Sept. 21, 1965 K. MÜLLER 3,206,800

PLANT FOR PRODUCING PRESSED SHEETS

Filed Dec. 20, 1962 2 Sheets-Sheet 1

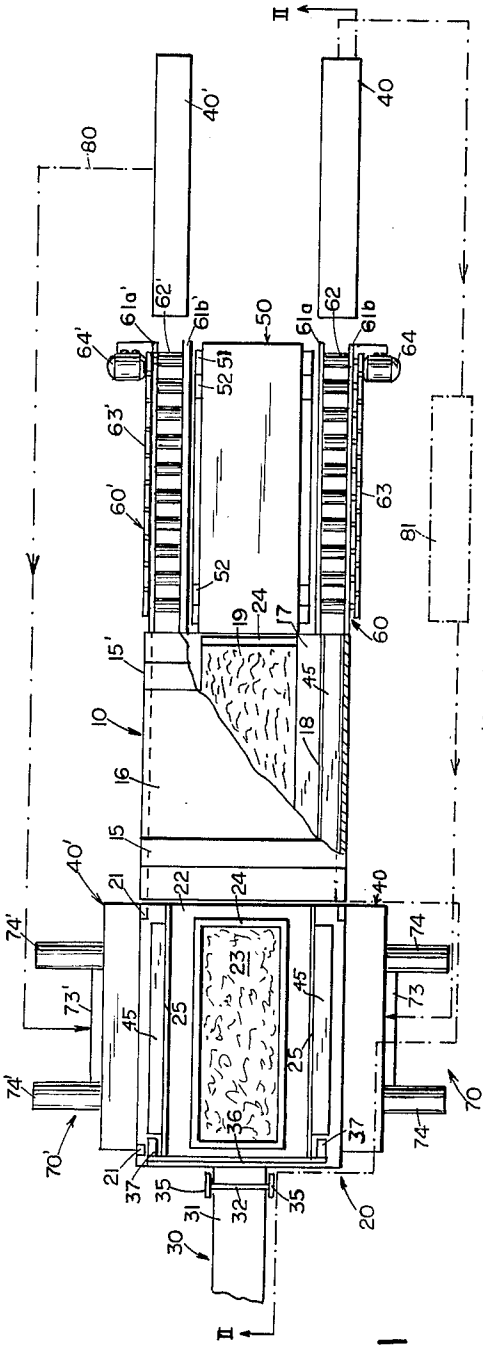

FIG. 1

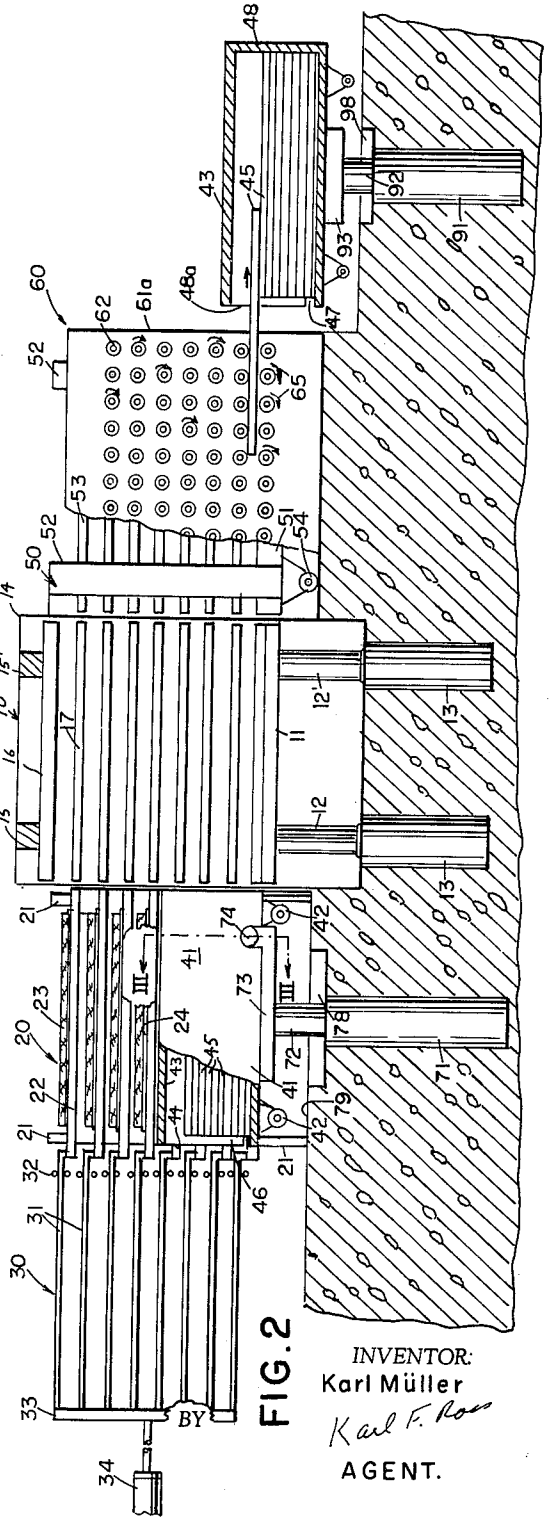

FIG. 2

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Sept. 21, 1965 K. MÜLLER 3,206,800

PLANT FOR PRODUCING PRESSED SHEETS

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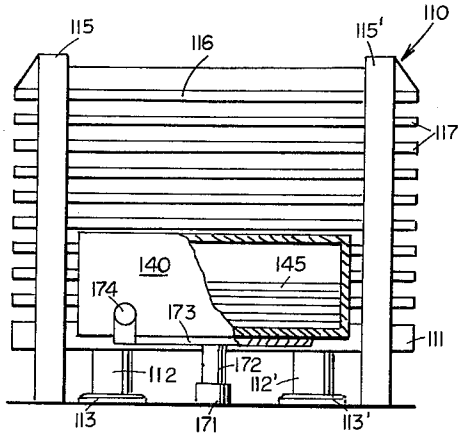

FIG. 5

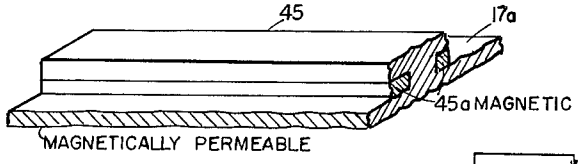

FIG. 4

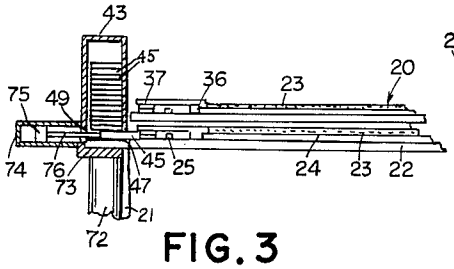

FIG. 3

