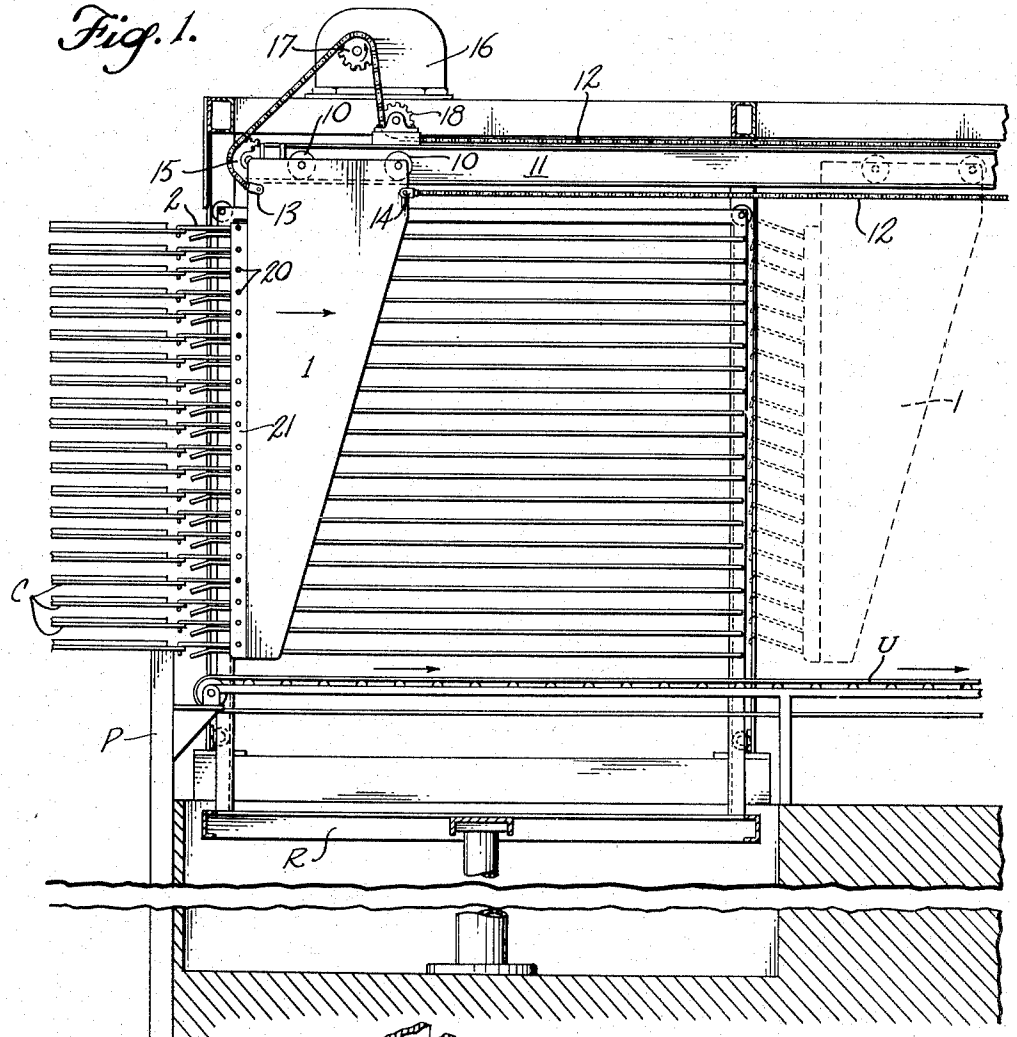
Oct. 6, 1959 E. CUNNINGHAM 2,907,479

CAUL PULLING MECHANISMS

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Fig. 1.



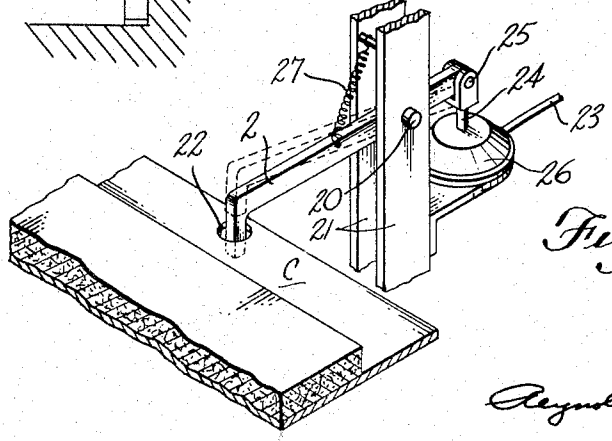




Fig. 2.

