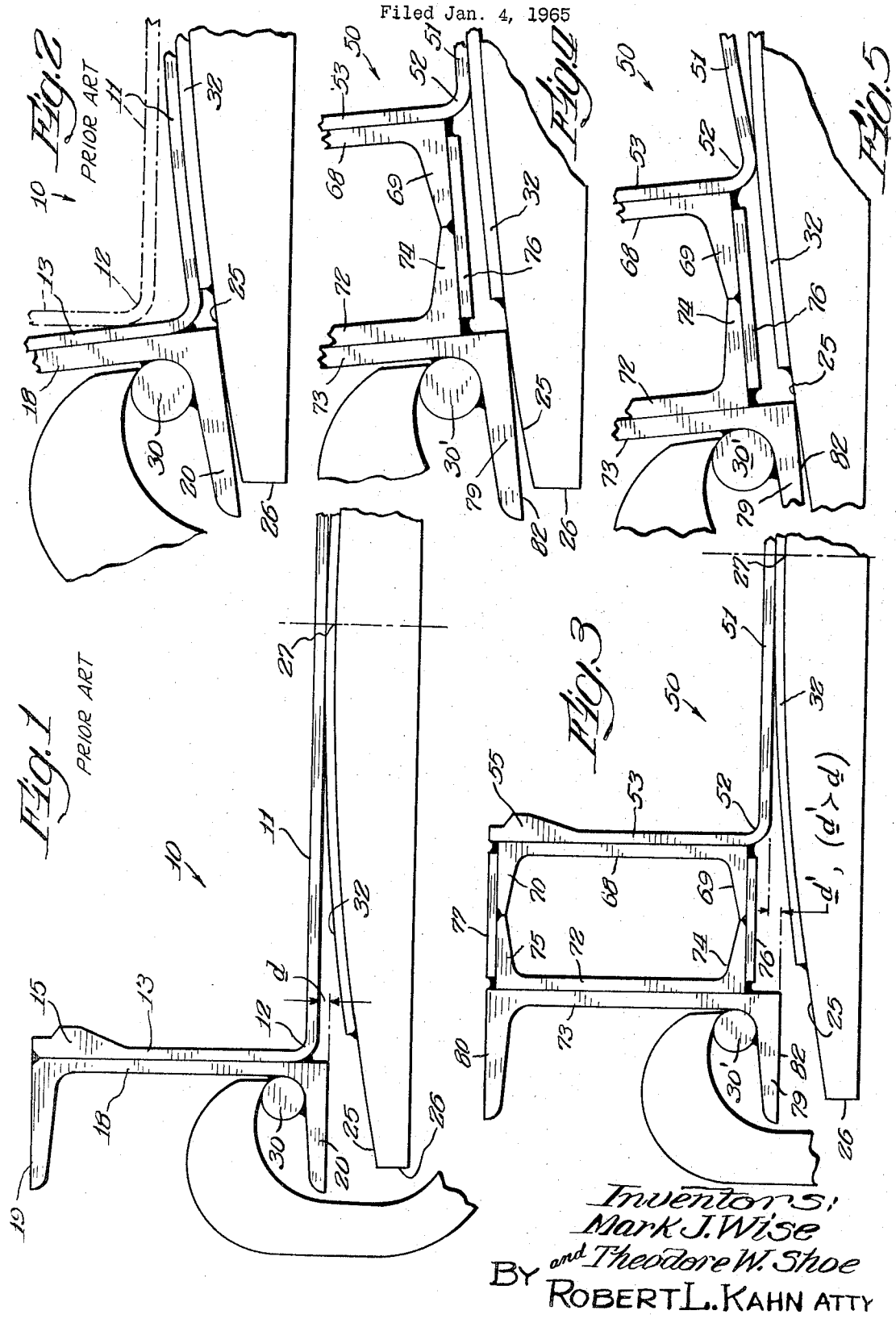
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ONE-PIECE CASTING FORM

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ONE-PIECE CASTING FORM

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This invention relates to a one-piece casting form and is a modification of the casting form disclosed in United States Patents Nos. 3,023,476 and 3,023,477, issued on March 6, 1962, to the present assignee. In these patents, there are disclosed two modifications of casting forms for handling long castings wherein release of a casting from the casting form is affected by buckling the bottom of the casting form in a curve which is concave to the interior of the casting form to spread the form sides. This manner of casting release is necessitated by the fact that grout keys are formed in the casting. The interlocking action between the key forming portion of the casting form and the casting key itself prevents the removal of the casting by simply pulling the casting away from the form in a direction normal to the length of the casting.

