

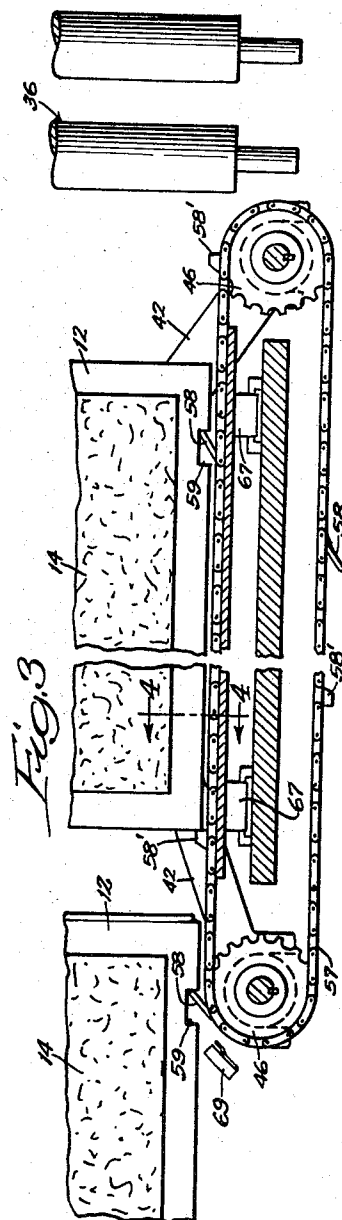
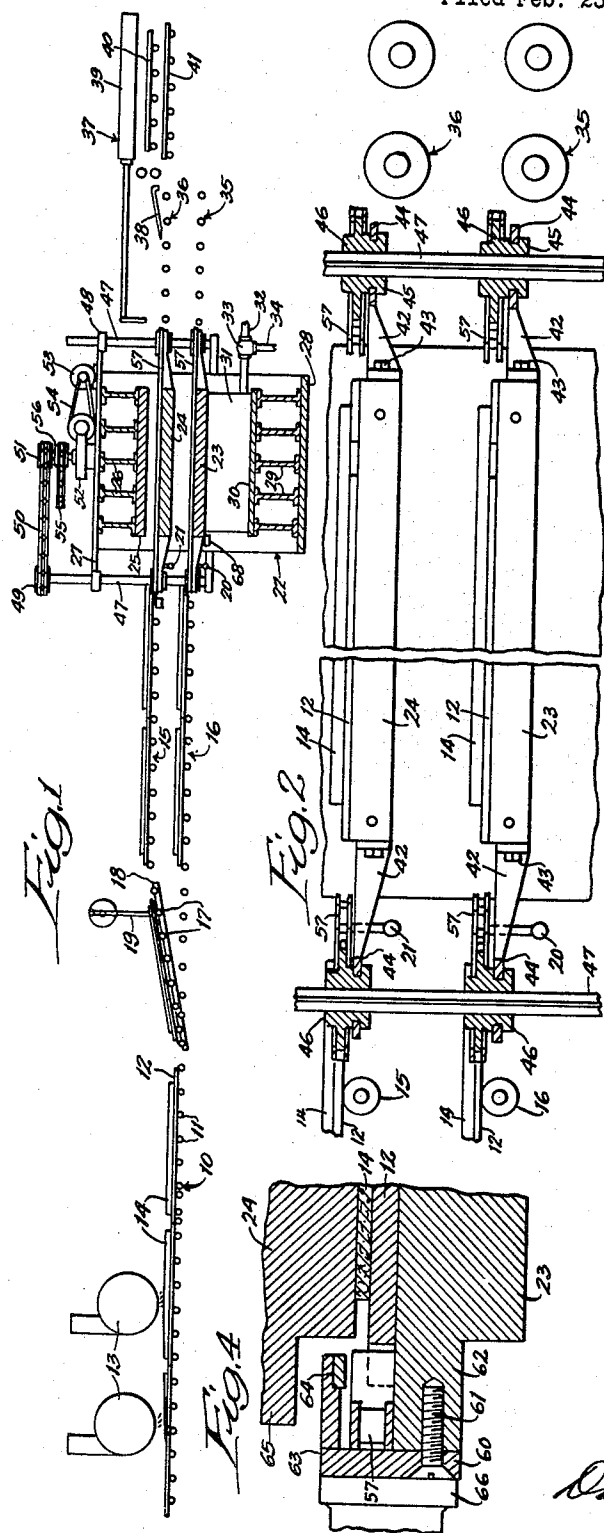
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PRESS FEEDING APPARATUS

