July 17, 1962 E. WEBER 3,044,310

TRANSMISSION FOR SHEARING PLATES

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Fig. 7

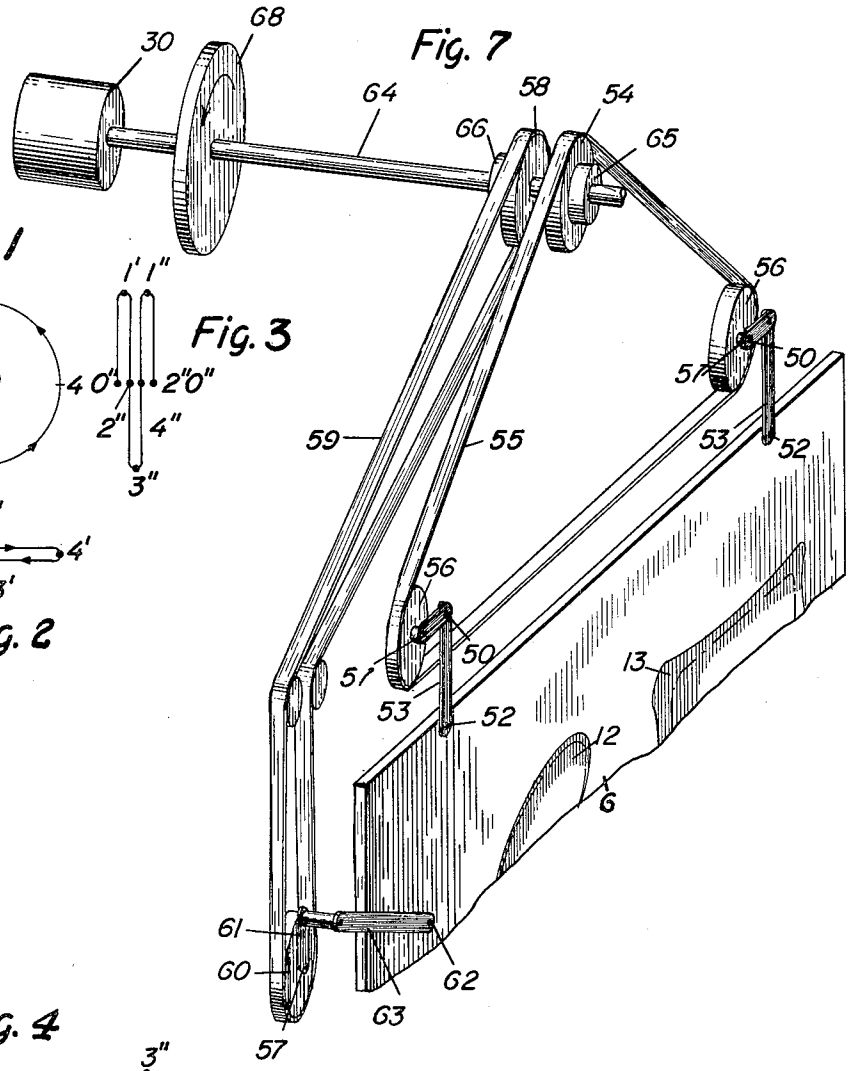



Fig. 1

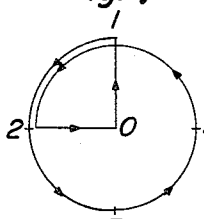



Fig. 3



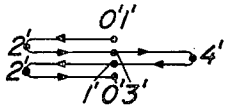




Fig. 2

Fig. 4

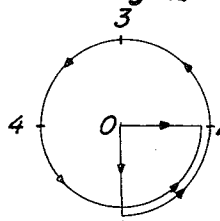
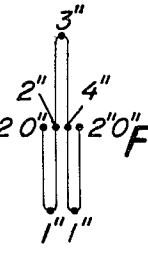