As the above patents disclose, the design of the keys in a casting is controlled by a number of considerations and, as a result, is a factor in the radius of curvature imparted to the casting form bottom during the stripping operation. One of the important factors governing the radius of curvature of the form during stripping is the characteristic of the steel. It is important that the steel of which the casting form is made should not be overstressed and thus be permanently damaged.

In order to strip such casting forms, a so called contour stripping means is disclosed in prior Patent No. 3,061,904, also assigned to the present assignee. This contour stripping means provides a contour surface against which the casting form bottom is urged and thus causes the casting form bottom in arching to follow a prescribed curve conforming to the shape of the contour surface. This curve is designed so that the maximum spreading of the casting form sides is obtained without over-stressing the form.

The contour plate stripping means disclosed in the last identified patent provides a quick and efficient means for stripping a casting form. In general, such a stripping means is designed to accommodate what might be termed a conventional width casting form, such as, for example, 24 inches. This is the width of the inside of the casting form from side to side and represents the width of the finished casting. As a rule, such stripping means provide means for engaging the channel reinforcements along the sides of the casting form and extending outside of the casting form. These channels are heavy and for all practical purposes may be considered as rigid and unyielding insofar as arching or flexing of the casting form bottom is concerned.

Thus, a conventional stripping machine designed for a particular width of slab, such as, for example, a 24-inch slab casting form, will have the bottom flanges of the reinforcing channels spaced apart from each other a certain distance. The claws or hooks for pulling the form flanges downwardly can be quickly and simply positioned to engage the form flanges.

It happens that instead of a standard width slab, such as, for example, 24 inches, it may be necessary to provide a number of slabs having what might be designated as sub-standard widths such as, for example, 20 inches or 18 inches rather than the standard 24 inches. This may come about due to the fact that a large number of slabs when laid side-by-side in the field do not completely fill the prescribed space of a building or floor and, in consequence, makes it necessary to have one or more slabs of different and smaller widths as fillers.

This invention relates to a sub-standard width slab casting form which can be handled, however, in a conventional stripping machine without requiring any adjustments. In designing a sub-standard width casting form, it is important that it be susceptible to stripping in a conventional stripping means having the customary contour plate for stripping full width slabs. Any requirement for special width contour plates for such machines would render the design of such machines expensive and the use of such machines, as a rule, prohibitive. This is because the means for engaging the flanges at the outsides of the forms are dimensioned for standard width forms and would involve a complete redesign of such a machine not only with respect to the width of a contour plate, but also with respect to the spacing between the means for applying force to the flanges of the casting form. To incorporate special width adjustment features in a stripping machine is not desirable due to the infrequent use of such adjustments.

As will appear further in connection with the description of the present invention, certain problems arise in connection with the expedient of increasing the external rigid portion of the casting form to be engaged by the stripping claws while decreasing the width of the casting form to provide a casting of sub-standard width. The problem and a solution will be more easily explained in connection with the drawings, wherein:

FIGURE 1 is a transverse showing of one half of a standard width casting form and the reinforcing flange along the side thereof, it being understood that both halves of the casting form are similar, the casting form resting upon a contour plate, the concrete casting being omitted;

FIGURE 2 is a detail and illustrates the form in FIGURE 1 during stripping;

FIGURE 3 is a view analogous to FIGURE 1 of a casting form embodying the present invention and adapted to accommodate a slab of sub-standard width;

FIGURE 4 is a detail and shows the casting form of FIGURE 3 during stripping on the contour plate illustrated in FIGURES 1 and 2 designed for full standard width casting slab forms;

FIGURE 5 is a detail showing pan distortion during stripping in a sub-standard width form not utilizing the invention.