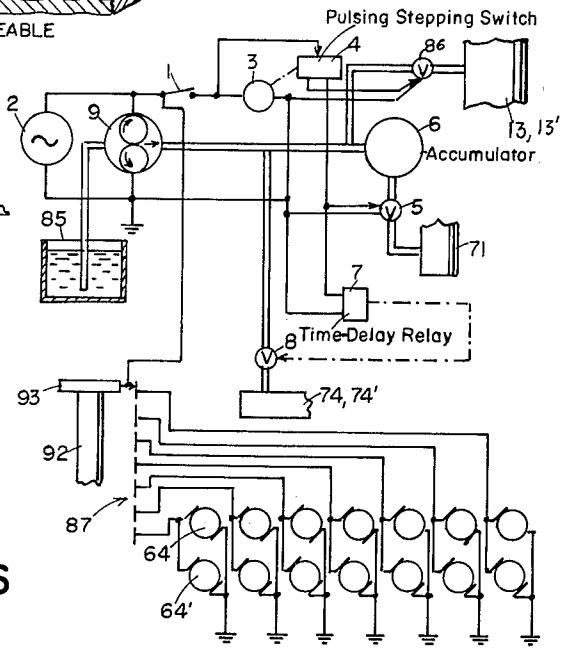

FIG. 6

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PLANT FOR PRODUCING PRESSED SHEETS

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Claims priority, application Germany, Dec. 23, 1961, S 77,278
13 Claims. (Cl. 18—4)

The present invention relates to a plant for producing pressed sheets and, more particularly, to apparatus for manufacturing hardboard and the like incorporating a multi-platen press of the type described in U.S. Patent No. 3,050,777, issued August 28, 1962.