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CAUL PULLING MECHANISMS

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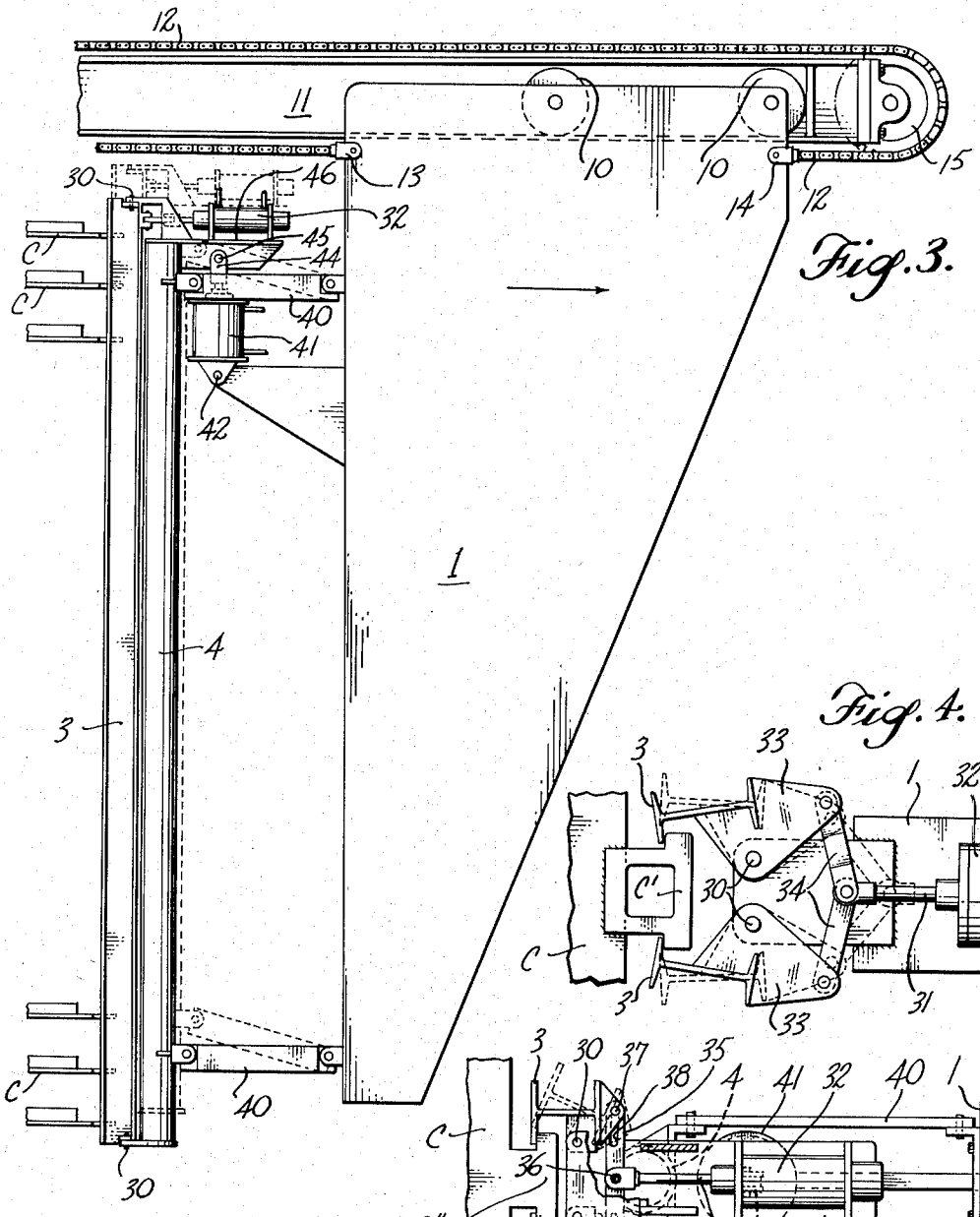



Fig. 3.




Fig. 4.




Fig. 5.