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PRESS FEEDING APPARATUS

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This invention relates to press feed apparatus and method, and more especially to its application in handling a material deposited upon supporting members to move such members and the material carried thereby into a consolidating press and for thereafter removing the members and consolidated material from the press. The apparatus and method are especially applicable to the handling of a series of fibrous matrices supported upon caul plates to move the caul plates into and from a multiple-opening hot press that is utilized in consolidating the matrices into boards by the application of heat and pressure.

In the handling of fibrous materials from which consolidated boards are formed, it has been the practice, before pressing the fibrous material to consolidate the same, to stack the caul plates and the flat mats of fibrous material carried thereby in vertical tiers adjacent the inlet end of a multiple-opening press. When the press is opened to receive the cauls it is usual to apply a push, generally by a transverse vertical member, to the remote ends of the cauls and thereby force them into the openings of the press. It is also customary to rely upon the engagement of the forward end of a caul being moved into the press with the rear end of a caul within the press to apply a push against the latter caul to move it outwardly through the discharge end of the press. Because of the rapid heating and cooling of the cauls that occurs in the movement thereof through the press (heat is applied to the cauls and fibrous mats carried thereby within the press as part of the consolidating operation) they often buckle and in consequence the engagement of the adjacent ends of the ingoing and outgoing cauls is a matter of uncertainty, especially if the cauls are thin. There is also the likelihood of a lengthwise buckling of the ingoing cauls if the caul within the press sticks, as may frequently occur. In either event the result is that a pile-up and jamming of the apparatus takes place. Trouble with the cauls occasionally sticking to the platens of the press is common unless there are unusual conditions present which greatly lessen the probability of adhesive or moisture getting between the cauls and top surface of the platen prior to or during the actual pressing.

To obviate the difficulty of cauls sticking to the platen, one recourse has been to provide the leading or forward ends of the caul plates with T-shaped tongues which protrude outwardly from the discharge end of the press. A transverse vertical withdrawing member is adapted to engage these tongues in a manner somewhat similar to a railway car coupling to provide a positive pulling force upon the cauls of such magnitude as to overcome any tendency thereof to stick upon the platen within the press. The projecting tongues provided on the ends of each caul constitute a very decided drawback and cause considerable inconvenience in the subsequent handling of the cauls. The reason for this is that the cauls of necessity must be thin and they are therefore easily bent when the withdrawing force is applied to the cauls through the tongues. Further, because of the presence of the tongues,

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the caul plates are prevented from being passed end to end between one or more felting heads such as are described in my co-pending application Serial No. 286,716 filed May 8, 1952, now Patent 2,748,429, to receive a continuous felted mat thereon. In addition, the provision of a suitable retracting mechanism to withdraw a number of caul plates from a long press with one or more of the plates or the boards temporarily stuck in part at least to the faces of the platens requires a massive and extensive apparatus. Moreover, the vertical retracting member used for engaging the tongue is undesirable since unless provision can be made for its temporary withdrawal it interferes with smooth forward passage of the cauls and boards.

Another system used in an attempt to overcome the problem is that of conveying the matrices to be pressed into the press by woven wire mats that extend through each press platen and over the corresponding loading tier. Similarly, the mats extend outwardly over the unloading tier at the discharge end of the press and the mats then are also utilized in withdrawing the matrices, after consolidation, from the press. In such systems the wire mat is moved back and forth through the press with both ends of the mat wound around a horizontal roller similar to that employed in the conventional roller type window blind.

Rapid deterioration of the wire mats is inherent in such a system and it has been proposed to make the wire mats endless and to cause them to move into one end of each opening of the press and out of the other end by means of a pair of endless chains fixed to each edge of the wire mat and that passes over suitable locating sprockets at the ends of each opening of the press. The use of a woven wire mat to support the matrices and, particularly, return over them, is objectionable because of the impression of the weave left in the adjacent faces of the consolidated boards. It has been suggested that to eliminate this weave impression left by the wire mats, an endless flexible metal sheet be used in place of the wire mats. As far as is known, however, a metal sheet has not been satisfactorily used because of its tendency to warp and "oil can" when only a part of it is clamped between the hot platens and the remaining parts thereof left cold. Moreover, if the carrying plates were thin enough to be sufficiently flexible for this use, they would be too readily dented or marred by the rigorous treatment given them when under pressure between the platens, particularly when large or adventitious elements are present in the matrices.

