Oct. 5, 1965 K. LOEWENFELD 3,209,405

MULTI-PLATEN PRESS WITH SIMULTANEOUS PLATEN CLOSURE

Filed Dec. 20, 1962 4 Sheets-Sheet 1

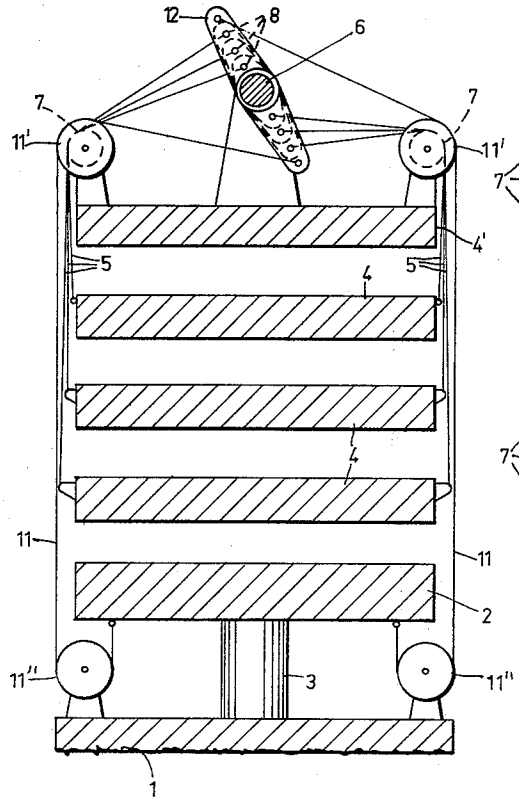



Fig. 1

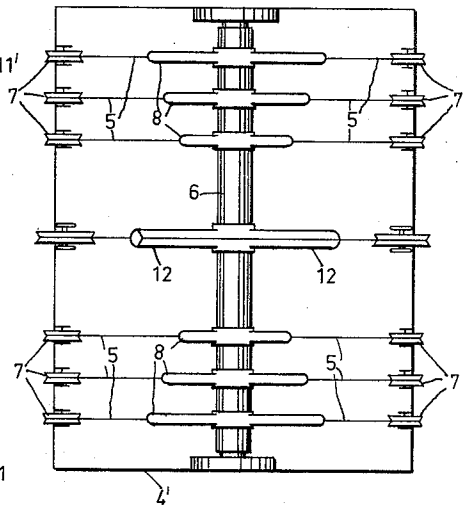



Fig. 2

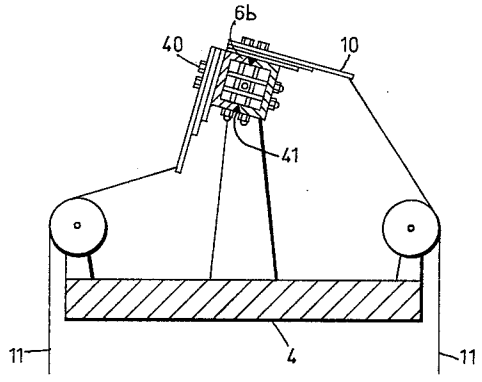



Fig. 6

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MULTI-PLATEN PRESS WITH SIMULTANEOUS PLATEN CLOSURE

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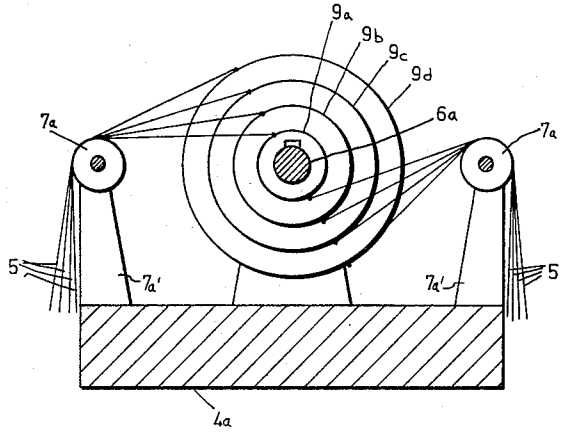