Presses of this nature are generally provided with a plurality of superimposed platens adapted to carry the noncoherent or loosely coherent sheets which are to be compressed under elevated temperatures to produce fiberboard or other pressed sheet material. The heated platens may co-operate with a simultaneous-platen-closure mechanism coupled with the hydraulically displaceable bed plate for concurrent movement therewith whereby compression of the sheet material between the platens is effected when the upper abutment or stop is engaged. To ensure that excessive compression of the sheets will not occur and to enable the production of sheets with reproducibly uniform thickness, spacer bars or inserts are frequently employed. These members, of substantially incompressible material (e.g. iron or steel) as compared with the fibrous material to be compressed, generally have thicknesses on the order of the desired sheet thickness and extend longitudinally alongside one of the edges of the rectangular platens. Thus compression of the fibrous material between platens is effected only until the spacer carried by a lower platen (or the press bed) engages the successively upper platen (or stop), whereupon further application of pressure to the sheet material ceases while curing of the sheets is initiated under the elevated temperatures prevalling between the platens. Heretofore, these spacers, which extended along two or more edges of each sheet disposed upon the platens, were replaced or interchanged only at relatively great expense as a consequence of the lengthy down-time and high labor cost. For multi-platen presses having from sixteen to twenty tiers, for example, periods between 40 and 50 minutes were required for a complete change of spacers. This system had, however, considerable advantages inasmuch as it permitted interchanging of spacers and substitution of those having a smaller thickness for others with a greater thickness and vice versa, thus affording ready selection of the final sheet thicknesses.

It is an object of the present invention, therefore, to provide an improved apparatus for changing the spacers interposed between platens of a multi-platen press and effecting this change in a substantially less tedious manner than possible hitherto.

A further object of the invention is to provide a plant for producing pressed sheets and including a multi-platen press wherein rapid interchange and replacement of spacers is possible.

These objects are realized, in accordance with the invention, by providing supply means including magazines capable of receiving and dispensing the spacers associated with the press platens. The spacers may, therefore, be interchanged if, concurrently with discharge of the sheet material from the press, the spacers previously placed thereon are shifted off the platens and, preferably, stacked in a magazine alignable with tiers corresponding to those of the press platens via an appropriate discharge means. Other spacers of the same or different thickness, previously superposed in a magazine, are then transferred to the

press platens. Advantageously, the magazines filled at the discharge side of the press may then be transferred to the charging side for reinsertion of the spacers between the platens.

According to another aspect of the invention, the plant comprises a charging station constituting part of the supply means and including a multi-level charging stand whose platforms are aligned with respective platens of the press in its open condition. The platforms are generally dimensioned so as to have an area somewhat larger than that of the sheet-carrying trays disposable thereon whereby the spacers to be inserted into the press can be positioned alongside these trays for concurrent displacement therewith onto the respective platens. While it is preferred to provide pusher means capable of shifting the spacers generally longitudinally onto the platens in order to effect simultaneously the removal of the previously used spacers, it is also contemplated, according to the invention, to provide such magazines for direct insertion of the spacers into the press.

Yet another feature of the invention resides in the provision of automatic means at the charging station for depositing the spacers upon the respective platforms. Such automatic means may include means for vertically displacing the magazine successively into alignment with each platform as well as fluid-responsive (e.g. hydraulic or pneumatic) means for shifting a spacer out of the magazine upon such alignment. While the magazine will, for spatial economy, generally be disposed along the longitudinal edges of the platforms to permit a transverse displacement of the spacers, it should be noted that positioning of the magazines in the linear path of the spacers is also possible. In this case, the magazines may extend perpendicularly to the shorter sides of the platforms or platens at their inlet ends. The plant may also be provided with a discharge station at the outlet end of the press for removal of the pressed plates. To facilitate filling of the magazines, the discharge station preferably incorporates means for advancing the spacers into the magazines operable independently of the press. Thus the latter may be charged while the finished plates and previously used spacers are ejected at the discharge station and compression recommenced. The spacers are then stacked for reuse or storage. The magazines can be provided with wheels or any conventional conveyor means (overhead rail, tracks, etc.) for returning magazines from the discharge station to the charging station.