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CAUL PULLING MECHANISMS

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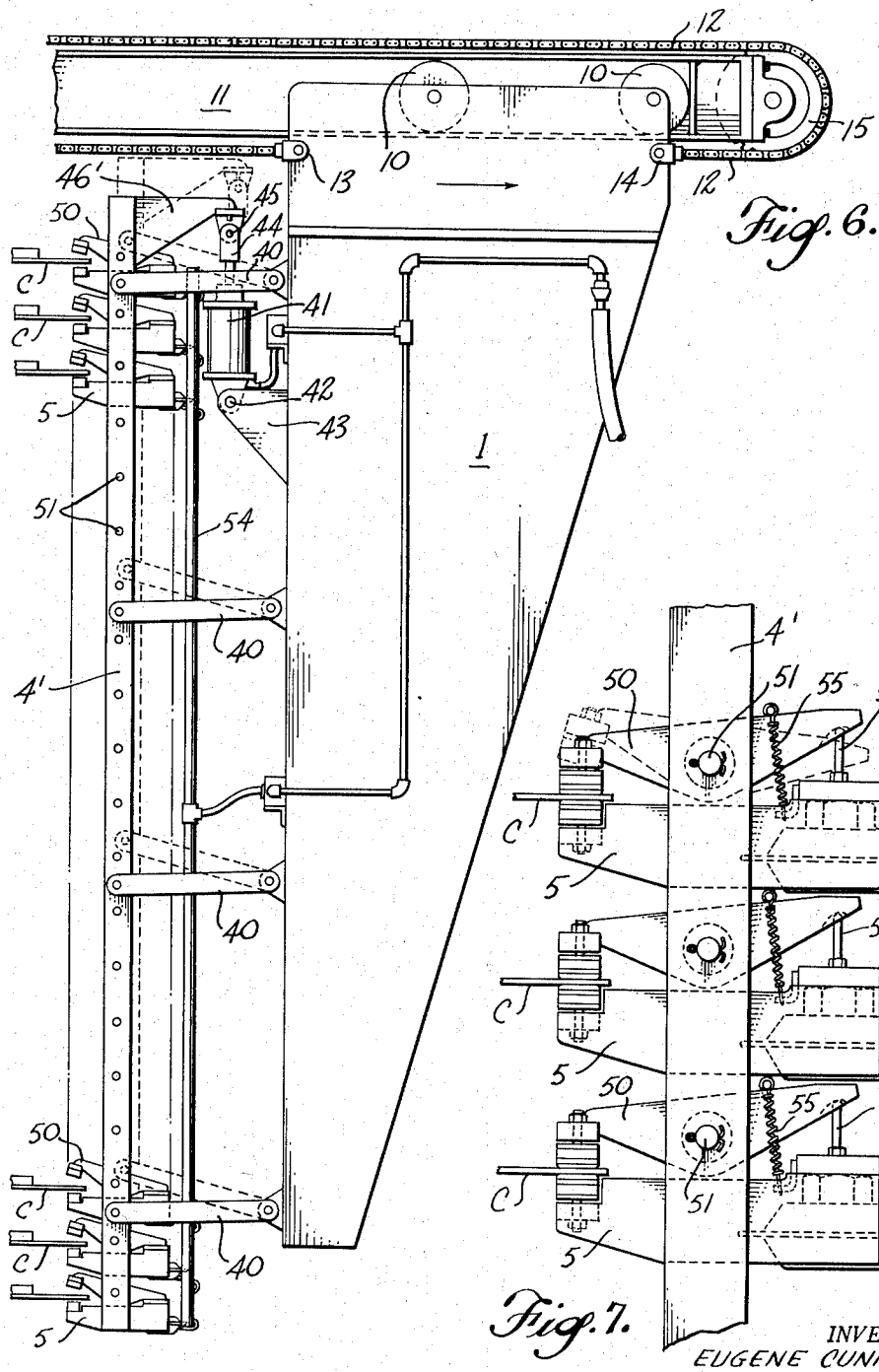



Fig. 6.




Fig. 7.

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2,907,479

# CAUL PULLING MECHANISMS

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Application May 12, 1953, Serial No. 354,501

3 Claims. (Cl. 214—16.6)

In the manufacture of sheets from comminuted material by pressing such material while heated it is customary to carry such comminuted material on metal sheets or cauls, and the present invention is concerned with mechanism for pulling a plurality of such cauls simultaneously from the openings of a multiplaten press into a receiver. Specifically it is an object to provide mechanism for engaging the edges of such cauls for the purpose of exerting an edgewise pulling force on them.