Fig. 6



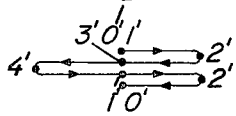




Fig. 5

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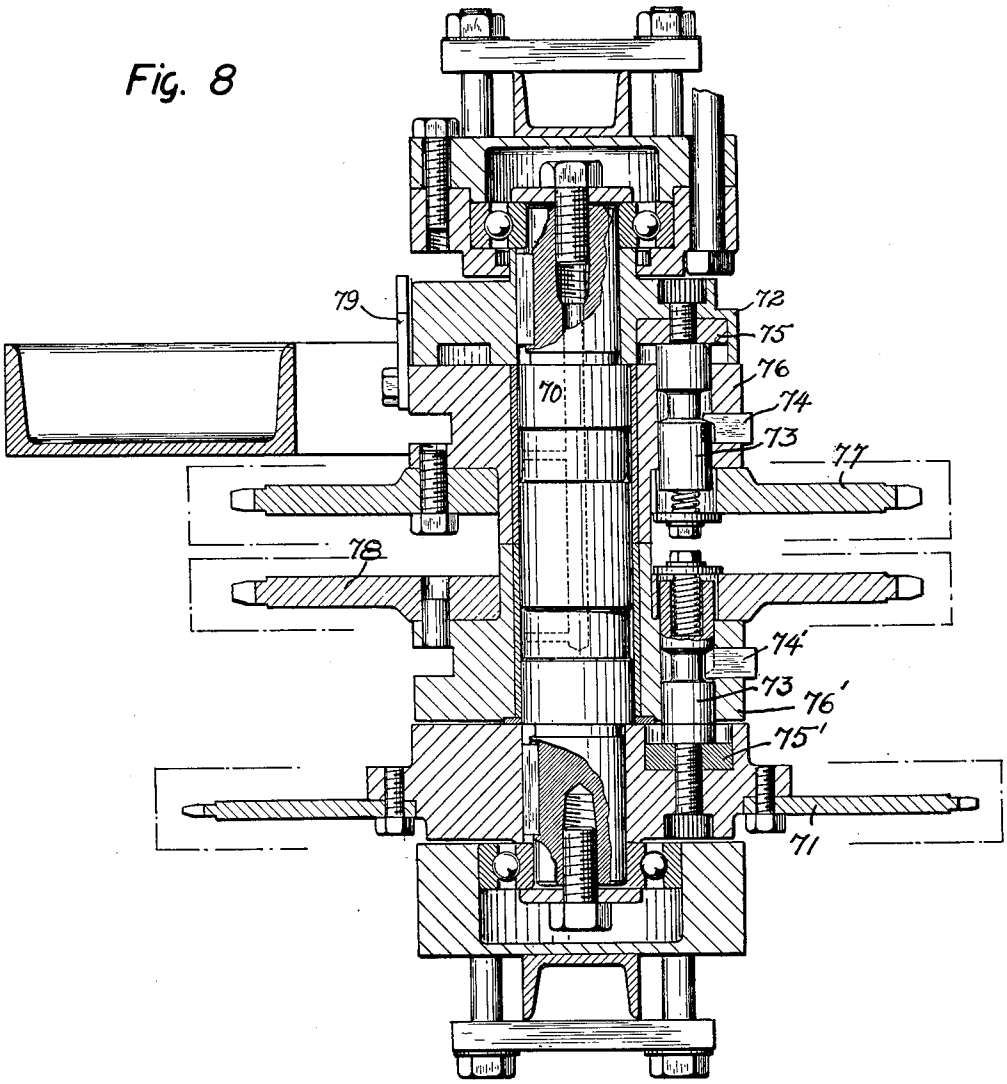
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Fig. 8




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# TRANSMISSION FOR SHEARING PLATES

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4 Claims. (Cl. 74—86)

The present invention relates to a method for cutting off along a determinated plane from a spatial sheet formation at least one part projecting beyond said plane.

