June 29, 1937. O. F. LOHMANN 2,085,435

MANUFACTURE OF PRINTED AND DIE CUT ARTICLES

Filed Dec. 4, 1933 5 Sheets-Sheet 1

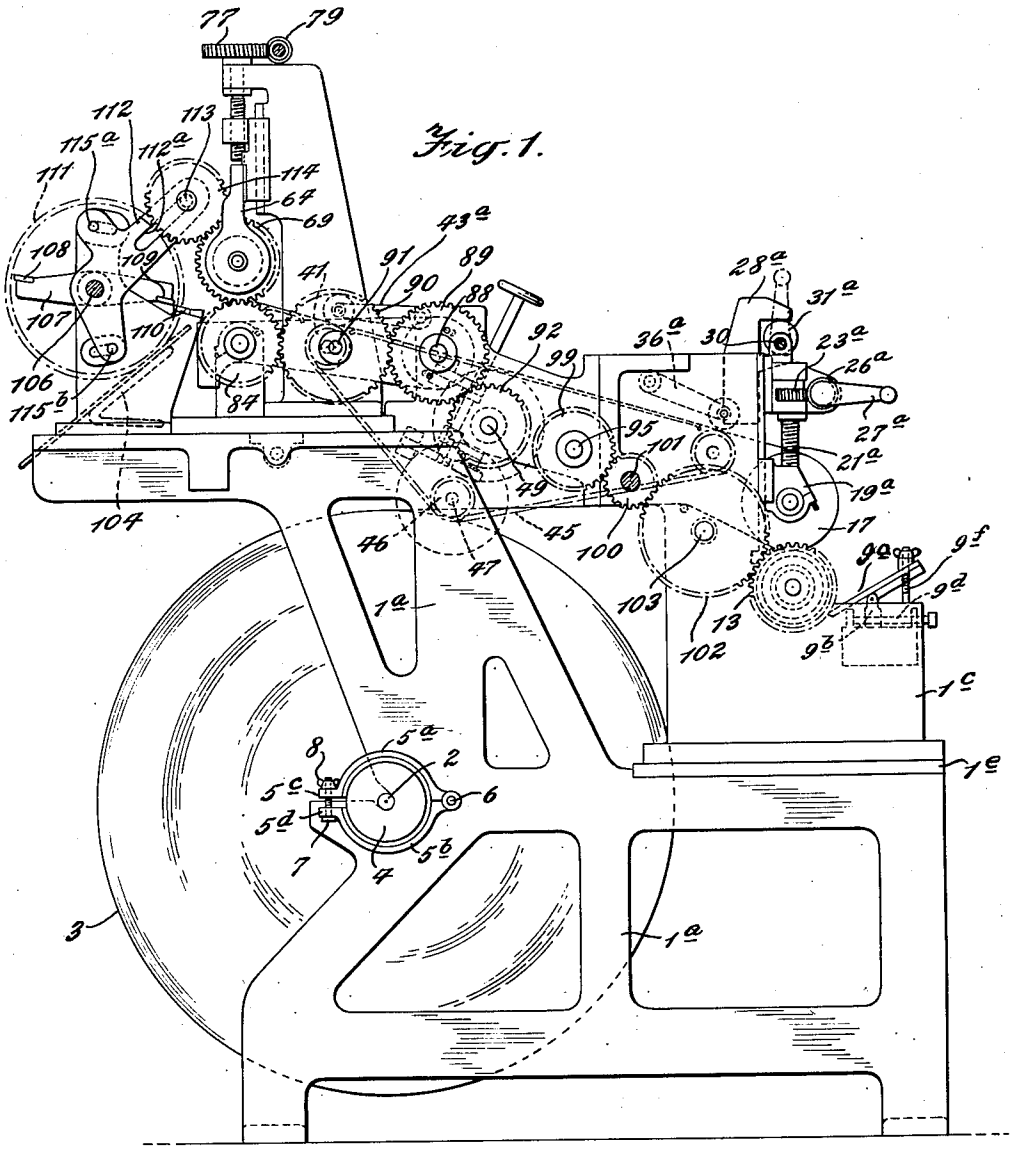


Fig. 1.

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MANUFACTURE OF PRINTED AND DIE CUT ARTICLES

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Fig. 2.