A further feature of the invention resides in the formation of the spacers with magnetic means along their lower surfaces while magnetically permeable materials are employed for the platforms and platens. Since the resulting magnetic force holds the spacers relatievly tightly against the platforms and platens, there is little tendency for the spacers to undergo spontantaneous lateral movement as they are displaced longitudinally therealong. It should be noted that the term "spacer" as employed herein is intended to include any body adapted to be positioned adjacent the sheets to be compressed on their carrying trays.

The above and other objects, features and advantages of the present invention will become more readily apparent from the following description, reference being made to the accompanying drawing in which:

FIG. 1 is a plan view, partly broken away, of a plant for producing pressed fiberboard sheets, according to the invention;

FIG. 2 is a cross-sectional view taken generally along the line II—II of FIG. 1;

FIG. 3 is a cross-sectional view taken along the line III—III of FIG. 2, illustrating a detail of the assembly;

FIG. 4 is a perspective cross-sectional view of a spacer embodying the invention;

FIG. 5 is a side-elevational view, partly in section, of a multi-platen press, showing a modification of the invention; and

FIG. 6 is a diagram illustrating a control system for parts of the plant.

The plant of FIGS. 1–3 comprises a multi-platen press **10**, of the upright type shown in the aforementioned patent, which may be provided with a simultaneous-platen-closure mechanism as fully described therein. At the inlet side of press **10** there is arranged a charging station **20** with which a press-charging mechanism **30** cooperates to insert the sheet material into the press. At a pair of supply stations **70**, **70'** spacers **45** are deposited from respective magazines **40**, **40'** onto the platforms **22** of the charging station. From the press **10**, the sheets pass onto the discharge station **50** at the outlet end of the press while the spacers are fed into respective storage stations **60**, **60'** preparatorily to restacking in the magazines **40** and **40'** which have previously been emptied.

The press **10** is formed with a pair of lateral support walls **14** which are interconnected by transversely extending struts **15**, **15'** and frame the vertically spaced horizontal platens **17**. The latter can be supported by cables or the like as taught in the aforementioned patent and overlie a vertically displaceable bed **11** which is mounted upon a pair of pistons **12**, **12'**, slidably received in the hydraulic power cylinders **13**, **13'** in the conventional manner. A stop plate **16** overlies the uppermost platen **17** and serves as an anvil against which the platens and bed compress the sheet material disposed thereon. To effect setting of these sheets, the platens **17** and bed plate **11** may be provided with passages for a heating fluid or with other heating means (e.g. resistance-heating wire).

The charging station **20** consists of a plurality of posts **21** which carry vertically spaced horizontal platforms **22** bearing transport trays **24** for the loosely coherent sheets **23** of fibrous material. These sheets may be deposited upon the trays by means of an apparatus employing a plurality of horizontally displaceable conveyor belts, as described in the commonly owned copending application Ser. No. 835,687, filed August 24, 1959, and now U.S. Patent No. 3,077,271, prior to positioning of the charging device **30**. Each of the platforms **22** is provided with a pair of ridges **25** parallel to their longitudinal sides but inwardly therefrom to serve as stops for the spacer bars **45** thrust onto the platforms in a direction transverse to these ridges and to the bars themselves. To permit simultaneous insertion of the sheets **23** into the press and removal of the compressed sheets **19** previously processed, the charging device **30** is provided with a hydraulically or pneumatically operated cylinder **34** whose piston bears upon a beam **33** to which is affixed a plurality of bars **31** guided between horizontal rollers **32** journaled in a support **35**. As can be best seen in FIGS. 1 and 3, the free ends of the bars **31** are bent downwardly at **36** to rest upon the platforms **22** and engage the trays **24** thereon. Laterally spaced from the downwardly bent portions **36** are forwardly projecting members **37** which are aligned with the spacers **45** and serve to displace these spacers into the press together with the sheets **23**.