Fig. 3

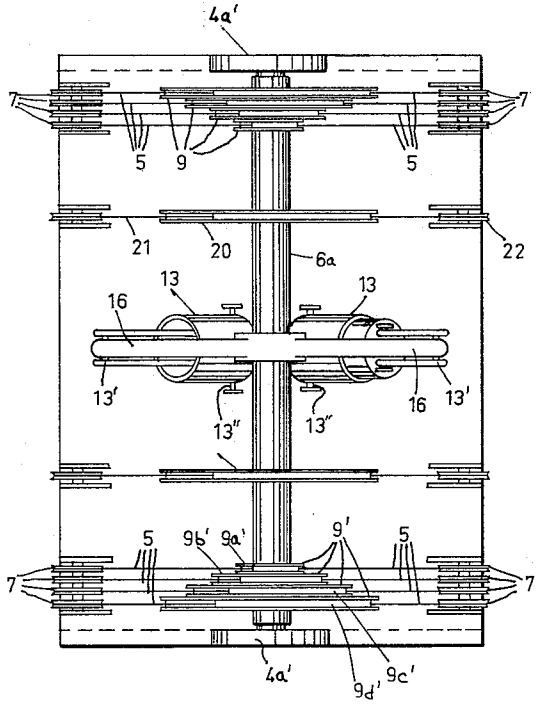



Fig. 4

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MULTI-PLATEN PRESS WITH SIMULTANEOUS PLATEN CLOSURE

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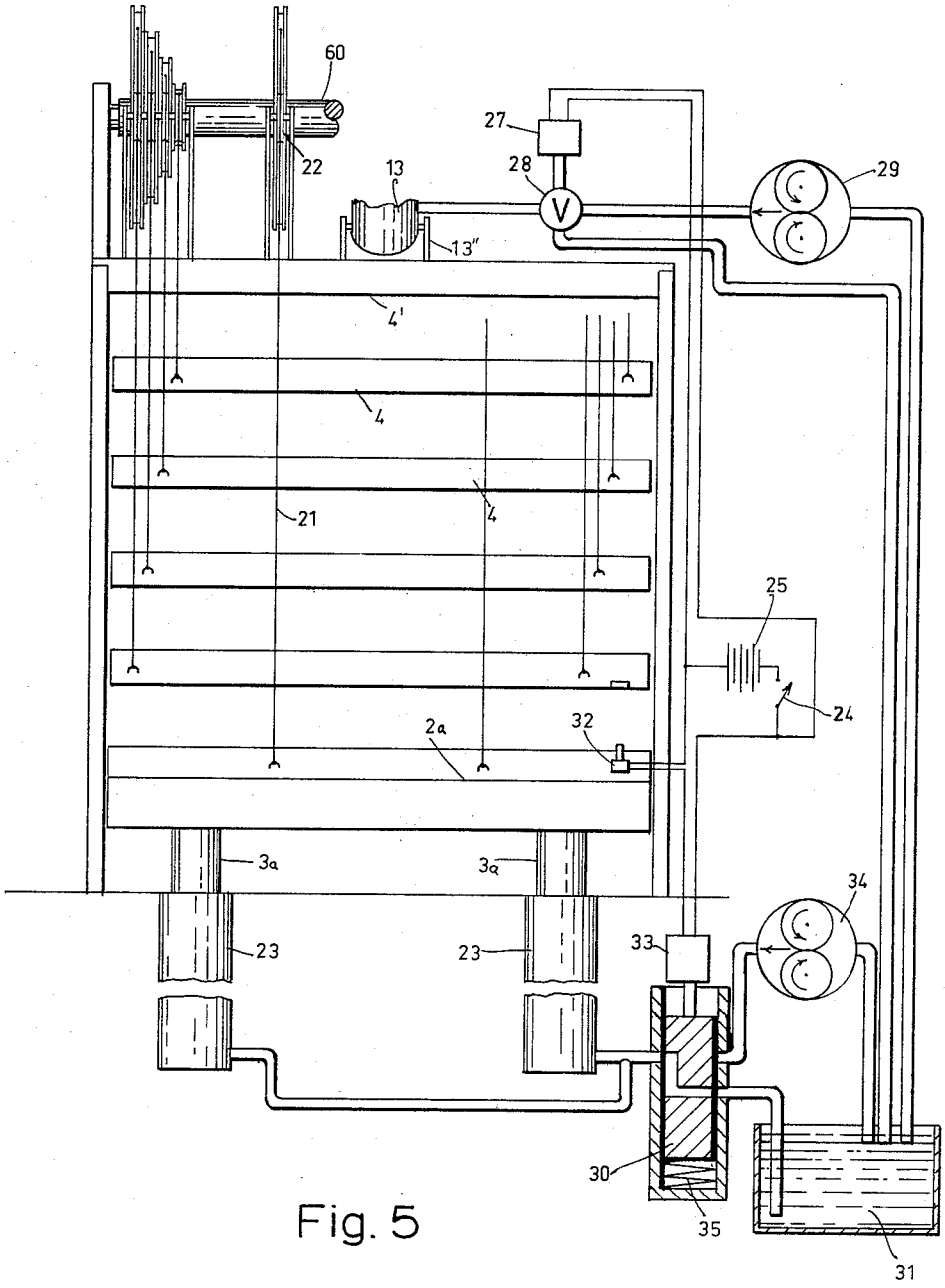