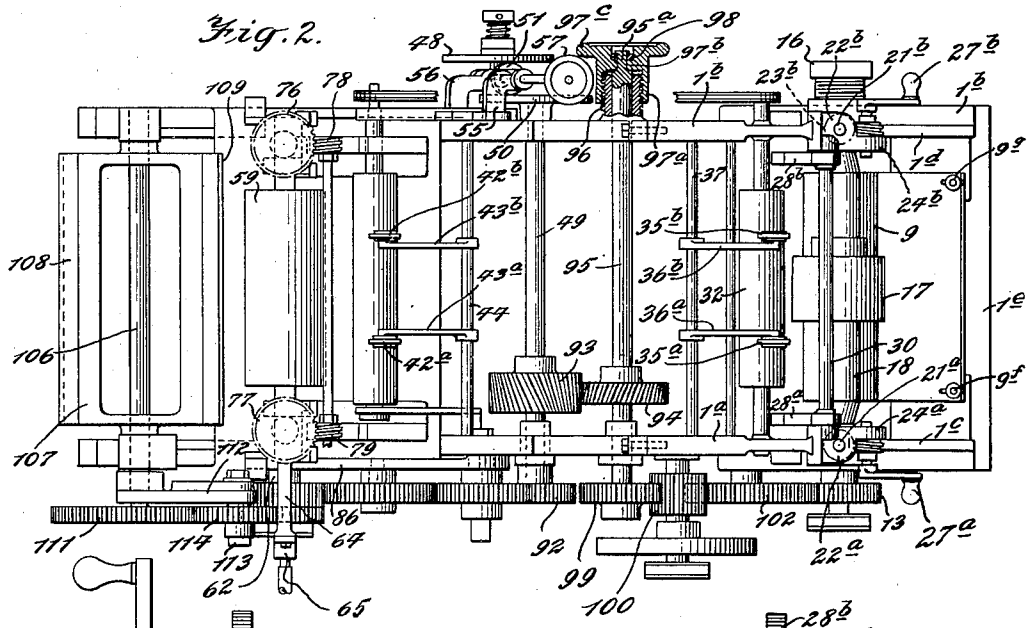
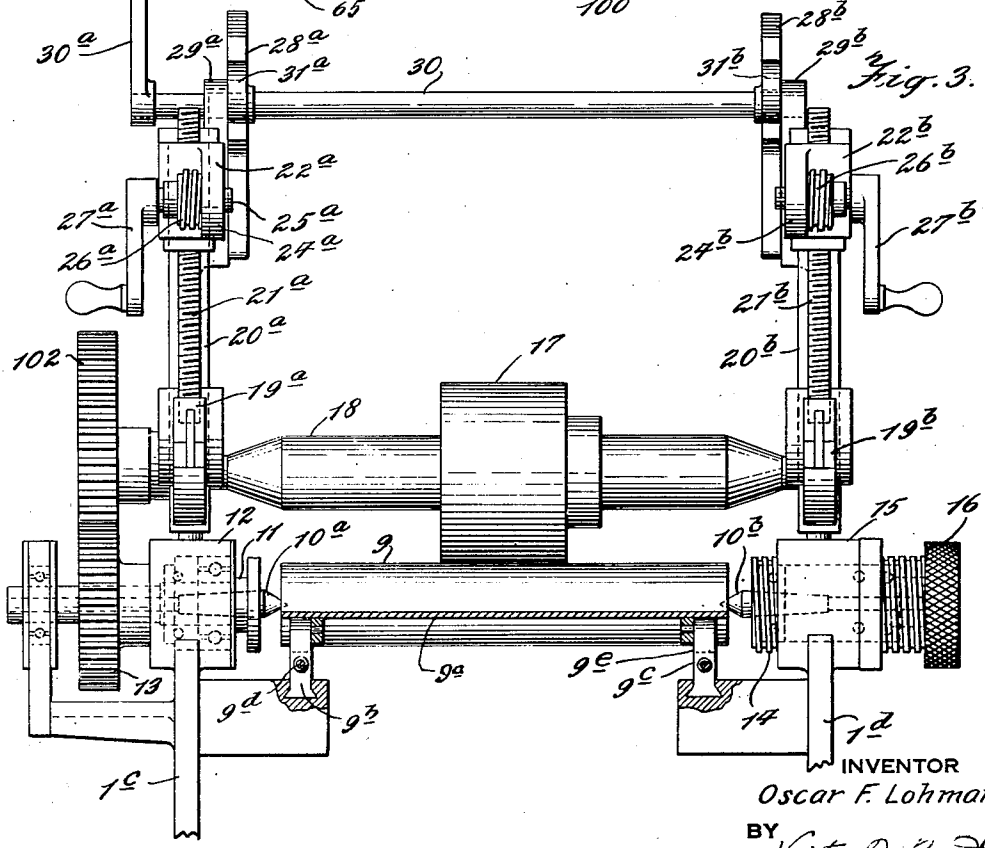


Fig. 3.



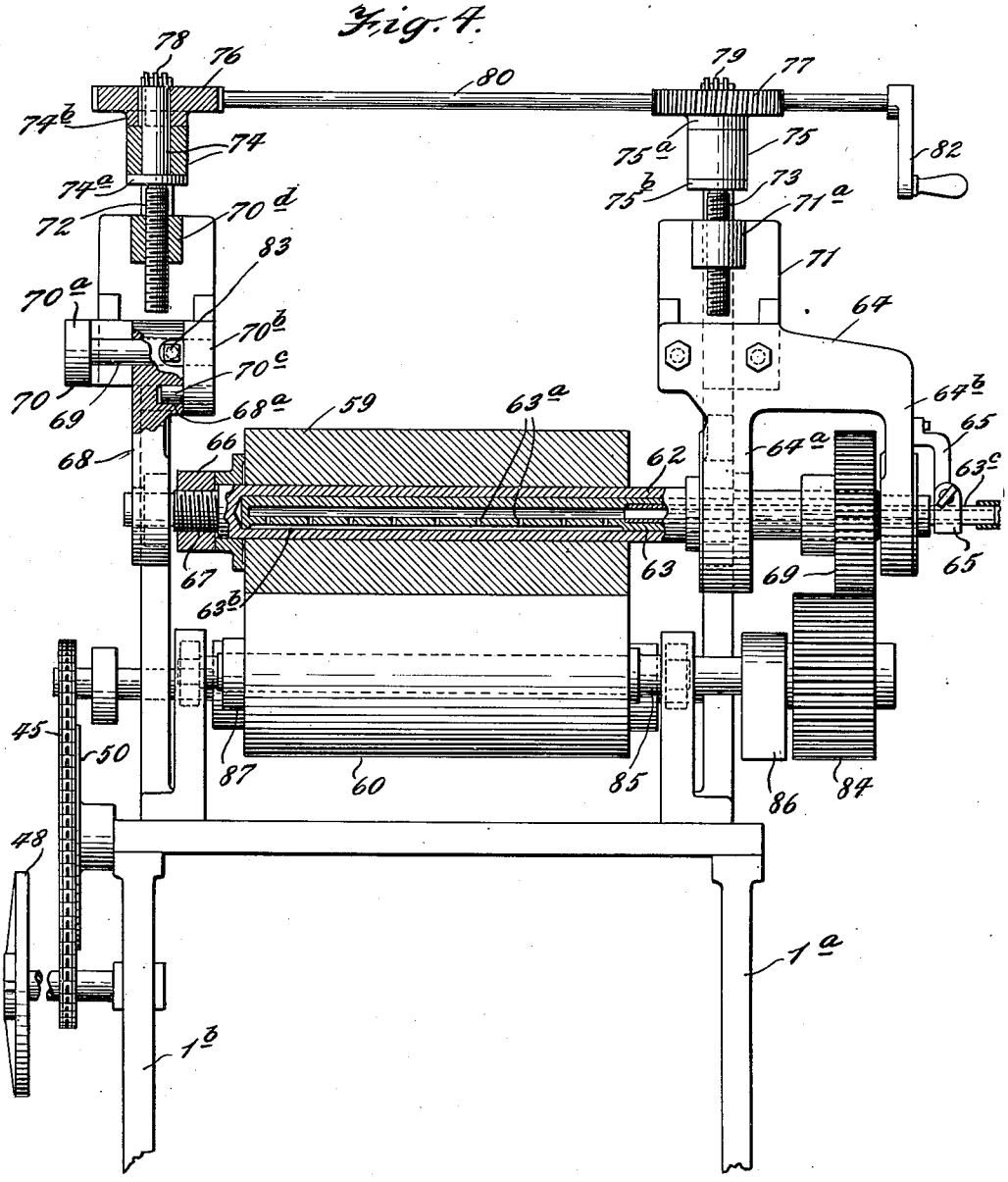
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MANUFACTURE OF PRINTED AND DIE CUT ARTICLES

