July 17, 1962 J. KURY 3,044,393

DRIVING MECHANISMS OF THE MOVABLE PLATEN OF A PLATEN-PRESS

Filed April 11, 1960 3 Sheets-Sheet 1

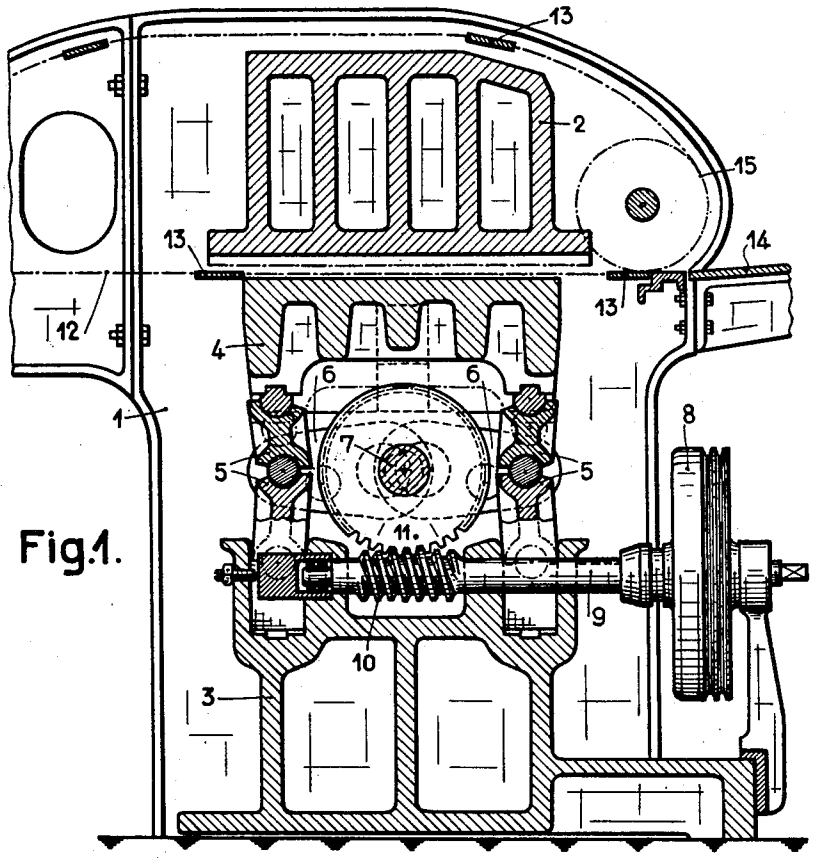

Fig.1.

Fig.2.

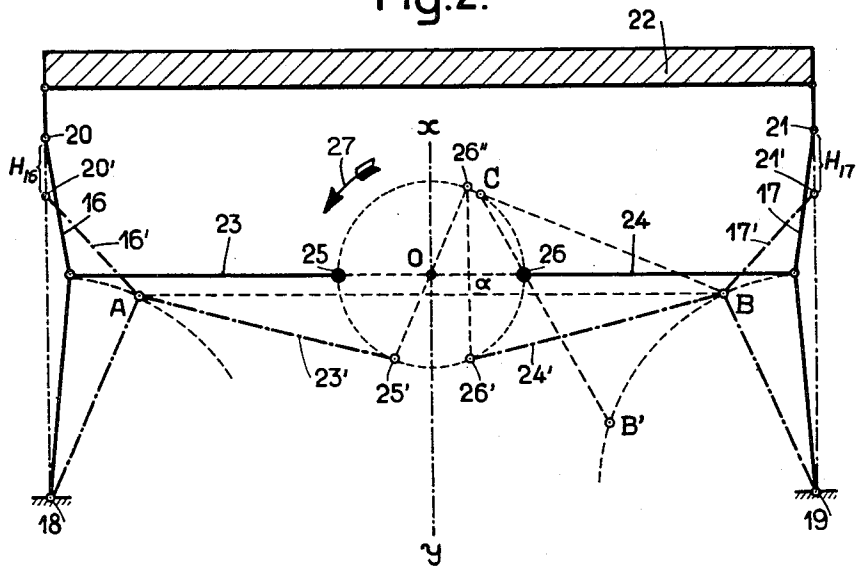
22
20
H_{16}
20'
16
16'
23
27
x
26"
C
21
21'
H_{17}
17
17'
24
25
O
26
α
A
B
23'
25'
26'
24'
B'
18
19
y

Fig.3.