It is, accordingly, an object of this invention to provide apparatus and a method for overcoming the disadvantages set out above. Another object of the invention is to provide apparatus and a method for feeding caul plates to and from a consolidating press and that will overcome any tendency of the caul plates to stick without causing damage to the caul plates or matrices carried thereby. Still another object is in providing apparatus and a method wherein a positive force is applied to caul plates along the lateral edges thereof whereby any tendency of the plates to stick within a hot consolidating press is overcome. A further object is in providing caul plates with notches adjacent the forward ends thereof and along the lateral edges of the plates that receive dogs that are positively advanced and in their movement force the caul plates forwardly and into or out of a consolidating press.

Yet a further object is to provide apparatus adapted to provide a positive pull upon caul plates that carry matrices to move them into and out from a consolidating press and that are arranged to reciprocate with the movement of the press platens in the pressing operation. Ad-

ditional objects and advantages will appear as the specification proceeds.

Embodiments of the invention are illustrated in the accompanying drawings, in which—

Figure 1 is a side view partly in section and which is largely diagrammatic and shows a system for handling caul plates and matrices in the consolidation of the matrices into boards; Fig. 2 is a broken side view partly in elevation and partly in section of a portion of the consolidating press; Fig. 3 is a broken top plan view of the apparatus illustrated in Fig. 2; and Fig. 4 is a broken transverse sectional view taken on a line 4—4 of Fig. 3.

Reference will first be made to Fig. 1, which shows the essentials of a system for handling caul plates and matrices prior to the consolidation of the matrices in a press, during the pressing, and also during the discharge of the consolidated boards and caul plates from the press. On the left-hand side of Fig. 1 is illustrated a conveyor 10 having a plurality of individual rollers 11 which are preferably positively driven. Received upon the rollers 11 are a plurality of caul plates 12 that are in end-to-end position, the leading edge of one caul plate abutting the trailing end of the adjacent caul plate. One or more felting heads 13 are adapted to deposit upon the caul plates 12 a fibrous pad or matrix 14 that will be subsequently consolidated into a board.

Adjacent the forward end of the conveyor 10 is provided an upper conveyor 15 and a lower conveyor 16 each having a number of positively driven rollers adapted to receive thereon and advance the caul plates 12 and matrices 14. Interposed between the infeed conveyors 15 and 16 and the conveyor 10 are a plurality of conveyor rollers 17 that are positively driven. These rollers are rotatably carried on a movable frame 18 that is movable between a horizontal position and the inclined position shown in Fig. 1. An eccentric 19 is adapted to pivot the frame 18 and the roller carried thereby between the inclined position shown and the horizontal position described. Any other suitable structure may be employed to bring about the raising and lowering of the frame 18.

Preferably the rollers 17 rotate at a greater speed than the infeed conveyor rollers 11, so that the caul plates 12 carried by rollers 17 will be advanced more quickly than the caul plates carried upon the rollers 11, and a separation between the respectively carried caul plates will be caused. Alternately, a caul plate and matrix are directed onto the lower rollers 16 and thereafter the next advancing caul and matrix are advanced onto the upper rollers 15, and this cycle is carried on repeatedly.

To slow the rate of advance of the cauls and matrices upon the rollers 15 and 16, it is preferable to make the forward rollers idler rollers so that no positive advance of the cauls is provided thereby. A lower stop member 20 and an upper stop member 21 are each aligned respectively with the lower rollers 16 and upper rollers 15 and are adapted to stop the advance of the caul plates toward the press which is indicated generally by the numeral 22. Any conventional and suitable stop means may be provided for preventing random movement of the caul plates into the press while permitting movement of the cauls thereinto at selected times and with the upper and lower caul plates in substantially vertical alignment. While such stop means is well known in the art and a detailed description thereof believed unnecessary and will not be set out, it may be indicated that the stop members can be biased into a position where they intercept the caul plates and therefore stop the same while the biasing force thereof may be overcome when a positive force is applied to the caul plates to move them into the press 22.