According to the invention use is made of two plates, having each at least one plane surface portion limited by an edge, surrounding in the first plate a recess enclosed by this edge and being in the second plate surrounded by this edge and forming at least a portion of a raised surface, the sheet formation being brought between these two plates in such a way, that the projecting part to be cut off lies with its convex side in the recess of the first plate and the raised part of the second plate is surrounded by the remaining portion of the sheet formation immediately adjacent to the part to be cut off, so that the mentioned plane surface portions of the two plates lie parallelly to each other from opposite sides against the plane along which the projecting part of the sheet formation shall be cut off, whereafter the two plates are moved relatively with respect to each other along such a closed trajectory in this plane that at every point of the cutting line of the said plane with the sheet formation the mentioned edge of one of said plates is crossed at least once by the corresponding edge of the other plate, whereby the sheet formation is cut off between these edges at the intersecting points of the edges of both plates.

A further object of the invention is the provision of an apparatus for carrying out the above method. This apparatus comprises two plates provided each with at least one plane surface limited by an edge surrounding in the first plate a recess and being in the second plate surrounded by this edge and forming at least a portion of a raised surface part of this second plate, whereby one of these plates is movably guided along the other in a plane against which the mentioned plane surface portions of both plates lie from opposite sides.

Other features and advantages of the invention will become apparent from the description now to follow of preferred embodiments thereof given by way of example and in which reference will be made to the accompanying drawings, in which:

FIGURE 1 is a diagrammatic view illustrating a trajectory along which one plate must be moved with respect to the other for cutting off projecting parts.

FIGURES 2 and 3 are diagrammatic views further illustrating FIGURE 1.

FIGURE 4 is a further example of a trajectory.

FIGURES 5 and 6 are illustrative diagrams of the trajectory of FIGURE 4.

FIGURE 7 is a diagrammatic representation of the driving mechanism for moving the plate along the trajectories of FIGURES 1 and 4, and

FIGURE 8 is a cross-sectional view of a coupling used in the apparatus of FIGURE 7.

A plate 6 is moved in two subsequent working cycles first through a trajectory according to FIG. 1, and then through a trajectory according to FIG. 4. Both trajectories are identical but turned about an angle of 180° about the starting position 0 with respect to each other.

According to each of the FIGS. 1 and 4, the plate 6 is first displaced rearwardly (FIG. 1) from the starting position 0 and forwardly (FIG. 4) respectively into the position 1. From this position the plate 6 follows a circular trajectory in which it passes subsequently the positions 2, 3 and 4.



Then the plate 6 returns into position 1 so that the projecting parts of a work piece are separated from the remainder part. However, instead of returning from position 1 directly into the starting position 0 the plate 6 follows again the quarter of the circle 1—2 and is guided back into the starting position 0 from the position 2. When the plate 6 has completed the trajectory of FIG. 1 the remainder part of the work piece is removed and a new work piece is inserted whereafter plate 6 follows the trajectory of FIG. 4. For separating or cutting off the projecting parts of the third work piece, the plate 6 will again follow the trajectory of FIG. 1, etc.

The plate 6 may be guided along the trajectories of FIGS. 1 and 4 by one driving means by having it execute about its starting position 0 two combined and coordinated to-and-fro movements in two directions perpendicular to each other, namely, a to-and-fro movement to the left and to the right (FIGS. 2 and 5, respectively) and rearwardly and forwardly (FIGS. 3 and 6, respectively), whereby at each operation and in each of the two directions, it is first displaced about half the amplitude of the to-and-fro movement with respect to the starting position, then executes the full to-and-fro stroke and then returns to the starting position. The to-and-fro movements are effected synchronously but not in phase as the one in one direction only starts when the plate has completed the displacement about half the amplitude of the to-and-fro movement in the other direction. The return of the plate to the starting position in the first-mentioned direction is thus only effected when the to-and-fro movement of the plate in the other direction is completed.