The magazines **40**, **40'** each comprise a housing whose rear wall **41** is provided with a pair of openings **49** aligned with the lowermost spacer **45** and with an elongated discharge slit or outlet **47** in the forward wall **46** through which the spacers can be successively urged for deposition upon the platforms. The walls **41** and **46** are bridged by a roof **43** which, together with them, frames a lateral opening **48***a* through which the spacers may be inserted into the magazine into contact with a remote lateral wall **48**, serving as an abutment for aligning the spacers in the magazine **40** or **40'**. Each of the magazines **40**, **40'** is also provided with a set of casters **42** which permit their displacement from the discharge end to the charging end of the press. These casters are, however, merely representative of any suitable means for cycling the magazines

for reuse of the spacers and may, of course, be replaced by other conveyors well known in the art for shifting trucks and trundles from one location to another.

At the charging station **20**, the magazines **40**, **40'** can be moved along the floor surface **79** via their casters **42** until they overlie respective elevating stages **73** which are receivable within recesses **78** to be flush with the surface **79** during displacement of the magazines. The stages **73**, **73'** form part of spacer-supply stations **70**, **70'**, which further include respective elevating pistons **72** (only one shown). Each piston **72** is received in a hydraulically or pneumatically operable cylinder **71** and serves to lift the respective magazine **40**, **40'** and a pair of fluid-responsive cylinders **74**, **74'** which are longitudinally spaced along and carried by the elevating stages **73**, **73'**. When each magazine is properly positioned upon the elevating stage (as shown in FIG. 3), the pusher rod **76** of the respective piston **74** passes through one of the aforementioned openings **49** and, upon actuation, can shift the lowermost spacer **45** transversely onto a platform **22** whose receiving surface is aligned with the lower edge of outlet **47**.

From the press **10**, the pressed plates **19** upon their trays **24** can pass onto respective tiers **53** of a transporting carriage **51** constituting the discharge station **50**. These tiers, which are, like the platforms **22**, aligned with respective platens **17** of the press **10** in an open condition thereof, are supported by uprights **52** fixed to the carriage **51** whose wheels or casters **54** permit movement thereof to a curing kiln or the like.

The carriage may be inserted between the storage stations **60**, **60'** which retain the spacers **45**, pushed off the platens **17** together with the sheets **19** upon charging of the press **10**, until they can be reassembled in superposed relation within empty magazines **40**, **40'**. Station **60**, **60'** are respectively provided with a pair of laterally spaced support plates **61***a*, **61***b* and **61***a'*, **61***b'* between which are journaled horizontal arrays of longitudinally spaced rollers **62** and **62'**. The rollers of each horizontal array are coupled for joint rotation via a chain **63** or **63'** and can be driven, independently of the other arrays vertically spaced therefrom, by a motor **64** or **64'** in the clockwise sense (arrows **65** in FIG. 2). The empty magazines **40** and **40'** may be longitudinally aligned with the rollers **62** and **62'** with their open ends **48'** confronting the storage stations **60** and **60'** to receive the spacers **45**.

To facilitate return of the spacers to their magazines, a pair of hydraulically or pneumatically operable elevating stages **93** (only one shown) are provided at this end of the plant. Stage **93** is affixed to a piston **92** of a fluid-responsive cylinder **91** and is receivable in a recess **98** in the surface **99** to permit displacement of the filled magazines, upon retraction of the pistons, along this surface to the charging station. The recycling of the magazines is indicated schematically by dot-dash lines **80** and **80'** while a magazine in the process of such displacement is shown at **81**.