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Fig. 4.



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MANUFACTURE OF PRINTED AND DIE CUT ARTICLES

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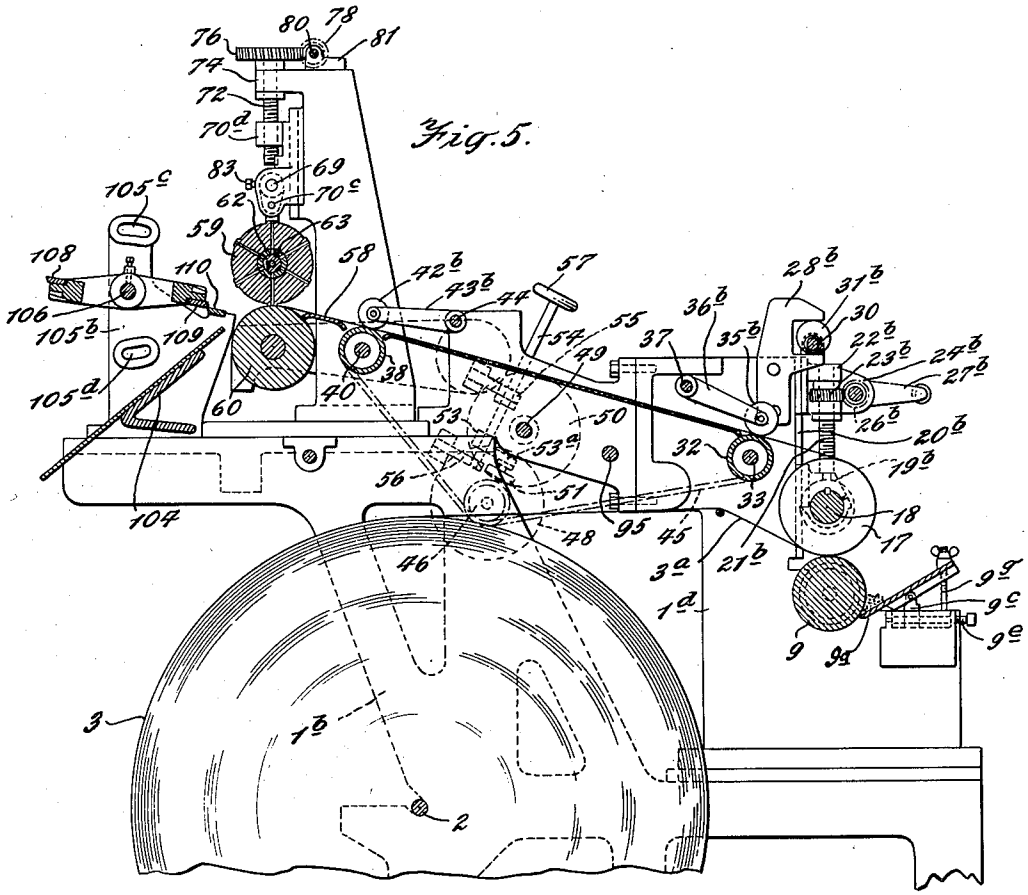


Fig. 5.