The press 22 in the illustration given is a multiple-opening press having an upper and lower pressing station that receive simultaneously a caul and matrix. The lower station is defined by a lower platen 23 that receives thereon a caul plate carrying a matrix, while the upper

station is defined by an intermediate platen 24 adapted to receive thereon a caul plate carrying a matrix. The press also includes an upper platen or plate 25 that is stationary and that is reinforced by a plurality of I-beams 26 that engage the platen 25 and also the frame 27 of the press.

A lower support member 28 attached to the sides of the press is provided and resting thereon are a plurality of I-beams 29 that provide rigidity and support for the bottom part of a cylinder 31 that is indicated generally in Fig. 1 and which carries the customary piston adapted to move the lower platen 23 upwardly toward the upper platen 25. During such movement the intermediate platen 24 will also be advanced toward the platen 25. Any suitable piston and cylinder arrangement may be employed for this purpose and since these are well known in the art they need not be further described. A conduit 32 leading to a source of fluid under pressure is adapted to communicate with the cylinder 31, and interposed within the conduit 32 is a valve 33 that is preferably 4-way and has connected therewith a conduit 34 that provides a return to the low pressure side of the fluid pressure source for evacuating the cylinder 31 to permit return of the platens to the position illustrated, after a pressing operation.

After a pressing operation in which the fibrous matrices are consolidated into boards upon the caul plates 12, the caul plates are discharged from the lower platen 23 and intermediate platen 24 respectively onto the lower tier of conveyor rollers 35 and upper tier of conveyor rollers 36. The apparatus shown to the right of the tiered rollers 35 and 36 is adapted to bring about a separation of the consolidated boards from the caul plates and is indicated generally with the numeral 37. Such apparatus may include a doctor blades 38, power means 39 for advancing the cauls and boards toward the doctor blade, and thereafter discharging the separated board onto a board conveyor 40 and the caul onto a caul conveyor 41. The tiers 35 and 36 may be a part of a conveyor-elevator system so that when the caul and board upon the upper tier 36 have been removed therefrom, the lower tier 35 advances to the uppermost position to bring another caul and board into alignment with the doctor blade, etc. Reference may be made to the co-pending application of James d'A. Clark and Robert D. Lambert Serial No. 389,296 filed October 30, 1953, now abandoned, which discloses separation apparatus of this character in detail.

The lower platen 23 and intermediate platen 24 are mounted for reciprocatory movement within the press 22 and each of these platens carries adjacent each corner thereof an outwardly angled bracket member 42 that may be rigidly secured to the platens by any suitable means such as by the cap screws 43. Each of the platens, then, carries four brackets 42 and since the brackets at each corner of the platens are substantially similar and the brackets carried by each of these platens are also substantially similar, a specific description of but a single one will now be set out and it should be understood that such description applies equally to the remaining seven brackets.

Each of the brackets 42 is equipped at its outermost end with a collar 44 that rotatably receives therein a hub 45 provided upon sprocket 46. A sprocket 46 is provided for each of the brackets 42 and the sprockets are slidably mounted upon splined shafts 47. While the shafts 47 permit the sprockets to slide freely thereon in vertical directions, the splines and splineways prevent relative rotary movement between the shafts and sprockets, and rotary movement of one of these members then necessitates rotary movement of the other. It will be appreciated that as the intermediate platens move upwardly and then downwardly within the press 22, each of the sprockets 46 will move upwardly and downwardly in unison therewith upon the splined shafts 47.

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The rearward and forward shafts 47 are rotatably carried within bearings 48 provided by the frame of the press 22. As can be seen best in Fig. 1, the rearward shafts 47 extend upwardly to an elevation slightly greater than that of the forward shafts, and one of the rearward shafts has secured thereon a sprocket 49 having entrained thereabout a drive chain 50 that receives at its opposite end portion a driven sprocket 51 carried upon the shaft of a gear reducer 52 driven by a motor 53 through a belt 54. The other rearward shaft 47 (not shown) is similarly equipped with a sprocket (not shown) that is adapted to have entrained thereabout drive chain 55 that receives at its opposite end a driven sprocket 56 mounted on a separate vertical shaft and geared to the shaft of the gear reducer 52 (similar to sprocket 90a in Fig. 3). Thus it will be apparent that when the motor 53 is actuated, the drive chains 50 and 55 are driven, as are both of the rear shafts 47.