Referring first to FIGURES 1 and 2, a casting form, generally indicated by **10**, has pan bottom **11**, curved corners **12** and sides **13**. The top portion of each side **13** is provided with key forming portion **15**. As disclosed in the first mentioned two patents previously referred to, pan bottom **11** and curved corner **12**, and possibly sides **13**, are made of steel having definite characteristics. The shape of key forming portion **15**, particularly the largest dimension inwardly of the casting to be made, is tied in with the radius of curvature which is necessary to impress upon pan **11** in order to spread sides **13**.

Sides **13** of the casting form are reinforced with channels **18** having top and bottom flanges **19** and **20** respectively. These flanges extend away from sides **13** of the casting form. It is understood that the casting form which is shown in section may have a length of as much as 40 or 50 feet. The casting form must be strong enough so that when filled with concrete mix, it will still maintain its shape, assuming that the sides and bottom are properly supported. After the concrete has set, the casting form is disposed upon a stripping means as disclosed, for example, in the last identified patent. This stripping machine in practice includes contour plate **25** having a predetermined width (dimension between sides **26** of the plate) and is also provided with hooks or claws for engaging grips **30** rigidly secured to the bottom

corner of each of the two channels. Grips 30 are provided as a convenient means to provide firm seats for claws or hooks of the stripping machine to engage or grip bottom flanges 20 at desired flange parts—in this instance, the heel of the flange where it merges into the web of the channel.

In practice, the bottom face of pan 11 in the position of the casting form when the pan is flat, as illustrated in FIGURE 1, is above the outer face of bottom flange 20 on each side of the casting form. This offset is illustrated as *d* and may be of the same general order of thickness as the thickness of pan 11. The value of *d* is not critical. The reason for the offset is to stack forms one above the other with the bottom flanges of a casting form resting upon the top flanges of a casting form just below it, with clearance for pan 11. Contour plate 25 has spacer plate 32 disposed above the contour surface. When the casting form is in stripping position, as illustrated in FIGURE 2, a portion of the bottom of flange 20 on each side of the casting form will rest upon the edge part of contour plate 25 just beyond the edge of spacer plate 32. The edge portions function as stops.

Preliminary to stripping, the casting form and its contents rest on center portion 27 of the contour plate with the sides of the casting form and the channels being clear above the contour plate. Due to the weight of the casting, there may be some curvature or buckling of the casting form. However, by itself, this is insufficient to affect stripping, and the stripping is accomplished by the procedure disclosed in the patent previously identified. As FIGURE 2 illustrates, during stripping, pan 11 of the casting form is arched upwardly, the curvature of the contour spacer plate 32 determines the nature of the shape assumed by the pan bottom during stripping.

It is important during stripping that the bottom flanges of the side channels be prevented from being pulled too far. This control may be provided by careful control of the stripping machine. A convenient arrangement is obtained by having the flange bottoms supported in stripping position against the contour plate edge portions which function as stops.

Referring now to FIGURE 3, casting form 50 embodying the present invention is illustrated. The casting form has pan portion 51, corner portion 52 and side portion 53. Key forming portion 55 is provided. The dimensions of key portion 55 are not the same as key forming portion 15 of the full width slab illustrated in FIGURE 1. In fact, the maximum thickness of this portion, that is, the dimension parallel to the thickness of side 53, will have to be somewhat less than the corresponding dimension of key portion 15 in the full width form. This follows from the fact that casting form 50 is not as wide as casting form 10 and can therefore not accommodate the same depth of keyway.