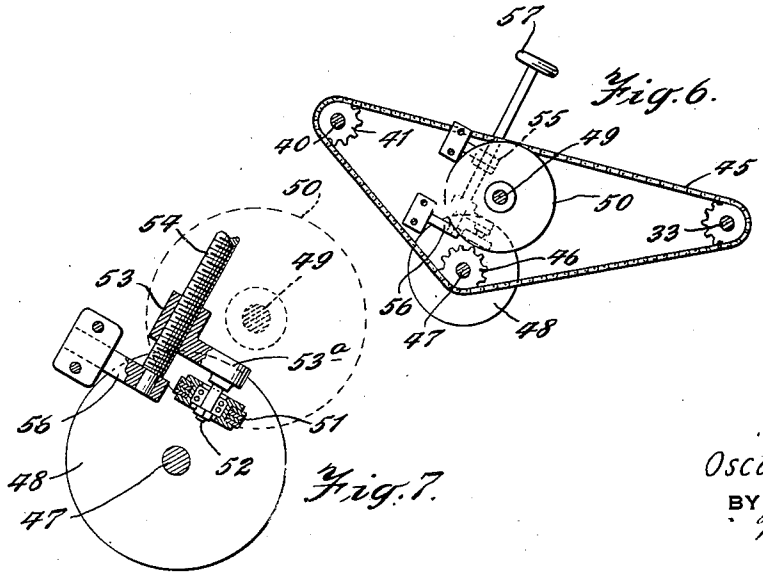


Fig. 6.

Fig. 7.

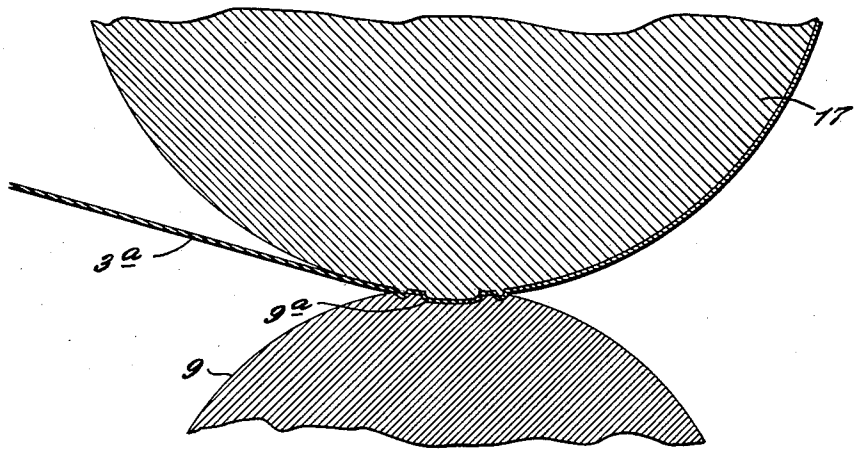
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MANUFACTURE OF PRINTED AND DIE CUT ARTICLES

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Fig. 8.



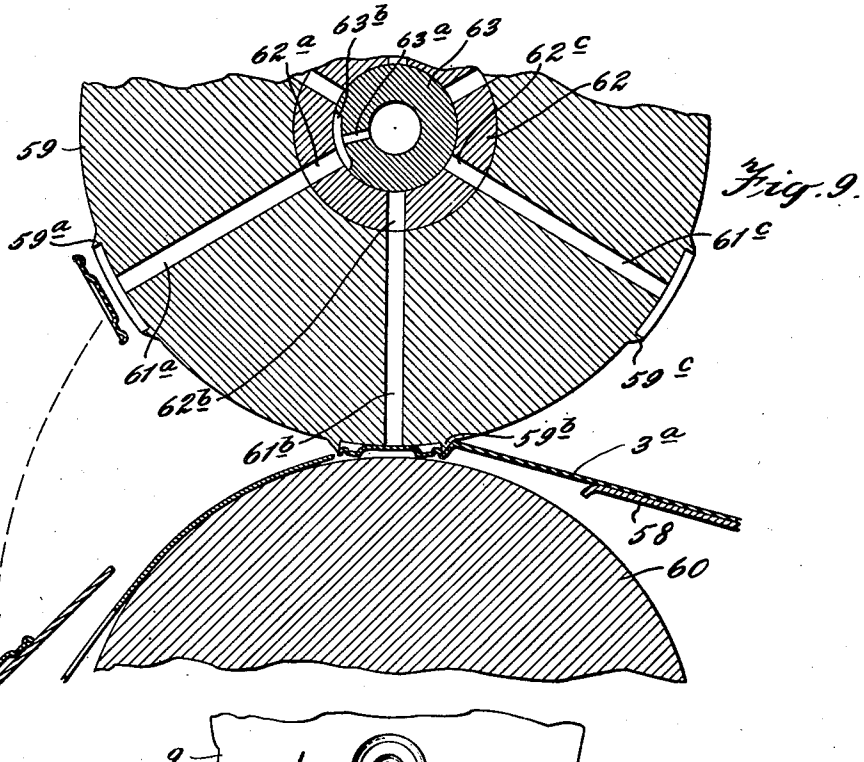


Fig. 9.

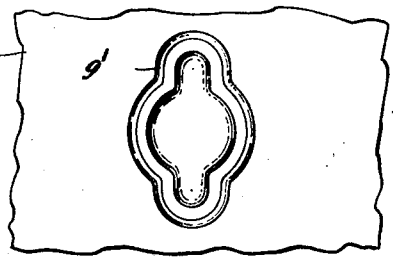


Fig. 10.

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Patented June 29, 1937 2,085,435

UNITED STATES PATENT OFFICE

2,085,435

MANUFACTURE OF PRINTED AND DIE CUT ARTICLES

Oscar Frederic Lohmann, Tenafly, N. J.

Application December 4, 1933, Serial No. 700,826

5 Claims. (Cl. 101—153)

The invention herein disclosed relates to the manufacture of printed, die-cut sheet material and to a machine for printing a design upon sheet material and cutting the printed design from the sheet material to carry out the manufacture of seals, box covers and the like.