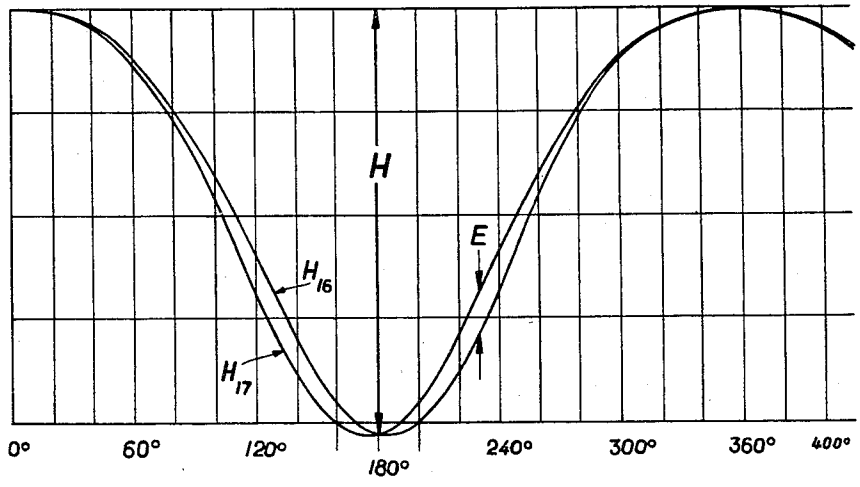
H
E
H_{16}
H_{17}
0°
60°
120°
180°
240°
300°
360°
400°

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Fig.4.

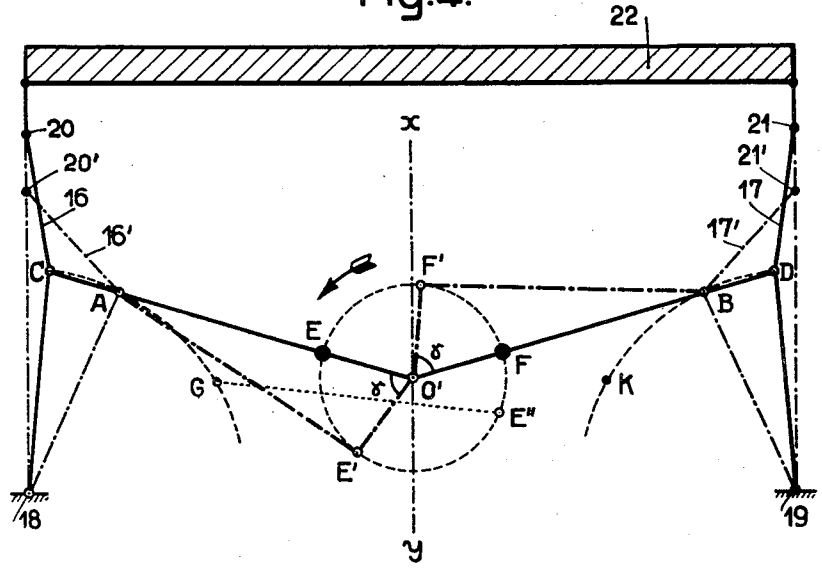
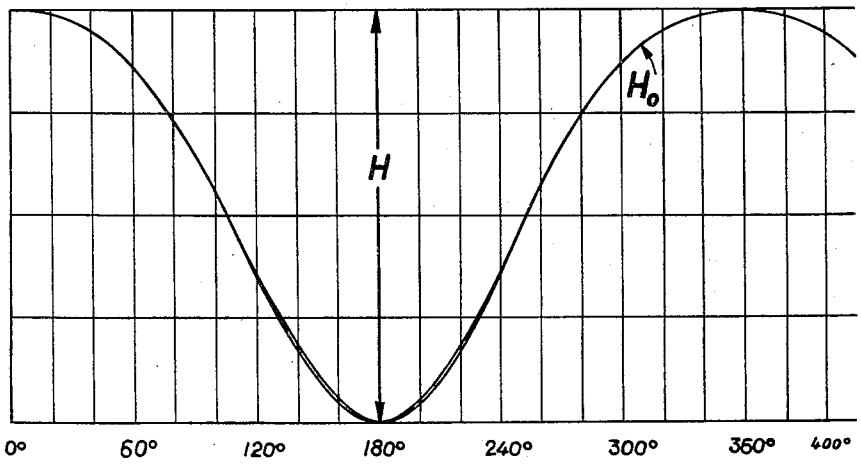


Fig.5.