Fig. 5

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MULTI-PLATEN PRESS WITH SIMULTANEOUS PLATEN CLOSURE

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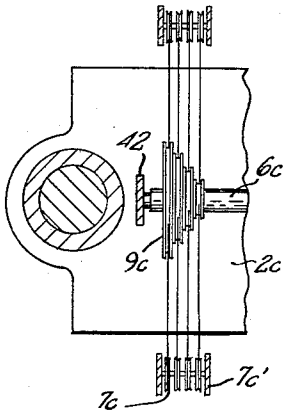



Fig. 7

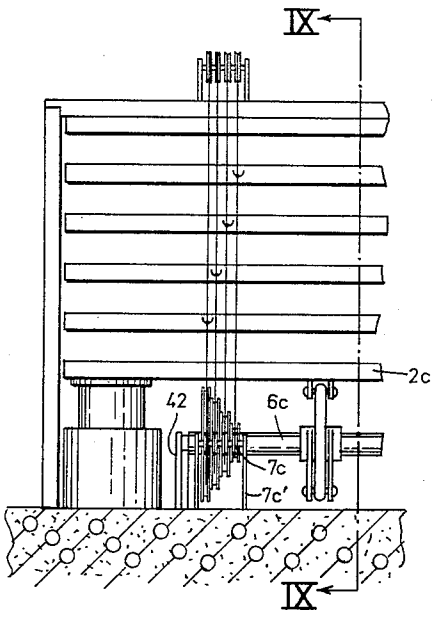
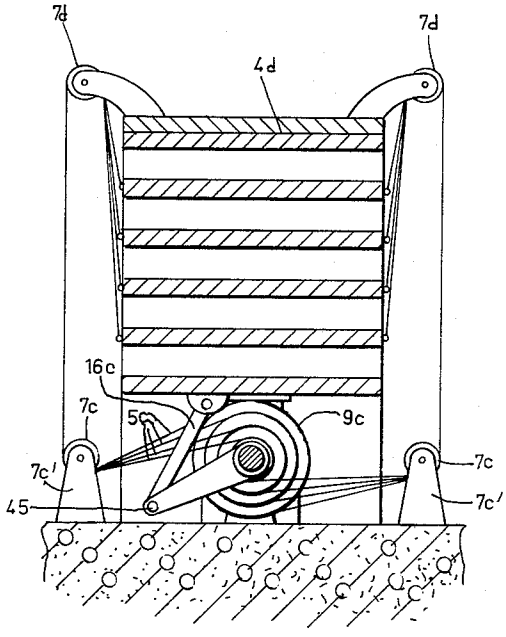



Fig. 8

Fig. 9




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United States Patent Office 3,209,405 Patented Oct. 5, 1965



3,209,405

# MULTI-PLATEN PRESS WITH SIMULTANEOUS PLATEN CLOSURE

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5 Claims. (Cl. 18—16)

The present invention relates to a multi-platen press and, more particularly, to an improved mechanism for the simultaneous closure of the platens of such a press.

In U.S. Patents 2,941,249 and 3,050,777 respectively issued to H. H. Rogers and E. Siempelkamp, there are disclosed multi-platen presses having simultaneous-closure mechanisms capable of maintaining spacing between the several platens during the closure of the press. Still earlier mechanisms of this type made use of lever arrangements for linking the platen with the movable bed of the press to effect a simultaneous displacement of all the platens into a closed condition. These lever linkages were inordinately complicated and prone to disorder. In many cases they were also incapable of effecting a synchronous displacement of all the plates at the four points thereof to which the linkages were joined.