Commonly, seals and the like are printed upon a continuous web of sheet material from which they are cut. Usually a seal press includes a reciprocating die which cuts the printed seal from the web, the web moving forwardly intermittently between successive cuts by the reciprocating die. The cutting die may include an embossing die so that the cutting and embossing are simultaneous operations. Such presses are bulky and slow in operation and it is an object of this invention to manufacture such articles continuously and economically and to provide a machine for carrying out the manufacture which is continuous in operation and economical to manufacture and operate.

In accordance with the invention, a continuously operating printing mechanism is utilized in conjunction with a continuously operating cutting mechanism. The cutting and printing mechanisms are synchronized so that a design printed upon a continuously moving web by the printing mechanism will be subsequently cut from the web by the continuously operating cutting mechanism. The printing and cutting mechanisms may be separated from each other so that the ink may dry between the printing and cutting mechanisms. In the machine of the invention, means are provided for varying the relation between the cutting and printing mechanisms in order to bring these mechanisms into exact synchronism when different designs are to be printed.

One machine which is utilized for, and embodies the invention is assembled upon a frame which supports a roll of paper, the printing mechanism at one end and the cutting mechanism at the other end. The printing mechanism is of the intaglio type for effecting raised printing and consists of a recessed die which is opposed by a resilient roll. This die is rotated by the power mechanism. The cutting mechanism includes a rotatably mounted cutting element and a rotatably mounted abutting element pressing against the cutting element. The cutting element consists of a roll having extending from the surface thereof knife edges arranged to outline the ultimate shape of the article. The cutting element and the die of the printing mechanism are geared together for synchronized operation through a gearing arrangement by which the relation between these two elements may be varied in order to bring them into exact synchronism. Feeding mechanism feeds a web of paper from a roll mounted on the frame continuously through the printing and cutting mechanisms. The printing mechanism prints the design and the cutting mechanism cuts the printed design from the web, both operating continuously.

Such a machine is illustrated in the accompanying drawings and described in detail below from which illustration and description a clearer understanding of the invention may be had.

In the drawings:

Fig. 1 is a side elevation of the machine;

Fig. 2 is a plan of the same;

Fig. 3 is an enlarged fragmentary end elevation illustrating the printing mechanism;

Fig. 4 is an enlarged fragmentary sectional end elevation illustrating the cutting mechanism;

Fig. 5 is a longitudinal sectional elevation;

Fig. 6 is a fragmentary elevation of the drive mechanism for driving the feeding mechanism;

Fig. 7 is an enlarged fragmentary sectional elevation of a portion thereof;

Fig. 8 is an enlarged fragmentary transverse sectional elevation of the printing die;

Fig. 9 is a fragmentary sectional elevation of the cutting element; and

Fig. 10 is a fragmentary plan of the printing die illustrating the design thereon.

The machine illustrated in the drawings includes a frame upon which the parts thereof are mounted. This frame includes a pair of spaced side frame members *1a* and *1b*. In each frame element there is provided, intermediate the top and bottom thereof and on the forward end, a groove which receives a shaft **2** upon which a roll of paper **3** is mounted. The end of the shaft **2** has a drum **4** thereon which extends on the outside of the frame element *1a*. The drum **4** is surrounded by a pair of semicircular brake bands *5a* and *5b* which are pivotally mounted on a pivot **6** secured to the frame element *1a*. The bands *5a* and *5b* have opposed flanges *5c* and *5d* respectively which are drawn together by a bolt **7** and a wing nut **8**. The two bands are drawn together with sufficient force to prevent the roll of paper **3** from rotating freely.

On the rear end of the machine the intaglio printing mechanism is mounted. This printing mechanism consists of a die **9** which is rotatably mounted on a pair of opposed centers *10a* and *10b* mounted on the auxiliary frame elements *1c* and *1d* vertically extending from the frame elements *1a* and *1b* and supported upon a plate *1e* extending between the frame members. The center *10a*

is mounted in a sleeve 11 which is rotatably mounted in a hub 12 formed on the frame element 1c. The sleeve 11 extends through the hub and has formed on the end thereof a gear 13. The center 10b is mounted in a sleeve 14 having a square thread cut in the outer surface thereof. The sleeve 14 extends through an internally threaded hub 15 on the frame element 1d and has formed on the outer end thereof a knurled hand-wheel 16. The threaded engagement between the hub 15 and the sleeve 14 permits the advancing and withdrawing of the center 10b to adjust the die on the centers or to remove the die and replace it with another having a different design thereon. The die 9 is of the usual type used in intaglio or raised printing. It has cut in the surface thereof a cavity 9' shaped in accordance with the design to be printed thereon and in operation, the die runs in a pool of ink, the reservoir for which is formed by a doctor blade 9a which presses against the surface of the die and wipes the surface of the die. The doctor blade is pivotally mounted on a pair of slidably mounted blocks 9b and 9c mounted respectively on extensions of the frame elements 1c and 1d. Each of the blocks 9b and 9c has an internally threaded opening therethrough which receives a threaded spindle, 9d and 9e, respectively, which is rotatably mounted in brackets extending from the extensions of the frame element but which is held stationary with respect to the frame member against longitudinal movement thereof. By means of handles on the ends of these threaded spindles, the doctor blade may be moved toward or away from the die. Bolts 9f and 9g are provided which extend through slots in the doctor blade on the opposite side of the pivots. Wing nuts on the bolts engage the doctor blade and rotate it about the pivots to force the doctor blade against the die.