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DRIVING MECHANISMS OF THE MOVABLE PLATEN OF A PLATEN-PRESS

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6 Claims. (Cl. 100—286)

This invention relates to driving mechanisms for presses and the like. It is an object of the present invention to provide an improved driving mechanism for a movable platen in a press of the type, for instance, employed for cutting or corrugating paper or cardboard sheets. It is a further object of the invention to provide an improved driving mechainsm for a platen in the type of press wherein the said platen is moved by means of toggle-levers driven by rods coupled to a common crank-shaft.

To achieve the above and other of its objectives as will become apparent hereinafter the invention contemplates the provision of apparatus for displacing a platen while retaining the attitude of the same substantially constant.

This apparatus in accordance with a preferred embodiment of the invention comprises spaced toggle systems each including a fixed pivot, a displaceable pivot, levers connected respectively to said pivots, and an intermediate pivot connecting said levers.

Furthermore, the apparatus comprises means to guide the displaceable pivots in linear parallel paths, a drive shaft being provided having an axis of rotation and having rods connected thereto by means connecting the rods to the shaft at pivot axes spaced substantially equal distances from the axis of rotation of said shaft.

Each of the aforenoted toggle systems has positions of full extension and maximum displacement and further has positions intermediate the same. The positions of the aforenoted intermediate pivots with the systems in full extension and in one of the intermediate positions define straight lines which intersect at the aforenoted axis of rotation.

In accordance with a feature of the invention the levers of each toggle system define obtuse angles with the associated systems in full extension.

According to a further feature of the invention the pivot axes associated with the drive shaft and the axis of rotation define an obtuse angle.

According to still another feature of the invention the displaceable pivots are the means of connection to the aforenoted platen.

According to yet another feature of the invention all of the above-noted pivots and pivot axes and the said axis of rotation are arranged in parallel.

The above objects and features of the invention will be best understood by reference to the following detailed description as illustrated in the accompanying drawing in which:

FIG. 1 illustrates partially in section and in side view the drive mechanism for a press employing a fixed and a movable platen;

FIG. 2 schematically represents the arrangement of the various elements of the press of FIG. 1 as arranged in accordance with the prior art;

FIG. 3 is a graph illustrating the relative movement of the platens according to the arrangement of FIG. 2;

FIG. 4 schematically illustrates the arrangement provided in accordance with a preferred embodiment of the invention; and

FIG. 5 is a graph illustrating the relative attitude of the platens when the arrangement is provided in accordance with the illustration of FIG. 4.

The press of FIG. 1 includes a pair of frames 1 supporting a fixed upper platen 2 and connected with the base 3 of the driving mechanism of the lower movable platen 4.

Platen 4 moves up and down successively once in the course of each working cycle of the press, and is driven by the toggle-levers 5 operated by the rods 6, which are connected by their heads to the main driving shaft 7 through eccentrics. This sole shaft thus constitutes a common crank-shaft for all the rods. It is driven by a motor, not shown, driving the flywheel 8, the shaft 9 and the worm 10 meshing with the toothed wheel 11, which is keyed to the said main shaft. On opposite sides of the platens is an endless chain 12, these chains being connected together by conveyor-bars with grippers 13 and subjected to an intermittent drive.

This arrangement constitutes a press for processing material in sheets, which are conveyed one by one onto the table 14, registered by known means, not shown, then seized by the gripping bar immediately under the chain-wheels 15, and finally inserted one by one between the platens 2 and 4 in separate position.

At this moment, and under the action of the toggle-levers, these platens bearing appropriate tools and counter-tools are applied against each other and thus carry out the desired work, for instance, a corrugation or a cutting or perhaps both operations at the same time.

These operations are repeated during each working cycle, which corresponds to one turn of the main shaft or crank-shaft 7.

In an operation of the above kind, which is mentioned by way of example, it is indispensable that the application of the platens against each other and their separation be effected with the parallelism of their opposing surfaces as perfect as possible.

FIGS. 2 and 3 make it possible to analyze what is going on in the case described above.

FIG. 2 represents diagrammatically two opposed toggle-levers 16 and 17, respectively having fixed pivots 18 and 19. Opposed pivots 20 and 21 are adapted for moving vertically in parallel slides and serve as fastening points for the toggle-levers with respect to the movable horizontal platen 22.

The ecntral joints of these toggle-levers are driven by the rods 23 and 24, the heads of which are coupled with eccentrics operating as cranks 25 and 26 diametrally opposed with respect to the common shaft turning in the direction of the arrow 27.

When crank 25 goes past position 25', the rod 23 passes position 23' and the toggle-lever 16 takes position 16', lowering its pivot 20 down to position 20', along with the corresponding side (left in the drawing) of the platen 22.