In the past it has been the practice to push cauls from the spaces of a multiplaten press by edgewise abutment of the new charge of cauls with them. In such a procedure, however, if the cauls are warped slightly the edge of a caul entering the press may ride up over the adjacent edge of a caul in the press, or slide beneath the edge of a caul in the press. In either event the caul in the press will not be discharged properly and the pressed product or the material to be pressed will be damaged. More important, such misregistry of the abutting edges of adjacent cauls will produce a jam which must be cleared manually by a workman instead of the operation of moving one charge of cauls from the press and inserting a new charge proceeding automatically.

To avoid trouble resulting from failure of an incoming caul to displace a caul carrying a pressed panel from the press, it is an object of the present invention to exert a positive pulling force on the discharge edge of each caul so that it will be withdrawn positively from the press before the cauls of the next batch are moved into the press platen spaces. The discharge edges of the cauls may be gripped in any of various ways to accomplish this purpose, but it is important that the caul edge be engaged securely so as to eliminate the possibility of a caul not being removed from the press and therefore interfering with movement into the press of the corresponding caul of the next batch.

In providing mechanism for exerting a pulling force on the discharge edges of the cauls it is an object to provide mechanism which will cooperate with a caul receiver arranged to support the fiimsy cauls adequately as they are withdrawn from the press.

A further object is to provide mechanism which will withdraw simultaneously from a multiplaten press all the cauls and the pressed panels carried by them. In effecting such operation remotely operated mechanism is employed which can be controlled automatically if desired.

In general the caul pulling mechanism incorporates a carrier preferably in the form of an upright beam which carries a plurality of caul-engaging devices each adapted to register with and engage the edge portion of a caul at the discharge side of a multiplaten press. Each of the caul-engaging devices includes its own individual actuator, and all of these actuators are interconnected for simultaneous conjoint operation so that all the cauls will be engaged at the same time. An alternative type of caul pulling mechanism incorporates an upright puller beam which carries caul-engaging means spanning the caul-



receiving spaces of the press in a vertical direction so as to engage edge portions of all the cauls.

Whichever type of caul pulling mechanism is used, the caul-engaging operation will be accomplished by remote control, and when the engaging means have been secured to all the cauls the carrier may be shifted away from the press so that the cauls and the pressed sheets carried by them will be withdrawn simultaneously from the press spaces.

The particular types of caul pulling mechanism illustrated in the drawings will be described in more detail hereinafter, and advantages inherent in the several forms are discussed.

Figure 1 is a somewhat diagrammatic side elevation view of one type of caul pulling mechanism, and Figure 2 is a fragmentary top perspective view of an individual caul engaging device of the type utilized in the mechanism shown in Figure 1.

Figure 3 is a side elevation view of a portion of the caul pulling mechanism shown rather diagrammatically, and Figure 4 is a fragmentary plan view of the caul engaging portion of the mechanism. Figure 5 is a plan view of an alternative type of caul gripping arrangement which may be utilized in the mechanism shown in Figure 3.

Figure 6 is a side elevation view of a portion of another type of caul pulling mechanism, and Figure 7 is a fragmentary side elevation view of a portion of the caul pulling mechanism showing caul engaging devices in greater detail.

The various types of caul pulling mechanisms illustrated in the drawings differ principally in their caul engaging features, the carrier mechanism and general type of operation being the same in all instances. It will be understood, therefore, that the general structure of the caul pulling mechanism shown in Figure 1 is the same as that of the other forms of pulling mechanism shown in major respect.

In the apparatus shown in Figure 1 the press P is shown diagrammatically as having a vertically arranged series of press openings, each receiving a caul C which carries a pressed panel at the time that the caul pulling mechanism is to be used to withdraw the cauls from the press spaces. Such multiplaten presses frequently have as many as twenty openings, as illustrated in Figure 1, so that considerable time is required to withdraw the caul if this operation is accomplished sequentially by hand. Moreover, the cauls are hot, heavy and awkward to handle because of their flexibility so that they cannot be handled manually with ease or expeditiously. Because the panels are pressed under heat, however, it is desirable to have them removed from the press spaces virtually simultaneously so that the pressed panels will be uniform rather than one panel having been subjected to heat for an appreciably longer period than another panel.