The section of the die having the design thereon is opposed in the operation of the machine by a resilient roller 17 which is mounted upon the shaft 18. Commonly, the roll 17 is slidable along the shaft so as to be adjustable to any position on the die. The shaft 18 is journaled in bearing boxes 19a and 19b slidably mounted respectively on the frame elements 1c and 1d. The frame elements are provided with vertical faces 20a and 20b. The bearing boxes 19a and 19b have grooves formed therein which receive the vertical faces 20a and 20b. Extending from each bearing box and secured therein there is a threaded spindle which extends vertically from the bearing box. The bearing box 19a has a threaded spindle 21a extending therefrom and secured thereto and the bearing box 19b has the threaded spindle 21b extending therefrom. The spindle 21a extending vertically from the bearing box 21 passes through a bifurcated vertical hub 22a. The hub 22a is also slidably mounted upon the vertical face 20a. Between the arms of the hub 22a there is mounted about the spindle a worm gear 23a. The worm gear is internally threaded and the threads thereof engage the threads of the spindle 21a. The hub bracket 22a has extending therefrom a bracket 24a in which there is mounted a shaft 25a having a worm 26a thereon which meshes with a worm gear 23a. On the end of the shaft, there is mounted a handle 27a through which the shaft 25a can be manually rotated. Rotation of the shaft 25a effects the rotation of the worm gear 23a and thus vertical movement of the threaded spindle 20a. The bearing block 19b is mounted in the same way and it is independently adjustable through a handle 27b. Thus the bearing boxes 19a and 19b are independently adjustable in a vertical direction. This independent adjustment is provided for properly contacting the roller 17 with the die 9.

The bearing boxes may be also moved through a limited distance together. This movement is effected through the slidable mounting of the bifurcated hubs 22a and 22b. Extending from each frame element there is a bifurcated bracket, 28a and 28b. Extending through these brackets and journaled in bearing openings in extensions 29a and 29b of the bearing brackets 22a and 22b, which slide against the brackets 28a and 28b, there is a shaft 30. The shaft 30 carries a pair of cams 31a and 31b which are mounted between, and one against each of the bearing extensions 29a and 29b and which are received in the bifurcated brackets 28a and 28b. The cams are eccentrics and are of a diameter which is equal to the distance between the arms of the bifurcated brackets between which they are received. Thus upon rotating the shaft 30 and the cams 31a and 31b secured thereto the shaft 30 is moved vertically. The shaft may be rotated manually through a handle 30a secured on the end thereof. Since the hub brackets 22a and 22b are secured to the shaft through the bearing extensions 29a and 29b the hub brackets will be moved together vertically upon rotation of the shaft 30. While the bearing brackets 19a and 19b are independently adjustable in a vertical plane, the shaft adjustment through the handle 30a and the shaft 30 is provided for the purpose of quickly raising and lowering the roll 17 after the roll has been properly adjusted on the die, particularly when it is necessary to thread a web of paper through the machine.

A web of paper 3a from the roll 3 passes between the roll 17 and the die 9 and around the roll 17. Immediately behind the roll 17 there is a feed roller 32. The feed roller 32 is mounted on a shaft 33 that extends between and is journaled in the frame members 1c and 1d, the shaft extending through the frame member 1d and having a sprocket wheel 34 mounted on the outer end thereof. Cooperating with this feed roller there are a pair of rollers 35a and 35b which are mounted upon arms 36a and 36b that are pivotally mounted upon a rod 37 extending between and secured to the frame members 1c and 1d. The rolls 35a and 35b rest upon the roller 32. The web of paper passing from the roll 17 passes between the rollers 33a and 33b and the roll 32.

Extending between the feed roller 32 and another feed roller 38 adjacent the other end of the machine there is a plate 34 which supports the web of paper which passes between the two feed rollers. The feed roller 38 is mounted upon a shaft 40 which extends between the frame members 1a and 1b and is journaled therein. The shaft 40 extends through the frame member 1b and has mounted on the outer edge thereof a sprocket wheel 41. Cooperating with this feed roller there are also a pair of rollers 42a and 42b which are mounted respectively on the ends of arms 43a and 43b which are pivotally mounted on a rod 44 that extends between and is secured to the frame members 1a and 1b.

The feed rollers 32 and 38 are driven through a chain 45 which extends around the sprockets 34 and 41 and a drive sprocket 46. The drive sprocket 46 is mounted upon a shaft 47 which extends from the outer side of the frame element 1b. The drive sprocket 46 is secured to a disk

48 for rotation therewith which disk is also mounted upon the shaft 47. Mounted upon the end of a shaft 49 which extends through the frame member 1b there is a disk 50. The shaft 49 is rotated through a prime mover such, for example, as a motor to which it may be directly connected or to which it may be connected through a train of gears. Rotation of the shaft 49 rotates the disk 50 which is secured thereto. Between the disks 48 and 50 there is mounted a friction roller 51. The friction roller 51 is rotatably mounted upon a spindle 52 which extends from an arm 53a of a bracket 53. The bracket 53 is internally threaded and is received upon a threaded spindle 54 which is journaled in spaced bearing brackets 55 and 56 mounted on the side of the frame member 1b, the bearing 56 being a thrust bearing. The spindle 54 is inclined to the vertical and extends between the planes of the two disks parallel to a line joining the axes of the shafts 47 and 49. A hand-wheel 57 on the end of the spindle is provided for manual rotation of the spindle. Manual rotation of the spindle moves the friction wheel 51 which is rotatably mounted on the spindle 52 transverse to the axes of the disks 48 and 50. The disk 48 is driven from the disk 50 through the friction wheel 51 which secures both disks. Movement of the friction wheel 51 transversely to the line joining the shafts varies the relation between the two disks and thus the relation between the speed of rotation of the shaft 47 and the shaft 49. In this way the movement of the web of paper through the machine may be varied in order to coordinate the movement with the printing and feeding mechanism.