In the aforementioned patents an improved closure mechanism was disclosed whereby the difficulties encountered in earlier devices were, to a large extent, avoided. Thus the closure mechanisms of the patents each included a plurality of stepped pulleys over the steps of which were passed flexible members respectively secured to the platens at four spaced locations. Each set of flexible members had associated therewith an individual stepped pulley which was rotatable independently of the others about its respective axis. Rotation of the pulleys was effected by further flexible elements coupled with the press bed and/or a follower member displaceable with the bed over at least part of its travel. As shown in the Rogers patent, the pulleys were usually oriented so that their axes extended at an angle of 45° to the longitudinal dimension of the press for convenience in disposing the several cables at the corners of the platens. Again it was difficult, if not impossible, to effect true synchronization of all of the four stepped pulleys so that canting of the platens was almost inevitable. Moreover, structures of the stepped-pulley type frequently were provided with resilient means along flexible members for actuating them. Any synchronism which might have existed in the displacement of the individual pulleys was found in practice to be affected by the high temperature prevalent in the region of the press.

It is an object of the present invention, therefore, to provide an improved mechanism for the simultaneous closure of the platens of a press while enabling the synchronous displacement thereof.

This object is attained, in accordance with the invention, by providing a single rotary body having affixed thereto a set of cables for each of the supported locations of the platens, the cables of each set being secured to successively lower platens and to the common rotary body at successively increasing distances from the axis of the rotation thereof. In addition the cables of each set may be axially spaced along the body. The rotary body is provided with transmission or drive means coupling it with the press bed for concurrent displacement therewith although in certain situations it may be apparent that individual actuation of the rotary body may be desired. Since all the sets of cables (e.g. at the four corners of the platens) are affixed to a common body, the desired synchronism in displacement of the flexible members can be ensured in contrast to earlier structures employing individually rotatable members for each set of cables.



Advantageously, the axis of the rotary body is parallel to the horizontal longitudinal dimensions of the press and lies in a vertical median plane therethrough either above or below the platens of the press. The flexible members of the sets, extending on opposite sides of this median plane to corresponding extremities of the platens, may then be affixed to the rotating body in respective axially spaced planes perpendicular to the axis at diametrically located positions with respect thereto but with identical spacing from this axis.

The body may, therefore, consist of a pair of stepped pulleys keyed to a common drive shaft for a simultaneous rotation about the axis, this rotation being effected with the aid of one or more flexible members linked to the press bed. It is also contemplated, according to the invention, to displace this shaft positively (e.g. with the aid of fluid-responsive means). In this case the press bed is also coupled to the rotating body via flexible elongated members for displacement thereby. This arrangement has the advantage that it permits a rapid closure of the press since the hydraulic fluid for operating the main press cylinders can be aspirated into the latter at a relative high rate during closure of the press by the fluid-responsive means. Subsequently the main pistons may be energized with high-pressure fluid from the usual pressure pump. The latter generally operates at a relatively slow rate to displace only a limited amount of fluid with relatively high pressure and thus is capable of closing the press only relatively slowly. Since large pressures are not required for the closure stroke, this may be accomplished by the fluid-responsive means at a relatively high rate without difficulty.

A more particular feature of the invention resides in the formation of the rotary body with a plurality of generally radial arms each of which is secured to a respective flexible cable. Again actuation of the rotary body may be effected with the aid of the lever arm or a pulley via a flexible cable coupled to the press bed or a positive-drive means. Since the rotary body is disposed centrally with respect to the press, it may be desirable to provide direction-changing idler pulleys for each of the cables. Each of these idlers may be disposed in a common transverse plane with the respective portion of the rotary body to which the cable is secured. It has been found that improved results can be obtained if the arms are somewhat resilient to provide elastic means replacing the springs formerly provided at the portions between the cables and the platens or bed. Preferably, the arms are formed as leaf springs secured to the rotary body which may have a prismatic configuration for facilitating assembly. To this end the shaft may have a U-shaped cross-section or be of tubular configuration with rectangular cross-section. In fact, a tubular shaft of this character may be formed by butt welding a pair of channel or angle irons together.

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 appended drawing in which:

FIG. 1 is a vertical cross-sectional view, taken along a plane perpendicular to the horizontal longitudinal dimension of a multi-platen press, diagrammatically illutrating the principle of the present invention;

FIG. 2 is a plan view of this press;

FIG. 3 is a fragmentary view, similar to FIG. 1, illustrating another rotary body, according to the invention;

FIG. 4 is a plan view of the embodiments of FIG. 3;

FIG. 5 is a side-elevational view of this press showing part of the control system thereof;

FIG. 6 is a view similar to FIG. 3, illustrating still another arrangement;

FIG. 7 is a bottom view of another press, according to the invention;

FIG. 8 is a side elevational view of the latter press; and

FIG. 9 is a cross-sectional view taken along the line IX—IX of FIG. 8.