Presses of the type with which the present invention may be used readily may have the press spaces closed sequentially or simultaneously. Usually each lower press platen is hung from the one above it, and closing of the press involves lifting the lowermost platen toward the uppermost platen which is stationary and continuing such movement until all the press openings have been closed and the desired amount of pressure is exerted on the caul carried panels received in the press openings. In this manner the panels are subjected to heat and pressure of predetermined values for a selected length of time. Such presses are conventional and do not constitute part of the present invention, but this invention has for its purpose the removal of the cauls from such a press.

Since the caul pulling mechanism of the present invention operates on the cauls subsequent to a pressing operation, and complete opening of the press, it is only neces-

sary to consider the relationship of the caul pulling mechanism to the press when the press is open. The caul engaging means must be capable of engaging all of the cauls under these conditions and capable of pulling them simultaneously out of the press.

At the discharge side of the press P is a caul receiver R which has a plurality of caul supporting shelves corresponding respectively to the press openings and in registry with them. The cauls may be unloaded from such a receiver by mounting the shelf structure on a hydraulic elevator so that it may be lowered progressively into a pit. During such movement the bottom cauls may be removed from the receiver successively by an unloading conveyor U. For the purposes of this invention, however, it should be understood that the particular structure of the press receiver and unloading conveyor may be considered to be conventional. They are of importance only to the extent that the present caul puller mechanism is intended to pull cauls edgewise from one station in which they are disposed in spaced-apart stacked relationship represented by the press to a second station in which they are also arranged in spaced-apart stacked registery represented by the receiver R.

The pulling mechanism itself includes a carrier 1 for the caul engaging means, which carrier is illustrated as an upright cantilever beam supported by its upper end in pendant attitude. The upper end of such beam carrier is supported by rollers 10 running on an overhead track 11, which may be of I-beam cross section. The several rollers are spaced transversely of the beam sufficiently to prevent appreciable tilting of the carrier by the effect upon it of the resistance to movement of the caul plates while they are being pulled from the press. The rollers, therefore, should be of a diameter nearly equal to the spacing between the flanges of the I-beam track, as shown in Figure 1.

The carrier 1 is moved along the track 11 by an endless chain 12 having its ends 13 and 14 secured to opposite sides of the carrier. Guide sprockets for the chain at opposite ends of the track 11, one of which 15 is shown in Figure 1, maintain the stretches of the chain 12 adjacent to its ends 13 and 14 parallel to the track 11 so as to move the carrier in either direction by application of a direct pulling force to it. The chain is driven by suitable power drive mechanism 16 having a sprocket 17 engaged with the chain. An idler sprocket 18 is shown positioned relative to sprockets 15 and 17 so as to effect engagement of the chain with sprocket 17 over a substantial arc, that illustrated being approximately 120°.

Preferably the carrier beam 1 is tapered from its track-supported end downward as is customary in cantilever beam design, and the edge of the beam adjacent to the press is disposed substantially vertical so that the caul engaging means structure may be of uniform type along the length of the carrier. Such caul engaging means, therefore, will be mounted along this vertical edge of the carrier beam. Moreover, the actuating means for the caul gripping means is mounted on the carrier and preferably is of pneumatic type, although electric or hydraulic actuating mechanism could be used instead. Fluid conduit or electric wires, as may be required, will extend from the carrier to the fluid or electric source and will be provided with appropriate remote controlling mechanism.

Various considerations enter into the selection of the particular type of caul engaging mechanism with which the carrier 1 is provided, but in all the instances described below the engaging means is mounted on the carrier 1 and is arranged to be in engagement with a plurality of cauls and preferably all the cauls in the press simultaneously, so that the cauls thus engaged are pulled from the press conjointly rather than separately. The caul engaging means shown in Figures 1 and 2 includes individual hooks 2, each swingably supported by a pivot pin 20 extending between spaced, parallel, upright bars 21 secured along the vertical edge of the carrier beam 1 adjacent to the press, as shown in Figure 1. These hooks are swingable between an upwardly inclined position shown in broken lines at the right of Figure 1 relative to the carrier 1, and a lowered position relative to the carrier as shown in solid lines at the left of Figure 1, in which position they are engaged with the respective cauls C by being inserted in holes 22 in such cauls.