From the feed roll 38 the web of paper passes on to a plate 58 and from the plate 58 between a rotatably mounted cutting element 59 and a rotatably mounted abutment 60 which abuts against the cutting element 59. The rotating cutting element is cylindrical in shape. Extending from the surface of this cutting element there are a series of cutting dies 59a, 59b and 59c as shown in Fig. 9. These cutting dies each consists of a raised knife edge extending from the surface of the element. The knife edges outline the design which is printed by the printing mechanism. A series of radial holes 61a, 61b and 61c extend between the center of these knives and the interior of the cutting element and form air passages. The abutment roller 60 may be of either hard or soft material but in operation the cutting element and the roller 60 are pressed together with sufficient pressure for the knife edges to penetrate the material which is passing through the machine. The cutting element 59 is mounted upon a cylinder 62. The cylinder 62 has a series of radial holes 62a, 62b, 62c extending between the outer and inner surfaces and connecting with the holes 61a, 61b and 61c through the cutting element. The cylinder 62 is mounted upon a shaft 63. The shaft 63 is hollow and has a series of radial openings 63a extending therethrough and connecting the interior of the shaft with circumferential grooves 63b. In the position shown in Fig. 9 it will be observed that the air passages 63a, 62a and 61a are in alignment and the knife 59a is connected to the interior of the shaft 63. Air which is supplied to the shaft under pressure is thus connected to the center of the cutting element and ejects from the cutting element the piece cut from the web of the material. The arrangement of the grooves and passages is such that as each knife section moves off the roll 60 and into a position corresponding to the position of the knife 59a as shown in Fig. 9, the air under pressure is delivered to the center of the knife section. The air under pressure is supplied by a compressor (not shown) through an air tube to a tube 63c which connects with the interior of the shaft 63.

One end of the cylinder 62 extends through and is journaled in the arms 64a and 64b of a bifurcated bracket 64. The shaft 63 extends through the cylinder 62 and extends beyond the arm 64b of the bracket 64. A bracket 65 secured to the arms 64b of the bracket 64 engages a tube 63c which extends from the shaft 63 and holds it stationary. The cylinder 62 at the end opposite to the end received in the bracket 64 is received in a hollow fixture 66 which is threaded on to a stud 67 that is journaled in a bracket. The sleeve 62 has mounted thereon between the arms 64a and 64b of the bracket 64 a gear 69. The stud 67 is journaled in a bracket 68 which is pivotally mounted upon a stub shaft 69 that extends between the arms 70a and 70b of a bifurcated bracket 70. The bracket 70 is slidably mounted upon the edge of the frame member. The bracket 64 is also secured to a slidably mounted bracket 71 which is also slidably mounted upon the edge of the frame member. The bracket 70 carries an internally threaded hub 70d and the bracket 71 carries an internally threaded hub 71a. The hubs 70d and 71a respectively receive threaded spindles 72 and 73 which engage the internal threads of the hub. These spindles are rotatably mounted in hubs 74 and 75 formed on the upper end of the frame member. Thrust collars 74a and 74b prevent vertical movement of the spindle 72. Similar thrust collars 75a and 75b one on each end of the hub 75 prevent vertical movement of the spindle 73. On the upper end of the spindle 72 there is mounted a worm gear 76 and on the upper end of the spindle 73 there is mounted a worm gear 77. The worm gear 76 is engaged by a worm 78 and the worm gear 77 is engaged by a worm 79. The worms 78 and 79 are mounted upon a shaft 80 which is journaled in bearing brackets 81 on top of the frame members. The shaft 80 extends beyond the bearing boxes and has fixed on the end thereof a handle 82 through which the shaft may be manually rotated. Upon rotation of the shaft 82 the worms 78 and 79 are rotated and the worm gears 76 and 77 are rotated, rotating the spindles 72 and 73. Upon rotation, the spindles 72 and 73 move the brackets 70 and 71 vertically and thus move the cutting element vertically into or out of engagement with the abutment roller 60. The cutting element may be removed and replaced by sliding the bracket arm 68 along the shaft 69. The bracket arm 68 has a socket 68a therein which receives a pin 70c extending from the arm 70b of the bracket 71 when the arm 69 is in the position shown in Fig. 4, that is, the operative position. The arm 68 is held in any position on the shaft, particularly in the position shown in Fig. 4, by a set screw 83. Upon releasing this set screw the arm may be slid along the shaft and thus the stud 67 released. When the stud 67 is released the arm 69 may be rotated about the shaft 70 and the cutting element 59 may be removed and replaced.

The gear 69 on the sleeve 62 meshes with a gear 84 mounted upon the end of a shaft 85 on which the abutment roller 60 is mounted. The shaft 85 is journaled in a bracket 86. The abutment roller 60 is held positioned on the shaft by a