In FIGS. 1 and 2 there is shown a vertical multi-platen press whose base **1** carries a schematically shown hydraulic cylinder **3** to which is affixed the movable bed **2** of the press.

A plurality of vertically spaced horizontal platens **4** are disposed above the bed **2** and are supported by respective cables **5** which pass over idlers **7** on the upper platen **4'** of the press. These idlers **7** are journaled for rotation about respective axes extending parallel to the axis of a shaft **6** which, together with an array of arms **8**, constitute a rotatable body serving to simultaneously close the platens. The arms **8** extend radially from the shaft **6** and are provided with diametrically opposite connecting points to which the flexible cables **5** of each platen **4** are secured. Thus the arm **8** and idlers **7** associated with each platen lie in a respective plane transverse to the axis of shaft **6**. In addition to being axially spaced, the arms **8** have their respective connection points disposed at a distance from the axis corresponding to the relative position of the respective platen. Thus successively lower platens have their cables **5** secured to arms **8** at successively increasing distances from the axis of shaft **6**. The rotary body **6**, **8** is displaced concurrently with the movable bed **2** of the press via further arms **12** to which are joined elongated flexible members **11** passing over idlers **11'** at the top of the press. These cables **11** also pass around direction-changing pulley **11''** journaled on base **1**. The cables **5** are arrayed in sets affixed to corresponding locations of the platens so that, as indicated in FIG. 2, one set of cables is secured to the platens at substantially each of the corners thereof. All the cables, however, terminate at the common body **6**, **8**.

In operation, elevation of the bed **2** via piston **3** will rotate the arms **12**, to which the cables **11** are secured, in the clockwise sense (FIG. 1), thereby displacing the body **6**, **8** in the same sense to raise the platens **4**, owing to the staggered effective lengths of the respective arms **8**, at rates proportional to their distance from the upper platen **4'**. The latter may be supported by means of the ususal frame not shown. It will be understood that synchronous displacement of all portions of the platens **4** is effected by virtue of the fact that only a single body serves for the closure of the press.

In FIGS. 3 through 6 there is shown a modified arrangement wherein a stepped pulley **9** serves, together with its shaft **6***a* and a similar stepped pulley **9'** at the other end of the shaft, as a common rotary body for the flexible cables **5** of the platens **4**. Shaft **6***a* is journaled in a pair of supports **4***a'* at opposite ends of the upper platen **4***a* which also carries supports **7***a'* for the idler pulleys **7***a* over which the cables **5** pass. It should be added that cables from corresponding ends of each platen **4** are secured to a respective step **9***a*, **9***b*, **9***c*, or **9***a'*, **9***c'*, **9***d'* at diametrically opposite locations. These steps may be channeled or grooved along their periphery to prevent axial shifting of the cable during winding of the latter. Again the platens spaced farthest from the upper platen **4'** are joined by the cable **5** to the pulley step of largest diameter (**9***d*, **9***d'*) while successively higher platens are secured to pulley steps of successively smaller diameters. The shaft **6***a* to which the pulleys **9**, **9'** are keyed, is provided with a pair of generally radial arms **16** against which the pistons of a pair of hydraulic cylinders **13** bear via respective swivels **13'**. The cylinders **13** are also hinged (e.g. at **13''**) to the upper platen **4***a* and may be single-acting cylinders operating in push-pull so that simultaneous actuation of the cylinders will result in retraction of one of the pistons and extension of the other. A pair of pulleys **20'** keyed to the shaft **6***a* are provided with respective cables **21** secured to the bed **2***a* of the press after passing over respective idlers **22**. The bed **2***a* has affixed thereto the pistons **3***a* of a pair of main-pressure cylinders **23**.