While each of the hooks 2 are supported independently of the other hooks, as shown, it is preferred that they be swung in synchronism between their broken-line, disengaged positions and their solid-line caul engaged positions. Such simultaneous actuation can be effected by operative interconnecting all the actuators of the individual hooks. Such interconnection may be accomplished by providing a common source of power for the several actuators and conveniently the power medium may be compressed air, supplied to all the actuator supply conduits 23.

The hook actuators; if of the pneumatic type, may each include a plunger 24 connected to the shank of hook 2 by pivot pin 25 at the side of the hook supporting pivot 20 remote from the hooked end. The plunger 24 extends into the casing 26 with which the air supply conduit 23 communicates and may be carried by a diaphragm or piston on which the air pressure is exerted. Pressure of the air in the container 6 will force the plunger 24 outwardly to swing upwardly the end of lever 2 to which the plunger is attached, and thus cause the hooked end to swing downwardly into the hole 22 for engagement with the caul C. When the air pressure is released the spring 27 will pull the hook into the broken-line position of Figures 1 and 2 again to release the hooked end from the caul aperture 22.

It will be evident that when the press P has been opened the drive mechanism 16 will be energized to shift the carrier 1 from the broken-line position at the right of Figure 1 through the space between the caul supporting shelves of the receiver R, into the solid-line position shown in Figure 1. Air will then be supplied to all the conduits 23 for engaging the individual hooks 2 with the respective holes 22 in the corresponding cauls C in the press openings. When all the hooks have thus been engaged, the drive mechanism 16 will be reversed so that the end 14 of chain 12 will pull the carrier 1 back to the broken-line position of Figure 1 and thus withdraw the cauls edgewise from the press openings to the receiver spaces. The supply of air to the containers 26 may then be discontinued and the springs 27 will swing the hooks upward into disengaged position. As the receiver is then lowered the unloading conveyor U may remove the successive bottom cauls from the receiver spaces until the receiver has been completely unloaded. It may then be raised again into the solid-line position shown in Figure 1 to be ready for the next caul receiving operation.

Instead of providing individual caul engaging means such as the hooks 2 shown in Figures 1 and 2, the caul engaging means may extend vertically substantially throughout the length of the carrier 1 and still be capable of engaging all the cauls C simultaneously. Such alternate mechanism is shown in Figures 3, 4 and 5 as including the elongated flanged members 3, shown to be of I-beam cross section. These elongated caul gripping members are disposed in adjacent upright parallel relationship and are supported from the carrier beam 1 by structure including pivots 30 about which the caul engaging members may swing toward and away from each other on upright axes. Each of the cauls C has a lug C' carried by its edge portion, which is of generally T-shape, arranged to accommodate flanges of the caul engaging members 3 projecting toward each other behind their projections.

In the caul engaging means shown in Figure 4 the members 3 are swung conjointly toward and away from each other by the piston rod 31 of a pneumatic or hydraulic cylinder 32, which is connected to supporting plates 33 for the elongated caul engaging members 3 by a toggle joint 34. Preferably the cylinder 32 will be double-acting so that when the piston rod 31 is retracted the members 3 will be swung positively away from each other into the broken-line positions shown in Figure 4. When the piston rod 31 is moved to the left as seen in Figure 4, the toglle joint will be expanded to swing the upright caul engaging members 3 toward each other into clamping engagement with the caul lugs C'. All of these lugs of the various cauls will, of course, be substantially in registry, so that when the flanged engaging members 3 are moved toward each other they will bring these lugs into virtually exact registry transversely of the direction of pull of the cauls and immediately after initiation of the caul pulling movement of the carrier 1 in the direction indicated by the arrow in Figure 3. All of these lugs will be moved into virtually exact registry in the direction of caul movement.

The caul engaging mechanism shown in Figure 5 operates on the same principle as that shown in Figure 4, but the components of the mechanism differ slightly from those of the apparatus illustrated in Figure 4. The lug on the edge portion of the caul gripped by the flanged engaging members 3 in Figure 4 is attached to the caul C such as by welding and has a hollow central portion, as shown. The lub C'', shown in Figure 5, on the contrary, is formed as a portion of the caul sheet.