Each of the sprockets 46 on one side of each of the platens at the front and rear thereof has entrained thereabout an endless link chain 57. That is to say, an endless chain 57 is entrained about the sprockets 46 on each side of each of the platens 23 and 24 so that in all, four chains are supplied, two for each of the platens. It will be apparent that since the sprockets 46 at the rear ends of the platens are driven through the splined shafts 47, as has heretofore been described, that the chains 57 will be driven and since entrained about the sprockets 46 at the forward ends of the platens, that these sprockets will also rotate and are in fact idler sprockets for the chains 57. It is believed that the above described arrangement is best seen by referring to Fig. 3.

Each of the chains 57 is equipped with a plurality of outwardly and angularly projecting lugs or dogs 58. Preferably there are three dogs per chain and these are equally spaced and are adapted to enter the notches or slots 59 provided at the forward ends of the caul plates 12 along the side edges thereof, as is best seen in Fig. 3. The dogs 58 engage the caul plates 12 when within the slots 59, and the physical arrangement of the dogs upon the chains 57 and the spacing of the sprockets 46 which determines the length of the chains 57, enables the chains to advance an incoming caul plate 12, seen at the left in Fig. 3, to a position within the press, which is also indicated by the second caul plate 12 in Fig. 3. At the same time, the caul that is within the press and has had the matrix consolidated thereon is advanced during the movement of the chains 57 and is discharged onto the rollers 35 and 36 at the outlet end of the press. The dogs 58 engageable with the caul plates 12 when within the slots 59 are adapted to provide a positive pull upon the caul plates and the forward ends thereof and to thereby overcome any tendency of the cauls to stick to the hot platens within the press 22. If desired, auxiliary dogs 58' may be added to the chain 57 and these dogs are adapted to engage with the rearward end of the caul plates 12, and serve to shove the plates 12 further on to the rollers 36, when the plates are discharged.

Preferably, means are provided to prevent any tendency of the sides of the relatively thin caul plates to buckle or warp when within the press and thus permit the ends or slots to become disengaged from the dogs, and an example of such means as illustrated in the sectional showing of Fig. 4. To accomplish this result, an L-shaped channel member 60 is secured by screws 61 to each side of each of the platens. In the showing of Fig. 4, an L-shaped channel 60 is secured to the lower platen 23. To facilitate such mounting if desired, each of the platens may be equipped with an outwardly-extending edge portion 62 to which the channels are secured. The inwardly-extending leg 63 of each of the channels 60 is equipped with a hardened abutment member 64 against which the caul plates 12 may rub if they are warped and tend to buckle upwardly when within the press 22 and when passing therethrough. Advantageously, platen 24

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above is equipped with outwardly-extending lateral edge portions 65 that extend over the channel members 60 carried by the lower platen 23. Each of the channel members 60 may be equipped with spaced-apart bars 66 rigidly secured thereto that, as is seen in Fig. 3, provide supports at predetermined positions when the press is open, by resting on correspondingly placed stops 67 on the inside of the side frame of the press. As can also be seen in Fig. 4, the endless chains 57 move under the inwardly-extending legs 63 of the channel members and the platen which carries the same.

Operation

The operation of the apparatus shown in Figs. 1 through 4 is as follows. Caul plates 12 are received upon the rollers of the conveyor 10 and are advanced in end-to-end relation under the felting heads 13 where they receive a fibrous pad 14 thereon. Through operation of the eccentric mechanism 19 the caul plates and matrices are advanced alternately to the upper infeed conveyor 15 and to the lower infeed conveyor 16 where they are advanced into engagement with the stop members 20 and 21. When the platens 23 and 24 are in the lowermost position illustrated in Fig. 1, the lower platen 23 is seen to be in engagement with a switch 68 which is adapted to complete an electric circuit when the platen 23 is in engagement therewith. The switch 68, through suitable electric circuitry which is not shown since wholly conventional and understood by those skilled in the art, energizes the motor 53, which through the endless chain and sprocket arrangement described causes the endless chains 57 to rotate and the engagement of the dogs 58 within the slots 59 of the caul plates advances a caul plate upon each of the conveyors 15 and 16 over the respective stop members and into the press 22 to positions upon the intermediate platens 23 and 24 which are shown in Figs. 2 and 3. At the same time, if the press 22 has therein caul plates with consolidated matrices thereon, these caul plates are discharged from the press by engagement of the forward dogs 58 with the slots 59 provided by these caul plates and auxiliary dogs 58a with the rear end of the plates. Thus, while the caul plates with consolidated matrices thereon are discharged from the press, additional caul plates with unconsolidated matrices thereon are advanced over the stop members and into the press.