So as to cause the platen 22 to be displaced in parallel to its original position, it is necessary that pivot 21 be lowered to position 21', with toggle-lever 17 moving to position 17', at a level identical to that of position 16'.

This might be possible if crank 26 moves to position 26' which is symmetrical with respect to position 25' in relation to the vertical axis x—y of the whole, so that the rod 24 assumes position 24'.

This arrangement has already been realized by making the two eccentrics to turn at equal speeds, but in opposite direction from each other, or by providing two crank-shafts with parallel axes, which solutions lead to complicated and cumbersome mechanisms.

The two groups of eccentrics being on a common crank-shaft, the position 25' will correspond to the diametrically opposed position 26''.

The distance from 26' to the horizontal A—B uniting the joints of the toggle-levers in their symmetrically deformed positions being shorter than the distance from 26'' to that horizontal, it is seen that of the two right-angled

triangles 26′—α—B and 26″—α—B, the hypotenuse of the second one is longer than that of the first one. This means that the distance 26″—B could in no way correspond to the length of the rod 24 (equal to 24′) but is longer, so that B cannot occupy the illustrated position.

By drawing its correct position, this point (the joint of the toggle-lever 17) happens to be at B′, determining a deformation of the toggle-lever 17 more important than that of the toggle-lever 16, and consequently a lowering of the point 21 greater than that corresponding to the point 20 (this position moreover even impossible when adopting the proportions of this diagrammatic figure).

Now, if 21 is lowered at a given moment more than 20, it is obvious that the platen 22 will no longer be parallel to its starting position.

By following this motion during one complete revolution of the eccentrics, it will be seen that this lack of parallelism of the platen with respect to its original position and, consequently, with the fixed counter-part with which it cooperates, is produced successively in one direction, then in the opposite direction, i.e. the platen performs a swinging motion.

When the platen course is designated H and the two curves which correspond to the displacements H_{16} and H_{17} during a cycle are superposed, FIG. 3 will be obtained in which the ordinates correspond to the said course and the abscissas to a little more than a revolution (420°), in the case of a press, the platen of which measures practically 800 mm. between the pivots 20 and 21, with a course H_{max} of 50 mm., the total length of the toggle-levers being about 400 mm. and the radius of the eccentrics crank being about 40 mm.

The curves are designated by H_{16} and H_{17} and the curves pass twice a cycle through a position of maximum distance E. This distance amounted to 5 mm.

Without being prejudicial to the good functioning of a platen-press in all cases, this swinging will be, in some cases, the cause of inaccuracies, in particular when operating on paper or cardboard on which have to be superposed different prints.

The object of the present invention is to reduce the above-noted swinging to make it practically negligible.

FIG. 4 of the attached drawing, outlined in the same diagrammatical proportions as FIG. 2, makes it possible to explain the rules through the application of which this can be attained.

Therein, the references 16 to 22 designate the same parts as in FIG. 2, and the points A and B and the axis x—y on which is the axis O′ of the eccentrics are found here again.

This axis is however placed lower than O in the first example, i.e. at the intersection of the straight lines C—A—O′ and D—B—O′. Of these designations, the points C and D correspond to the respective positions of the central joints of the toggle-levers in extension (upper dead point of the platen 22), it being understood that in this position, the two levers of each toggle-lever are not in linear alignment (see drawing) but form between them a large obtuse angle, for instance of 170°.

The points A and B correspond to an intermediate position of the central joints, i.e. comprised between the aforementioned extension position and the maximum bending.

The position of O′ being thus determined after having chosen at will the symmetrical positions of A and B, the eccentrics are disposed so that their cranks be no longer diametrically opposed, but located at O′—E and O′—F on the straight lines O′—A—C and O′—B—D. The rods are then constituted by E—C and F—D.

It is obvious that when causing the cranks to turn by 180°, a symmetry-position will be reached in the sense that crank E will assume position E″, the corresponding central joint will assume position G (rod E″—G) and the opposite central joint will assume position K, exactly symmetrical with respect to G.

Like in the first example, the starting position (extension) and that obtained after one rotation of 180° of the cranks, are symmetry positions, insuring the perfect horizontality of platen 22.

But while in the first case, these two positions only insure that symmetry, one can see that the second example still insures it in an intermediate position, precisely that which has been chosen for placing it at the points A and B.

If, indeed, the rods A—E′ and B—F′ are drawn from A and B which are symmetrics, it follows that:

The lengths A—O′ and B—O′ are equal, each to a rod length; plus a crank length;

The lengths A—E′ and B—F′ are equal, corresponding to a rod length;

The lengths O′—E′ and O′—F′ which are equal are the cranks.