Closure of a switch **24** causes electric current to pass from a source **25** to the solenoid **27** of a two-way valve **28** disposed between a rapidly operating high-volume hydraulic pump **29** and the cylinders **13** to displace the arms **16** and the shaft **6***a* in the clockwise sense (FIG. 3). Since cables **21** are thus wound about the pulleys **20**, **20'**, bed **2***a* is raised along with the platens **4** whose cables **5** are synchronously wound about the steps of the respective pulley **9**, **9'**. The main valve **30** of the press-control system is, however, in the position illustrated so that the upward displacement of the pistons **3***a* of the bed **2***a* serves to aspirate fluid into the main cylinder **23** from a reservoir **31** at a relatively high rate coinciding with the rate of the closure of the press as determined by the rapidly acting cylinders **13**. When, however, the press is closed, a limit switch **32** is operated to energize the solenoid **33** of valve **30** to shift the latter into a position wherein fluid from a low-volume, high-pressure pump **34** can be communicated to the main cylinder **23**. The desired pressure is then applied by the main cylinders to the bed and the sheets disposed between the platens. If desired, limit switch **32** can be provided with a normally closed contact in series with solenoid **27** for cutting off the press-closure mechanism when the platens are in position for high pressure to be applied to the material carried thereby. Since these presses are eminently suited for compacting fibrous material to produce hardboard or the like, the platens **4** and bed **2***a* may be heated to facilitate the setting of such board. When press operation is completed, switch **24** is opened to enable the valve **28** to discharge fluid from cylinders **13** to the reservoir **31** during the descent of the platens under their own weight. Simultaneously a spring **35** draws the valve **30** into a position wherein the cylinders **23** again communicate with the reservoir so that, as the bed **2***a* is lowered, the fluid from the cylinders **23** is forced back into the reservoir.

To avoid the need for spring means along the flexible cables **5** or **11** it is preferred to form the arms **10** (FIG. 6) of the rotary body to which they are secured as resilient members. Thus these arms **10** may be constituted as laminated leaf springs which are secured to a prismatic shaft **6***b* via throughgoing bolts **40**. Shaft **6***b* is tubular and may consist of two channel members welded together at **41** although angle irons may also be employed to produce the prismatic shaft.

In FIGS. 7 to 9 there is shown an arrangement generally similar to that of FIG. 4 wherein, however, the shaft **6***c* is journaled at supports **42** below the bed **2***c* while the idlers **7***c* are carried by additional supports **7***c'* at this level. The cables **5***c* secured to each of the platens thus pass under these idlers **7***c* and over another set of idlers **7***d* rotatably mounted upon the upper platen **4***d* of the press. In this case shaft **6***c* is driven directly by the platens via an arm **16***c* to which the platen is connected via a swivel link **45**. Thus elevation of the bed **2** causes a clockwise rotation of the shaft **6***c* and the stepped pulley **9***c* carried thereby to effect simultaneous closure of the gap between the platens.

The invention as described and illustrated is believed to admit of many modifications and variations within the ability of persons skilled in the art and deemed to come within the spirit and scope of the appended claims.

What is claimed is:

**1.** In a multi-platen press having a plurality of vertically displaceable spaced platens, a fixed stop above said platens, and a vertically displaceable bed below said platens, the combination therewith of mechanism for raising said platens simultaneously with said bed at rates decreasing

progressively from the lowermost to the uppermost platen, said mechanism comprising a body rotatable about a single substantially horizontal axis, a plurality of cable pairs eccentrically secured to said body and to said platens, the cables of each pair being secured to a respective platen at symmetrical locations on opposite sides of a vertical median plane and being further secured to said body at diametrically opposite points equidistant from said axis, the distance of said points from said axis increasing progressively for successively lower platens, and drive means for rotating said body about said axis.

2. The combination defined in claim 1 wherein said drive means includes at least one lever fixed to said body and fulcrumed on said axis.

3. The combination defined in claim 2 wherein said drive means linked with said lever includes fluid-responsive means, fluid-controlled support means for said bed operable to apply to said bed and said platens an upward force in a closed condition of said press, transmission means coupling said body and said bed for concurrent displacement whereby rotation of said body under the action of said fluid-responsive means elevates said platens and said bed to close the press at a rate in excess of the rate of displacement of said bed under the action of said control means responsive to incipient closure of said press for operating said support means.



4. The combination defined in claim 3 wherein said support means comprises a hydraulic cylinder, said control means including a valve operative to permit aspiration of a hydraulic fluid into said cylinder upon elevation of said bed by said fluid-responsive means.

5. The combination defined in claim 1 wherein said body is provided with axially spaced pairs of diametrically opposite radial arms each associated with one of said cable pairs, the latter being secured to said arms at free extremities thereof.

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