One of the factors in the amount of spring necessary for stripping is the width between sides 53 of the casting form. Casting form 50, as has been previously indicated, is of narrower width than casting form 10. It is understood that the width of the casting form is the distance between opposed sides 13 in casting form 10 and sides 53 in casting form 50. The bottom and sides of casting form 50 can be made of steel having the same characteristics as in casting form 10. This is on the assumption that the steel in casting form 10 is worked to the limits of safety during the stripping operation. By narrowing the casting form width, as is the case with casting form 50, the stresses in pan 51 will be increased if sides 53 are opened to as great an angle of divergence, as is true of sides 13 in casting form 10, to accomplish stripping. For that reason, the dimensions of key forming portions 15 and 55 respectively can not be the same. This is implicit in the mathematics of the design. However, in reducing the dimensions of key forming portion 55, it is desired to make the reduction as small as possible so that, in effect, the net result will be that the metal making

up the bottom of casting form 50 will be stressed to the limit of safety in a manner corresponding to the stresses in casting form 10.

The reduction in width of casting form 50 must be compensated for by suitable means to permit the use, without adjustment, of the same stripping mechanism as used in connection with casting form 10, it being understood that by the "same stripping mechanism" is meant not only the identical machine, but without requiring the change of any setting. Accordingly, casting form 50 is provided with channel 68 having flanges 69 and 70 as with form 10. In addition to channel 68, channels 72 and 73 are provided. Channel 72 has flanges 74 and 75 which are opposed and abut the edges of flanges 69 and 70 of channel 68. Blocks 76 and 77 are disposed on the outer surfaces of the opposed flanges and welded thereto to form rigid extension structures. Channels 68 and 72, together with blocks 76 and 77, are dimensioned so that the outer bottom face of lower block 76 is at or above the level of the pan bottom surface when pan 51 is flat. All the parts are suitably welded together.

Channel 73 has bottom and top flanges 79 and 80. Bottom flange 79 has claw grip 30′ at the junction of the flange and web. Top flange 80 may have its top surface generally level with the top of block 77 and the top edge of the casting form side. The arrangement of channels 68 and 72 makes a rigid lateral extension for the casting. Thus the effective width of the casting form structure—the distance across between grips 30′—is the same as between grips 30 of the standard width form of FIGURE 1. The overhang of the claws on the stripping machine will clear flanges 20 or 79 of the two kinds of casting form structures.

Actually, the width between flanges of channel 73 need not be greater than channel 18. It is the level of lower face 82 of lower flange 79 which is important. The top surface of flange 80 could be below the level of top block 77 and the structures would stack satisfactorily.

The precise manner in which the difference in width of casting form 50 and casting form 10 is taken up is not important, so long as each side 53 of the casting form is reinforced by some steel member corresponding to channel 68 and so long as the effective width of the entire casting form structure as a whole matches that of casting form 10. However, what is of critical importance is the fact that the difference *d′* between the bottom outer flat face of pan 51 and bottom face 82 of flange 79 be greater than the corresponding difference *d* in casting form 10. Not only must *d′* be greater, but the increase in this distance will be proportional to the decrease in width of the casting form proper. In other words, the difference between *d′* and *d* will be proportional to the increased distance between a side 53 of the casting form and the corresponding grip portion 30′. This difference will depend upon the curvature of the contour plate, and it is assumed that the contour plate is the same in FIGURE 4 as in FIGURE 2.

As is evident in FIGURE 4, when casting form 50 is stressed to a stripping position, the bottoms of welded blocks 76 will be above the extension of pan portion 51 and thus will be able to remain clear of the edge portions of spacer plate 32. However, what is important is that the heel of bottom portion 82 of flange 79 will be able to contact the edge portion of contour plate 25. If distance *d′* is made equal to *d* as in FIGURE 1, then from the geometry of the entire structure, it will be found that the heel of bottom surface 82 of flange 79 will be spaced above the top surface of the edge portion of the contour plate. In such case, during stripping, the powerful forces exerted upon members 30′ of the casting form will pull the heel portion of lower flange 79 of channel 73 down against the contour plate. Since the entire structure of channels from side 53 of the casting form can be assumed to be a rigid structure, the tremendous forces exerted in moving lower flanges 79 down against the contour plate

will have the effect of rocking each side **53** of the casting form about each radius corner **52**. This will cause excessive bending at the angle and will tend to arch pan portion **51** of the casting form upwardly above and clear of the contour surface, as illustrated in FIGURE 5, and result in over-stressing of the pan bottom.