It results therefrom that the triangles A—O′—E′ and B—O′—F′ are equal and consequently their angles γ too are equal.

This is tantamount to saying that the deformations of the toggle-levers bringing their central joints to the symmetrical positions A and B correspond to a real position of the cranks O′—E and O′—F, which will indeed have both turned by an angle γ.

Between the end points C and D, as well as G and K, it is therefore possible to provide at will, by construction, for point A and B where the platen 22 is horizontal.

What is most important is to avoid swinging near the upper dead point, when applying the platen against the opposite platen or when it is parting therefrom. By bringing the positions of the central joints of the toggle levers as designated by A and C and C and D relatively close to one another, it is possible to fix at will two positions for the central joint at which the platen is strictly horizontal. The closer these positions are to each other, the lesser will be the possibility of appreciable swinging between them.

FIG. 5 represents curves similar to those of the FIG. 3, in the case of an arrangement such as that which has already been described, by placing A and B about halfway of the total travel of the central joint of the toggle-levers.

It follows that in the part H_0 of the curves, corresponding to the passage by the upper dead point (platen working pressure) and on an appreciable length, the two curves are practically merged, so that the swinging of the platen is, so to speak, avoided. This zone extends at any rate from points C and D to the points A and B and even somewhat beyond and will be the more perfect from the point of view of the coincidence of the curves, the shorter will be the equal arches C—A and D—B.

In the lower part of the curves, where they are visibly parting the deviation is not only insignificant, but arises at a moment (motion on no load of the platen) where the swinging is without influence.

While the curves of FIGS. 3 and 5 correspond to an actual and practical example based, in both cases on the same platen and toggle-levers dimensions, the graphic representations of FIGS. 2 and 4 have deliberately been set up in the form of sketches because they are designed only to demonstrate geometrical properties which, in the case of a driving mechanism of the movable platen of a platen-type press in which this latter is moved by means of symmetrically arranged toggle-levers on either side of the crank-shaft axis which is common to them, may be formulated as follows:

The position (O′) of the axis of the crank shaft is determined by the intersection of two straight lines each passing through the projections of two positions symmetrical to the central joint of each toggle-lever, i.e. its position when they are fully extended (C and D) and one position between this and the bending end position (A between C and G and B between D and K) whereas the cranks of the rod eccentrics form between them an angle

different from 180°, such that on the instant of the aforementioned extension, their projections (O'—E and O'—F) are coincident with those of the two straight lines EAC and FBD respectively by fixing the position of the crank-shaft axis.

This rule is the characteristic of the object of the present invention.

What is claimed is:

1. Apparatus for displacing a platen while retaining the attitude of the same substantially constant, said apparatus comprising spaced toggle systems each including a fixed pivot, a displaceable pivot, levers connected respectively to said pivots, and an intermediate pivot connecting said levers; means to guide the displaceable pivots in linear parallel paths extending perpendicular to the platen, a drive shaft having an axis of rotation, rods connected to the intermediate pivots; and means connecting said rods to said shaft and having connection with the rods at pivot axes spaced substantially equal distances from said axis of rotation; said toggle systems each having positions of full extension and maximum displacement and further having intermediate positions; the positions of the said intermediate pivots with the systems in full extension and in one of the intermediate positions defining straight lines which intersect at said axis of rotation.

2. Apparatus as claimed in claim 1, wherein the rods of each toggle system define an obtuse angle with the toggle systems in full extension.

3. Apparatus as claimed in claim 1, wherein the pivot axes and axis of rotation define an obtuse angle of less than 180°.

4. Apparatus as claimed in claim 1, wherein the displaceable pivots are connected to said platen.

5. Apparatus as claimed in claim 1, wherein all of said pivots and pivot axes and said axis of rotation extend parallel to each other.

6. Apparatus for displacing a platen while retaining the attitude of the same substantially constant, said apparatus comprising spaced toggle systems each including a fixed pivot, a displaceable pivot, levers connected respectively to said pivots, and an intermediate pivot connecting said levers; means to guide the displaceable pivots in linear parallel paths extending perpendicular to the platen, a drive shaft having an axis of rotation, rods connected to the intermediate pivot; and means connecting said rods to said shaft and having connection with the rods at pivot axes spaced substantially equal distances from said axis of rotation; said toggle systems being movable between fully extended and maximum displaced positions under the action of the rotation of the drive shaft, the rods connected to the intermediate pivots of each toggle system being aligned with the corresponding means connecting the rods to the shaft to form an acute angle with respect to the platen with the toggle systems fully extended.

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