Upon completion of a press stroke, the press **10** is opened so that its platens **17** are aligned with the platforms **22** upon which have been deposited the sheets **23** and their trays **24** in the usual manner. To position the spacers **45** along the marginal portions of these platforms, a switch **1**, in series with a power source **2**, is closed to activate the timer motor **3** of a stepping switch **4** whose contacts correspond in number to the tiers of the press with an additional contact serving to reset this switch. The stepping switch **4** thus intermittently energizes an electrically operable valve **5** which transmits a predetermined incremental volume of hydraulic fluid to flow from an accumulator **6** into the cylinders **71**, thereby elevating the platforms **73**, **73'** and lifting the magazines **40**, **40'** with the slots **47** in a stepwise manner into successive alignment with each of the platforms **22**. Each energization of the valve **5** also activates a time-delay relay **7** which is tied to an electrically operable valve **8** serving, after a momentary delay sufficient to permit proper loca-

tion of the magazines with respect to the platforms, to admit fluid from the source 9 and the reservoir 85 into the cylinders 74, 74'. The pusher rods 76 of the latter thus thrusts respective spacers onto each of the platforms successively, without intervention of an operator.

After the last pair of spacers 45 has been disposed upon the uppermost platform, the resetting contact of the stepping switch operates to restore this switch to its original condition and deactivate it until switch 1 is again closed after an intervening open-circuiting. Simultaneously, this contact also energizes a valve 86 to supply fluid to the main press cylinders 13 and 13', thereby effecting the compression stroke. Just prior to this action, however, the cylinder 34 can be pressurized so that the bars 31 push the trays 24 and spacers 45, carried by the platforms 22, onto the press platens and concurrently transfer any trays and spacers already positioned thereon onto the discharge and storage stations.

While the press 10 is in operation, the carriage 51 may be transported to the usual kiln and replaced by an unloaded carriage while the spacers 45 are restacked in empty magazines 40, 40'. This is effected by lowering the pistons 92 and the stages 93 carrying these magazines. The descent of the pistons results in successive energization of a bank of contacts 87, each of which corresponds to a respective tier of the press, to connect successively lower motors 64, 64' in circuit with the power source 2. The rollers 62, 62' of each horizontal array are thus powered upon alignment of the respective magazine 40, 40' therewith to effect insertion of the spacers. When the magazines are filled they may be stored or returned to the charging station for another press cycle. Alternatively, other magazines, containing differently dimensioned spacers, may be disposed at this station for the subsequent sequence of operations.

While the platens 17 of the press 10 are provided with longitudinally extending ridges 18 aligned with the ridges 25 of platforms 22 to prevent lateral shifting of the spacers 45, it is preferred to dispense with such ridges on the press platens so as to maintain the working surfaces thereof free from these discontinuities. To this end, the spacer 45 shown in FIG. 4 is seen to be provided with magnets 45*a* along its lower surface so that it is drawn tightly against the magnetically permeable (iron or steel) platens 17*a*. The resulting high frictional force prevents any spontaneous motion of the spacers while permitting their displacement via the bars 31, the fluid-responsive means 74, 74' and the rollers 62, 62'.

The press 110 of FIG. 5 comprises frame members 115, 115' which carry the stop plate 116 and the platens 117 via the usual suspension cables or linkages. The bed plate 111 is powered by a pair of press cylinders 113, 113', whose pistons can be seen at 112, 112'. In this embodiment, the spacers 145 are directly deposited upon the platens from a magazine 140 with the aid of fluid-responsive means 174 carried by the elevatable platform 173. The latter can be raised in stepwise manner for positioning the magazine adjacent successive platens by means of a hydraulic cylinder 171 whose piston 172 is rigid with the stage 173. In operation, this mechanism functions similarly to that previously described with the exception that previouly employed spacers must be dislodged prior to insertion of others. The removal of the spacers can be effected with the aid of the bars 31, rollers similar to those shown at 62 or other pusher means.

The invention as illustrated and described is believed to admit of many modifications and variations within the ability of persons skilled in the art. All such modifications and variations are, therefore, deemed to be included within the spirit and scope of the appended claims.

I claim:

1. In a plant for the production of pressed sheets, in combination, multi-platen press means having a plurality of vertically spaced substantially horizontal platen members; charging means adjacent said press means and having a plurality of vertically spaced charging members aligned with said platen members for depositing sheets to be pressed thereon; and supply means including a magazine disposed alongside one of said press and charging means and containing a plurality of superposed spacers successively alignable with the corresponding members, and mechanism for successively shifting said spacers from said magazine for depositing said spacers on the corresponding members.