For effecting these to-and-fro movements of plate 6 as indicated in FIG. 7, there are provided three crank mechanisms driven by a common driving shaft. The two first crank mechanisms which are identical to each other serve to displace the plate 6 forwardly and rearwardly as well as to its parallel guiding. They comprise each a crank shaft 50 with a front crank 51 and a push rod 53 articulated to the latter and engaging the plate 6 on a tap 52. The two crank shafts 50 are synchronously driven in phase by a common chain wheel 54 over a chain 55 and chain wheels 56 mounted on that crank shaft and having a diameter of two-thirds of the diameter of the driving chain wheel 54. It results therefrom that the connecting line of the axes of the taps of the two front cranks 51 and thus the connecting line of the axes of the two taps 52 are constantly parallel to the one of the axes of the crank shaft 50. The third crank mechanism serves to displace plate 6 to the left and to the right and comprises a third crank shaft 57 driven from a driving chain wheel 58 over a chain 59 and a chain wheel 60, mounted on the crank shaft 57 and the diameter of which is two-thirds of the diameter of chain wheel 58. The crank shaft 57 carries a front crank 61, to which is articulated a push rod 63 engaging a tap 62 of plate 6. The two driving chain wheels 54 and 58 are rotatably mounted on a common driving shaft 64 and are entrained by the latter each over a coupling 65 and 66, respectively, of known construction. These couplings upon actuation couple the corresponding chain wheel 54 and 58, respectively, with the shaft 64 for one full revolution with the latter and uncouple subsequent to this full revolution automatically the respective chain wheels 54 and 58 from the shaft 64. The two couplings 65 and 66 are formed in such a way that they are actuated together but that the coupling 65 couples the chain wheel 54 with the shaft 64 only after the chain wheel 58 has been entrained by the shaft over the coupling 66 about an angle of 60°. Then the chain wheel 54 is also uncoupled from shaft 64 only after having effected, sub-

sequent to the uncoupling of chain wheel **58** from this shaft **64**, a further rotation of about 60°. In operation of the apparatus, the shaft **64** is continuously driven by a motor **30** and carries a flywheel **68**.

When the front cranks **51** and **61** are in the position shown in FIG. 7, they hold firmly by means of the push rods **53** and **63** the plate **6** in its starting position 0 (FIGS. 1 and 4), in which the work piece may be inserted. After this has been done, the couplings **65** and **66** are actuated by hand. The shaft **64** driven by the motor **30** entrains in rotation over the coupling **65** the chain wheel **54**, so that the crank shaft **50** over the chain **55** and the chain wheel **56** are rotated with an angular velocity which is 1½ times the velocity of rotation of shaft **64**. The coupling **66** has not yet coupled the chain wheel **58** with the shaft **64**. The crank shaft **57** thus yet stands still. The front cranks **51** rotating in the direction indicated by the arrow with the crank shaft **50**, then pull by means of the push rods **53** the plate **6** rearwardly, whereby the push rod **63** swings about its stationary articulation point at the front crank **61** and guides the plate **6** along a flat arc. When the chain wheel **54** with the shaft **64** has rotated about an angle of 60° and thus the two crank shafts **50** have rotated about an angle of 90°, the two front cranks **51** are rearwardly parallel to the front crank **61** and plate **6** is in its rearmost position, namely the position 1 of FIG. 1. At this moment the coupling **66** also couples the chain wheel **58** with the shaft **64**. From now on to the completion of the rotation commenced by the chain wheel **54**, i.e. during a further rotation of the shaft **64** about 300° all three crank shafts **50** and **57** and with them the front cranks **51** and **61** simultaneously rotate about the same angles namely about 1½ times said angle of 300°, i.e. about 540° or 1¼ full revolutions. The plate **6** effects a circular movement corresponding to this rotation and passes thereby the positions indicated by 2, 3 and 4 in FIG. 1, then again position 1 and finally again the left extreme position 2. At this moment the chain wheel **54** is uncoupled from the shaft **64** by the automatic coupling **65** and stands still. The crank shafts **50** also stand still whereby the front cranks **51** are positioned about an angle of 180° with respect to the position shown in FIG. 7. The chain wheel **58**, however, remains coupled over couplings **66** with the shaft **64** and is entrained in rotation by it over an angle of 60° until this chain-wheel too has completed its revolution. Thereby the front crank **61** effects a rotation over 90° from the left into the forward extreme position resulting in the plate **6**, guided by the push rod **53**, being returned into its starting position. The remainder part **1** of the cut off working piece is then removed and a further work piece inserted. By the following new actuating of the couplings **65** and **66** the same operations are started as described with respect to the previous operation with the difference that the front cranks **51** and the plate **6** are first moved forwardly so that plate **6** follows the trajectory according to FIG. 4.