Dimension *d'* will depend upon the amount of reduction of the width of the casting form (between sides **53**) and the consequent enlargement of the extensions at sides **53** of the casting form structure for engagement by stripping claws. While the difference of the various values of *d'* may be small in terms of dimensions, the differences in the operation of the entire casting form during stripping can be quite large and be critical of whether the casting form is operated within or outside of its elastic limits.

Dimension *d'* will be based upon the fact that the same stripping machine is used without any change in the contour plate or without any change in the spacing between the regions at the sides of the entire casting form structure where the pulling forces for arching the casting form bottom are applied. Consequently, different casting forms having different widths and different values of *d'* can be provided, and when used will not interefere with conventional production and stripping of casting forms having the full width.

It is understood that the stripping forces due to the claws will be applied to the bottom flanges as near as possible to the heel of the flange. If grip portions **30'** of the flanges were disposed near the free tips of the flanges, then some rocking of the rigid structure would result unless bottom surface **82** of the bottom flanges were so oriented that the flange tips would engage the stops ahead of the flange heels. In other words, the stripping forces should be applied just above the flange part which first contacts the stop in stripping position. For stacking, it is preferred to have bottom surfaces **82** of the bottom flanges level so that the casting form pan can be flat.

It is understood that grip portions **30** or **30'** are disposed along the length of a casting form and are so positioned as to cooperate with the claws of a stripping machine. The claws of a stripping machine may be disposed directly opposite each other or the claws on one side of the machine may be longitudinally offset from the claws on the other side of the machine. However, in all cases, the effective width being handled by claws is the direct distance across the length of a casting form. It is obvious that whether the claws and grip portions are longitudinally staggered or not makes no difference in the fundamental nature of the problem.

What is claimed is:

1. For use on a stripping machine for stripping long U-shaped steel casting forms, said casting forms having key forming portions extending toward each other from opposite sides, said stripping machine having means providing a contour curved plate surface over which the form bottom is arched as seen in transverse section and having pulling means on opposite sides of the contour means for engaging the form sides for pulling the form down to conform to the contour curve, said stripping machine having fixed stops for limiting the downward travel of the form sides during arching of the form bottom, said form sides being reinforced and the casting form having grip portions to be engaged by said pulling means, said contour curve being long enough to accommodate a full width casting form for casting full width slabs, said pulling means being dimensioned to cooperate with opposed grip portions on such full width forms, the spacing across such full width form grip portions being the effective width of a casting form structure, the improvement comprising a sub-standard width casting form having a U shape with a form bottom to be arched and with the U sides being closer than in a full width form to provide a narrower casting, rigid reinforcing means and grip means for each form side, said rigid reinforcing means having one portion along the outside of the form side and having a second portion extending laterally away from the form side but at a level somewhat higher than that of the form bottom, when flat, said grip portion extending from the second portion laterally away from the form side, said reinforcing means being dimensioned to space said grip means to provide the same effective width as in a full width form, said rigid reinforcing means for the sub-standard width form having the second portions thereof overlying unused contour curve portions at a high enough elevation to remain clear of such unused contour plate surfaces during stripping and having all portions, including grip portions, dimensioned to engage said fixed stops of said stripping machine when said sub-standard width form is in arched stripping position to limit the drop of grip portions, the dimensions of portions of said reinforcements and grout keys being determined by the width of the sub-standard casting, said sub-standard width casting form being usable on a stripping machine for full width forms without any adjustments or changes in the machine and without danger of over-stressing the form bottom.

2. The construction according to claim **1** wherein said sub-standard width reinforcing means includes for each casting form side, two channels with their flanges extending horizontally toward each other, the bottom flanges being high enough to clear the contour surface when the form is being stripped, a third channel with its web in back-to-back relation to the adjacent channel, the third channel having its web positioned so that the bottom flange has a portion of its bottom outer surface below the bottom flanges of the first named two channels sufficiently to engage the stripping machine stops when the casting form is being stripped and stop further down travel of the casting form grip portions.

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