2. In a plant for the production of pressed sheets, in combination, a multi-platen press having a plurality of vertically spaced substantially horizontal platens; supply means including at least one magazine containing a plurality of superposed spacers successively alignable with tiers substantially corresponding to the levels of said platens for depositing said spacers thereon, said supply means including mechanism for displacing said magazine vertically with respect to said press; and discharge means remote from said supply means for replacing spacers withdrawn from said press into magazines for subsequent reuse.

3. In a plant for the production of pressed sheets, in combination, a multi-platen press having a plurality of vertically spaced substantially horizontal platens; charging means including a plurality of vertically spaced platforms each aligned with a respective one of said platens; means for transferring sheets from said platforms to said platens; supply means including at least one magazine containing a plurality of superposed spacers successively alignable with said platforms for depositing said spacers thereon, said supply means including mechanism for displacing said magazine vertically with respect to said press; and shifting means for transferring said spacers to said platens concurrently with the transfer of said sheets.

4. In a plant for the production of pressed sheets, in combination, a multi-platen press having a plurality of vertically spaced substantially horizontal platens; charging means including a plurality of vertically spaced platforms each aligned with a respective one of said platens; means for transferring sheets from said platforms to said platens; supply means including at least one magazine containing a plurality of superposed spacers successively alignable with said platforms for depositing said spacers thereon; shifting means for transferring said spacers to said platens concurrently with the transfer of said sheets; and discharge means alongside said press remote from said charging means for receiving spacers displaced from said platens upon transferral of spacers from said charging means thereto and replacing the spacers in magazines for subsequent reuse.

5. In a plant for the production of pressed sheets, in combination, a multi-platen press having a plurality of vertically spaced substantially horizontal platens; a charging station adjacent said press for feeding compressible sheets onto said platens; supply means including at least one magazine containing a plurality of superposed spacers successively alignable with tiers substantially corresponding to the levels of said platens for depositing said spacers thereon; discharge means remote from said supply means for replacing spacers in superposed relationship in magazines for subsequent reuse; and shifting means for transferring spacers from said platens to said discharge means and thereafter transferring spacers from said supply means to said platens.

6. The combination defined in claim 5 wherein said discharge means includes a tiered support for said spacers and means for stacking spacers from said support in a magazine.

7. The combination defined in claim 6 wherein said support includes a plurality of vertically spaced horizontal arrays of rollers rotatable about respective axes extending generally transversely to the respective spacers, said stacking means including drive means for rotating said rollers to advance a spacer carried thereby into a magazine aligned therewith.

8. The combination defined in claim 5 wherein said shifting means including pusher means reciprocable to eject said spacers from said press and displace them onto said discharge means.

9. The combination defined in claim 8 wherein said charging station is provided with a plurality of vertically spaced generally horizontal platforms each substantially aligned with a respective platen in an open condition of said press, said pusher means being arranged to shift a sheet carried by each platform onto the respective platform with concurrent displacement of previously processed sheets out of the press.

10. The combination defined in claim 9 wherein said supply means further comprises an elevatable stage disposed adjacent said charging station, operating means for vertically displacing said stage and a spacer-containing magazine positioned thereon into successive alignment with said platforms, and fluid-responsive means for urging said spacers out of the magazine carried by said stage onto said platforms upon said alignment.

11. The combination defined in claim 10 wherein said charging station, said press and said discharge means are longitudinally aligned, said elevatable stage being disposed laterally of said platforms, said fluid-responsive means

including a plurality of transversely displaceable actuating members for displacing said spacers laterally onto said platforms.

12. The combination defined in claim 11 wherein said pusher means is engageable with said spacers on said platforms for slidingly displacing them onto said platens with concurrent displacement of spacers previously deposited thereon onto said discharge means.

13. The combination defined in claim 5 wherein said spacers are provided with permanently magnetic lower surfaces, said platens being composed of a magnetically attractable material.

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