collar 87. The abutment roller 60 is of the same diameter as the cutting element 59 and when the cutting element 59 is replaced by another of a different diameter the abutment roll 60 is also replaced with one of a different diameter. The bracket 86 is a pivotally mounted bracket. This bracket is mounted on a shaft 88 which extends from the frame member. The shaft 88 also carries rotatably mounted thereon a gear 89. The gear 89 meshes with a gear 90 that is mounted on a shaft 91 extending from the bracket. The gear 90 also meshes with the gear 84 so that there is a movement-transmission connection between the gears 89 and 84. The distribution of the weight on the bracket 86 is such that the gear 84 is urged against the gear 69. The gear 89 also meshes with a gear 92 that is mounted on the shaft 49 which as heretofore described extends through the frame elements. The shaft 49 carries between the frame elements a helical gear 93 which meshes with another helical gear 94 mounted upon a shaft 95. The shaft 95 is journaled in and extends through the frame elements and is slidably mounted in the frame elements. The end of the shaft 95 extends through, and is journaled in the frame element 1b and an externally threaded hub 96 on the frame. A sleeve 97 having an internally threaded section 97a which engages the threads on the hub 96, a reduced section 97b in which a reduced end 95a of the shaft is rotatably mounted and a hand-wheel 97c is secured to the shaft against longitudinal movement with respect thereto by a thrust collar 98. The sleeve 96 is provided with a hand-wheel 97c through which the sleeve may be manually rotated through the hand-wheel 97c. Upon rotation, the externally threaded sleeve 96 is moved longitudinally and effects longitudinal movement of the shaft 95. Longitudinal movement of the shaft 95 changes the relative rotational relation of the shafts 49 and 95 by virtue of the helical gears 93 and 94.

On the end of the shaft 94 extending through the frame element 1a there is mounted a gear 99 which meshes with a gear 100 rotatably mounted on a shaft 101 extending from the frame element. Gear 100 meshes with a gear 102 that is mounted upon a stub shaft 103 and gear 102 meshes with the gear 13 on the sleeve 11 which carries the center 10 upon which the die 9 is mounted and which meshes with a gear on the shaft 18 carrying the roll 17.

It will thus be apparent that the die and the cutting element are connected together through the train of gears just described. However, in that train of gears there are the helical gears through which the relation between the die and the cutting element may be varied in order to bring the die and the cutting element into exact synchronism. This synchronism of the die and cutting element is necessary in order that the knives of the cutting element will exactly surround the design printed by the die. The die is of the type used in intaglio printing so that the ink is raised giving the effect of embossing. When seals are printed with this intaglio printing, they appear as embossed seals.

Following the cutting element there is a supporting plate 104 for supporting the web of paper as it passes from the machine. This supporting plate is inclined and may be arranged so that the seals are delivered into a suitable receptacle. Mounted on the frame and extending therefrom there are a pair of brackets 105a and 105b. These brackets have a shaft 106 extending therebetween and journaled therein. On the shaft there is mounted a cutter 107 having a pair of cutting knives 108 and 109. These knives cooperate with a cutting blade 110 also extending between the brackets 105a and 105b. When rectangular designs are printed this latter cutter is preferably used. The width of the paper is the width of the design and the knife 107 is rotated at such speed as to cut successive sections of the paper in accordance with the length of the design.

The knife is driven through the shaft 106 to which it is secured by set screw 107. The shaft 106 extends through the side frame member and has assembled thereon a gear 111. A bracket arm 112 is pivotally mounted on the shaft 106 and extends radially thereof. This bracket arm 112 is provided with a slot 112a which receives a stub shaft 113 on which a gear 114 is mounted. The bracket 112 has a pair of pins 115a and 115b which are received in slots 105c and 105d in the bracket arm 105b. These pins 115a and 115b limit the amount of rotational movement of the arm 112 about the shaft 106. The slot 112a permits adjustment of the shaft 113 in accordance with the gear secured to the shaft of the cutting element with which gear the gear 114 meshes in the operative position. When it is desired to use the knife, the web of paper is brought over the blade 110. When the knife is not in use, the arm 112 is rotated about the shaft 106 so that the gears 114 and 69 are disengaged.

It is to be noted that the cutting element is at a higher elevation than the die 9 so that the web of paper approaches the nip formed by the cutting element and the abutting roller at an angle.

From the above description of the machine illustrated in the drawings, the manner in which the articles are manufactured will be apparent and it will be observed that the machine is continuous in operation and is capable of producing seals or other printed designs with raised printing which simulates embossed designs in continuous operation. The several parts which necessarily are coordinated for the proper operation of the machine are each adjustable, that is, the speed of operation of the feeding mechanism and the relation between the cutting element and the printing die.

It will be obvious that various changes may be made by those skilled in the art in the details of the embodiment illustrated in the drawings and described above within the principle and scope of the invention as expressed in the appended claims.

I claim:

1. In a printing machine, the combination comprising intaglio printing means for printing a succession of raised designs upon a continuously moving web, cutting means having the configuration of the printed design spaced from said printing means for cutting the printed portions from the web, and coordinating means for synchronizing the action of the printing and cutting means.

2. In a printing machine, the combination comprising intaglio printing means for printing a succession of raised designs upon a continuously moving web, cutting means spaced from said printing means for cutting the printed portions from the web, spaced support and feed rollers between said printing and cutting means for supporting and feeding the web, variable

speed driving means for said support and feed rollers, and coordinating means for synchronizing the action of the printing and cutting means.

3. In a printing machine, the combination comprising intaglio printing means for printing a succession of raised designs upon a continuously moving web, cutting means spaced from said printing means for cutting the printed portion from the web, spaced support and feed rollers between said printing and cutting means for supporting and feeding the web, variable speed driving means for said support and feed rollers, and coordinating means for synchronizing the action of the printing and cutting means including means for varying the relation between the printing means and the cutting element.

4. The method for making seals having raised characters which method comprises printing a raised design successively on the surface of a continuously moving web of paper with an intaglio printing mechanism, allowing the printed design to set, and die-cutting the successive printed sections from the continuously moving web.

5. In a printing machine, the combination comprising intaglio printing means for printing a succession of raised designs upon a continuously moving web, cutting means having the configuration of the printed design spaced from said printing means for cutting the printed portion from the web, driving means for said printing and cutting means, and coordinating means for synchronizing the action of the printing and cutting means.

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