As the chains 57 rotate, one of the main dogs or lugs 58 in its path of movement trips the switch 69, seen in Fig. 3, which is operative to deenergize the motor 53 which thereby terminates movement of the endless chains 57 and at the same time the switch 69 functions to complete a solenoid circuit which opens the valve 33 to admit fluid under pressure to the cylinder 31. The circuit by which the switch 69 accomplishes these functions is also not shown since it may be completely conventional and can be provided by anyone skilled in the art once the sequence of operations is herein described.

Pressure fluid is applied to the cylinder 31 and brings the platens 23 and 24 into pressing engagement with the caul plates and matrices carried thereby and also in this operation moves the platens upwardly whereby the upper stationary platen 25 functions in the pressing operation. The solenoid-controlled valve 33 is also controlled by a timer mechanism and pressure is applied to the matrices for a predetermined length of time, which is controlled by the selective setting of the timer. After the time has elapsed, the valve 33 is turned to interrupt the supply of pressure fluid thereto through the conduit 32 and to connect the cylinder to the low pressure side of the fluid supply through the conduit 34. The platens 23 and 24 then move downwardly where the lower platen 23 engages the switch 68, and the sequence of operations is again repeated.

As has been indicated before, the caul plates with the consolidated matrices thereon are discharged onto the

elevator tiers 35 and 36 where in subsequent operations the caul plates and consolidated boards are separated and are passed to their individual treating stations.

It is seen that when the platens 23 and 24 are moved upwardly during the pressing operation, the sprockets 46 and endless chains 57 entrained thereabout are also moved upwardly because of the slidable mounting of the sprockets upon the shafts 47 and because of the engagement of the bracket members 42 carried by the platens with the sprockets 46. At all times, then, the dogs 58 remain in engagement with the caul plates through the entry of the dogs into the slots 59 provided by the caul plates. Further, if the caul plates are warped, the hardened abutment surfaces 64 engage therewith and tend to hold them downwardly and thereby prevent further buckling, etc.

It is seen that means have been provided for applying a positive force to the caul plates along the side edges thereof at the forward ends of the plates for withdrawing them from a press wherein heat and pressure are applied for consolidating a fibrous matrix carried by each of the caul plates into a consolidated board. Yet no external protuberances are required which would interfere with the treating apparatus and no critical weakening of the caul plates is needed which would limit their life and which would necessitate careful handling thereof. While the invention has been described primarily in terms of structure, it will be appreciated that a method is also disclosed wherein a positive pulling force is applied to the caul plates during the handling thereof in the manufacture of the fibrous boards.

While in the foregoing specification embodiments of the invention have been set out in considerable detail for purposes of illustration, it will be apparent to those skilled in the art that considerable deviation may be made

in these details without departing from the spirit and principles of the invention.

I claim:

1. In apparatus for consolidating fibrous matrices into boards, having a press having an inlet end and an outlet end and a platen therebetween adapted to support a matrix carrying a relatively flexible caul plate thereon, the improvement comprising dog-engaging means on each side of said caul plate adjacent the forward end thereof, a pair of pulling members each equipped with a dog, said pulling members being positioned beside said press on opposite sides thereof and adjacent the outlet end thereof, each of said dogs being positively and releasably engageable with said dog-engaging means, and means for moving said pulling members so as to apply a pulling force to a caul plate.

2. The structure of claim 1 in which the said pulling members are movable in a direction away from said press while in engagement with a caul plate and for a distance necessary to completely remove a caul plate from the press.

3. The structure of claim 1 in which said dog-engaging means includes slots on each side of said caul plate.

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