Referring to FIGURE 8 which shows a type of coupling such as the coupling **65** and **66** a brief description follows:

When the motor **30** is switched on the shaft **70** is constantly driven by the sprocket wheel **71**. The part **72** which is fixed to the shaft **70** is also in constant rotation.

The two coupling pins **73** are fixed by the parts **74** and **74'**. Manual means are provided for initiating the cutting movement. As soon as the parts **74** and **74'** are pushed away from the coupling the pins **73** jump at the same moment into the grooves of the rotating parts **72** and **71**. The pins are also turned around by means of the catch bushes **75** and **75'** and therefore the parts **76** and **76'** and the sprocket wheels **77** and **78** begin to rotate.

By the rotation of the coupling and the wedge **79** the parts **74** and **74'** lift up the pins **73** from the catch bushes **75** and **75'** (the parts **74** and **74'** are screw thread segments).



The sprocket wheels **77** and **78** now make exactly one full turn and will stand still until the next cutting movement. The eccentric shafts **56** are driven by the sprocket wheels **77** and **78**.

The diameters of the chain wheels on the coupling and on the eccentric shafts have the following ratio:

$$\frac{\text{Wheel on the coupling}}{\text{Wheel on the ecc. shaft}} = \frac{3}{2}$$

When the coupling makes one full turn around, the eccentric shafts are turned one and a half turn around.

The catch pushes **75** and **75'** are displaced 60° to one another.

The upper pin **73** catches first and turns around the upper sprocket wheel **77** which turns one of the eccentric shafts.

After a 60° rotation of the coupling equals 90° rotation of the shaft **70** the other pin **73** is caught and therefore the other sprocket wheel **78** is rotated which again turns the eccentric shafts.

I claim:

1. Means for operating shearing plates in a shearing apparatus in which only one of said shearing plates is movable comprising a first and a second mechanism for reciprocating said movable shearing plate to both sides of its basic position in a first direction parallel to a fixed plane and a third mechanism for reciprocating said movable shearing plate to both sides of its basic position in a second direction parallel to said fixed plane, each of said mechanisms comprising a crank rotatable about an axis perpendicular to said fixed plane, a link pivoted to said crank at a point spaced from said axis, and a pivot connecting said link to the movable shearing plate, the said pivot and crank axis of said first and second mechanisms being aligned in parallel directions and the said pivot and crank axis of said third mechanism being aligned in a direction substantially perpendicular to said parallel directions when said movable shearing plate is in its basic position, first driving means for rotating said cranks of said first and second mechanisms at the same speed with said cranks thereof parallel to each other, and second driving means couplable with said first driving means for rotating said crank of said third mechanism at the same speed as said cranks of said first and second mechanisms.

2. Means for operating shearing plates as claimed in claim 1 in which said first driving means comprises a driving shaft, a transmission couplable to said driving shaft for driving said cranks of the first and second mechanisms each at one and a half the rotational speed of said driving shaft, and said second driving means comprising a transmission couplable to said driving shaft for driving said crank of the third mechanism at one and a half the rotational speed of said driving shaft.

3. Means for operating shearing plates in a shearing apparatus comprising a first mechanism for translationally reciprocating a movable shearing plate to both sides of its basic position in a first direction parallel to a fixed plane, a second mechanism for translationally reciprocating a movable shearing plate to both sides of said basic position in a second direction substantially perpendicular to said first direction but also parallel to said fixed plane, each of said reciprocating mechanisms comprising a crank rotatable about an axis perpendicular to the said fixed plane, a link pivoted to said crank at a point spaced from said axis, and a pivot connecting said link to the movable shearing plate, the said pivot and crank axis of one mechanism being aligned to each other in one direction and the said pivot and crank axis of said other mechanism being aligned to each other in a direction substantially perpendicular to said one direction when the shearing plates are in their basic position.

4. Means for operating shearing plates as claimed in claim 3 comprising driving means for rotating said crank

of said first mechanism at twice the speed of said crank of said second mechanism.


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