The mechanism interconnecting the piston rod 31 of the actuating cylinder 32 and the swingable caul engaging members 3 is not of the toggle joint type in Figure 5. Instead the crossbar 35 is pivotally connected at its center to rod 31 by pin 36. The opposite ends of this crossbar are connected respectively to the caul engaging members 3 by pivot pins 37. These pins are received in slots extending lengthwise of bar 35 so that as the piston rod 31 is retracted to the right the pivot pins 37 will also be pulled to the right and consequently will swing about the axes of pivots 30 carrying the flanged caul engaging members or bars 3. As the piston rod is thus withdrawn the pins 37 will move along the slots 38 toward each other, and the flanges of bars 3 extending toward each other will be retracted away from each other into caul disengaging position. These bars are swung in the opposite direction, of course, to engage the caul lugs, as the piston rod 31 is moved to the left.

It will be appreciated that actuating mechanism such as shown in Figures 4 and 5 could be used to swing caul engaging members each engageable with only one plate, rather than elongated elements such as the members 3 capable of engaging a plurality of cauls, if desired, but in that instance it would be necessary to provide a separate fluid actuator for each individual caul engaging device, and such an expedient is not necessary where a single pair of caul engaging members or bars is provided to engage a plurality of cauls. It may be desirable to adjust such bars vertically or to raise the caul engaging assembly when it is not in caul engaging position to enable the caul receiver unloading conveyor to be positioned somewhat higher than it is shown in Figure 1 relative to the press. Instead of the pivots 30 being carried by brackets mounted directly on the carrier beam 1, therefore, as shown in Figure 4, such brackets are carried by the upper and lower ends, respectively, of a post 4, which may be of cylindrical shape. This post, in turn, is supported from the vertical edge of the carrier 1 by parallel links 40, of which there may be any number but should at least be one near the upper end and one near the lower end of post 14.

To locate the post 4 in a desired, vertically adjusted position, and to hold it in such position, an actuating cylinder 41 may constitute the locating support for the post. This cylinder is mounted by pivot 42 on a bracket 43 projecting from the vertical edge of the carrier beam 1. The piston rod 44 of this cylinder is connected by pivot 45 to a platform 46 integral with the upper end of post 4 and serving as a support for the fluid cylinder 32 which swings the caul engaging members. If fluid is supplied to cylinder 41 to project piston rod 44, post 4 and the caul engaging members 3 will, of course, be moved upward, swinging on the parallel links 40, such as into the broken-line position shown in Figure 3. In solid lines the parts are shown in their extreme lowered position in this figure.

In some installations it may be rather difficult to position the cauls in a multiplaten press sufficiently accurately so that all the holes 22 of the cauls C will be located in sufficiently exact registry to receive the hooks 2 of the mechanism shown in Figures 1 and 2 without making such holes excessively large. Similarly, it may be that in such installations the cauls could not be located sufficiently exactly to dispose lugs on them, such as C' shown in Figure 4 or C'' shown in Figure 5, to insure reliable operation of lug-gripping mechanism of the type illustrated in Figures 3, 4 and 5. On the other hand, in some installations it might be considered to be undesirable to use cauls with holes in them or provided with projecting lugs even though the cauls could be located sufficiently accurately so that the devices described above would function properly.

It is possible to utilize the principles of the present invention in mechanism for gripping cauls which have no special provision for engagement such as a hole or a lug. An example of such mechanism is shown in Figures 6 and 7. This caul pulling mechanism, as the types previously described, has caul engaging means supported from a carrier beam 1 which is movably mounted by rollers 10 on track 11, along which it may be moved by chain 12. Also the caul engaging members in this instance may be supported on a post designated 4' carried by parallel links 40 as discussed in connection with Figure 3. This post may be moved vertically for adjustment or upward retraction purposes by a cylinder 41 moving a piston rod 44 pivoted by pin 45 to a bracket 46' integral with the post 4'. Further discussion of this structure and its operation is therefore unnecessary.

In the caul pulling mechanism of Figures 6 and 7 the post 4' is composed of two parallel bars spaced apart transversely of the direction of movement of the carrier 1 indicated by the arrow in Figure 6. Between these bars are received the elements of clamps constituting the caul engaging means. Each clamp includes a lower element 5 fixedly secured to the bars 4' and spaced apart distances corresponding to the spacing of the press openings. These fixed members may be adjusted conjointly into proper relation to the press openings by movement of piston rod 44 so that each member 5 will slide just beneath its corresponding caul as the carrier 1 is moved to the left as seen in Figure 6, at the beginning of a caul pulling operation.

The cooperating upper element 50 of each clamp is mounted on the upright post members 4' by a pivot 51 which is located approximately mid-way between the ends of the movable clamp member. A plunger 52 has its free end engaged in a recess in the end of movable clamp arm 50 remote from its caul engaging end. This plunger may be moved lengthwise by a fluid actuator 53 which may include a diaphragm received in a container and subjected to pneumatic or hydraulic pressure. A pneumatic actuator is preferred. In each instance such an actuator may be carried by the stationary clamp element as shown in Figure 7, and all the fluid actuators may be operatively interconnected for conjoint operation by a conduit 54 supplied with fluid under pressure from a common source. The fluid actuators may be of the single-acting type arranged so that supply of fluid will swing the

movable clamping member into clamping position and return springs 55 may interconnect the clamping members of each pair as shown to disengage the clamp from the caul when the supply of fluid under pressure is discontinued.

To insure that the cauls are engaged sufficiently firmly to pull them from the press by such clamping devices the clamp elements may have caul engaging surfaces of friction material such as cork. Moreover, instead of the caul engaging end portion of the swingable member being longer than the actuator engaging end portion as is the member 2 shown in Figure 2, the caul engaging end portion may actually be somewhat shorter than the actuator engaging end portion as suggested by Figure 7. The lever arm proportioning may be altered as will be best suited for the particular type of caul engaging element used.

Where caul surface engaging clamp means of the type shown in Figures 6 and 7 are used, it will be evident that the edge portions of the cauls need have no special formation, and the caul edges need not be in registry because, as the carrier 1 moves to the left in approaching the press, any cauls projecting too far will simply engage the bars 4' and be pushed farther into the press prior to caul engaging actuation of the clamp members. Where this type of mechanism is used it is only necessary to insure that the caul plates are moved far enough beyond the press platens to enable an edge portion of each caul to be clamped firmly. The upright beam will then be moved by chain 12 to withdraw all the cauls simultaneously from the press into the receiver as previously described.

I claim as my invention:

1. Mechanism for pulling edgewise from a caul support a plurality of cauls supported thereby in superposed horizontal positions and having lugs projecting in superposed registry from corresponding edges thereof, comprising a carrier, means guiding said carrier for movement toward and away from the caul support, two elongated upright caul lug gripping bars carried by said carrier and movable bodily therewith, pivot means supporting said caul lug gripping bars for swinging about upright axes relative to each other into gripping engagement with a plurality of such caul lugs, actuating means operable to swing said caul lug gripping bars into such lug gripping engagement, and means operable to move said carrier away from such support while such caul lug gripping bars are gripping caul lugs for removing edgewise from such support the cauls whose lugs are gripped by said caul lug gripping bars.

2. Mechanism for pulling edgewise from a caul support a plurality of cauls supported thereby in superposed horizontal positions and having lugs projecting in superposed registry from corresponding edges thereof, comprising an upright carrier, means guiding said carrier for movement toward and away from the caul support, an upright post, parallel linkage means supporting said upright post from said carrier and guiding said post for vertical movement relative to said carrier, post moving means operable to shift said post vertically relative to said carrier guided by said parallel linkage means, cooperating caul lug gripping members, means supporting said caul lug gripping members for relative swinging about an upright axis into gripping engagement with a plurality of such caul lugs, actuating means operable to effect such relative movement of said caul lug gripping members into such lug gripping engagement, and means operable to move said carrier away from such support while said caul lug gripping members are gripping caul lugs for removing edgewise from said support the cauls whose lugs are gripped by said caul lug gripping members.

3. Mechanism for pulling edgewise from a caul support a plurality of cauls supported thereby in superposed horizontal positions and having lugs projecting in superposed registry from corresponding edges thereof, comprising a carrier, means guiding said carrier for movement toward and away from the caul support, two elongated upright caul lug gripping bars carried by said carrier and movable bodily therewith, means supporting said caul lug gripping bars for movement relative to each other transversely of their lengths into gripping engagement with a plurality of such caul lugs, actuating means operable to move said caul lug gripping bars into such lug-gripping engagement, and means operable to move said carrier away from such support while such caul lug gripping bars are gripping caul lugs for removing edgewise from such support the cauls whose lugs are gripped by said caul lug gripping bars.


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