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H. G. KELLY

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PERFORATING MACHINE

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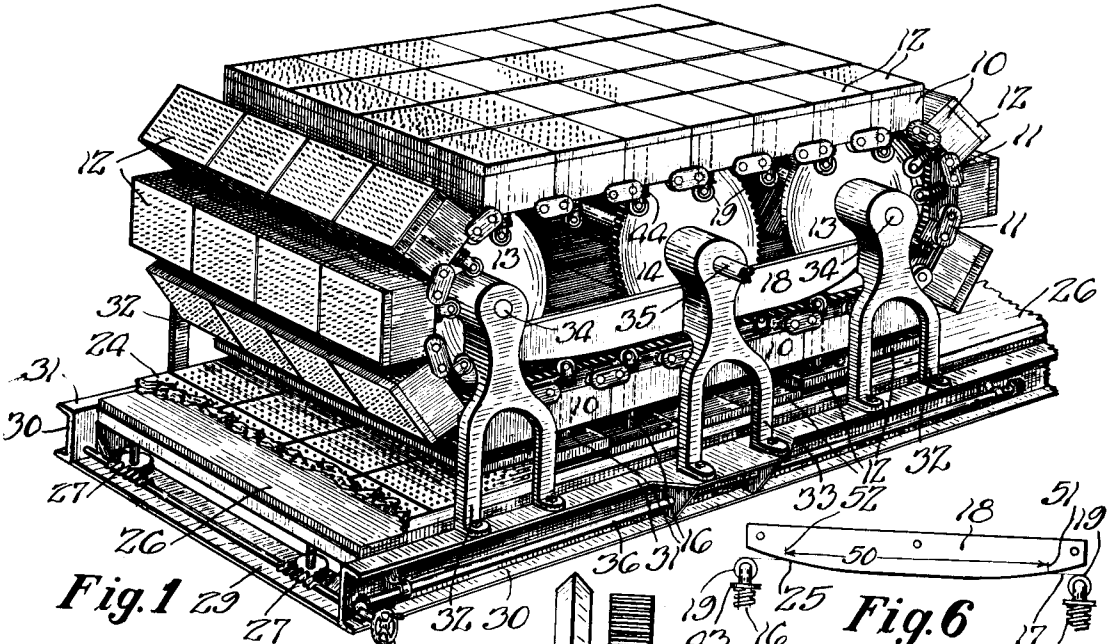


Fig. 1

Fig. 6

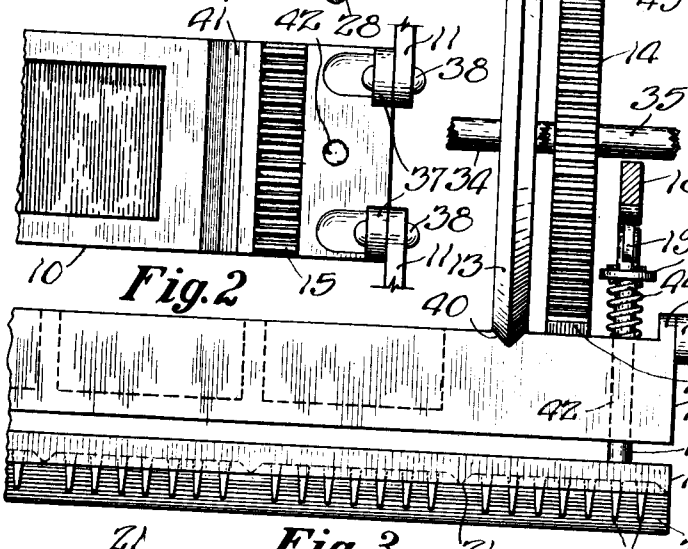


Fig. 2



Fig. 3

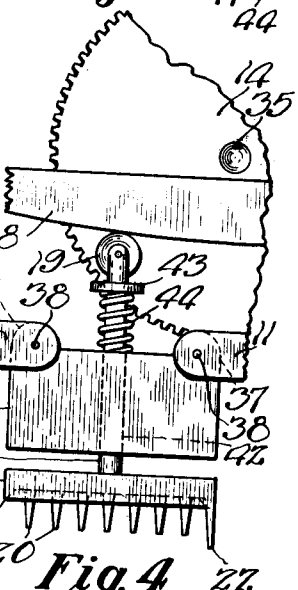


Fig. 4

Fig. 5

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PERFORATING MACHINE

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2 Claims. (Cl. 101—4)

The present invention has to do with a perforating or marking device and relates particularly to such a device adapted to travel with a moving sheet of material to perforate, incise, indent or mark such sheet.

The invention has for one of its objects a means for perpendicularly perforating, indenting or incising a sheet of material in motion, without interrupting the continuous movement of such sheet, or distorting the perpendicular perforations, indentations and incisions. This result is attained by imparting to a series of sleeve-blocks and associated die-plates, a motion similar and parallel to that of the sheet material, during which parallel motion die-plates are successively depressed by a cam action so that prongs, projections or knives mounted upon the die-plates are in turn pressed perpendicularly into the moving sheet of material and withdrawn perpendicularly from such moving material. Other objects of the invention will later appear.

The invention consists of a novel and useful construction, combination and arrangement of parts as described herein and later claimed, one form only of the invention being illustrated in the accompanying single sheet of drawing, wherein:

Figure 1 is a perspective view of a complete machine embodying the subject matter of the invention;

Figure 2 is a fragmentary plan view of the upper face of one of the sleeve blocks in its position when moving in the lower plane of Figure 1;

Figure 3 is a fragmentary view in elevation disclosing the association and inter-relation of the sleeve-block, rack, driving gear, guiding wheels, prongs, die-plates, spindles and cam when moving in the lower plane of Figure 1;

Figure 4 is an end elevation of the several parts disclosed in Figure 3;

Figure 5 is a fragmentary plan view of the lower face of a die-plate when moving in the lower plane showing the arrangement of the prongs, knives and projections upon the lower face of such die-plate; and

Figure 6 is a schematic representation of the cam which operates upon the die-plates to cause them to penetrate material going through the machine.

Like reference characters are used to designate similar parts in the drawing and in the description of the invention which follows.

In Figure 1, there are shown a number of sleeve-blocks 10 joined together to form an endless chain by means of flexible links 11 at their inner adjacent corners. Thus when the blocks are actuated by an outside force, said blocks and the die-plates 12 associated therewith are capable of moving around the outer segments of two sets of guiding wheels 13 located a distance apart, and in straight parallel planes between these wheels. Driving gear wheels 14 mesh with racks 15 (or to chains attached in a line to the inner faces of the sleeve blocks, not shown) provide continuous motion to the series of sleeve blocks 10 and associated die-plates 12 when the gear wheel 14 is actuated by a prime mover. The die-plates 12 are in close contact with a sleeve block 10 while the sleeve blocks are moving around either set of guiding wheels 13 or in the upper plane therebetween, but these plates 12 are depressed and pushed from the sleeve-block 10 when, in the progress of the sleeve blocks 10 along the lower plane of its travel, spindles 16 at each side of the die-plates 12 and extending through sleeve blocks 10 are successively brought into contact with one end of the under sides 17 of the cams 18.

As the spindle 16 travels therealong with its roller bearing 19 in engagement with the lower periphery of cam 18, plates 12 are forced downwardly so that the prongs 20, projections 21 and knives 22 of each die-plate 12 are pressed perpendicularly into the body of a sheet of material 24, which because of the penetration thereinto of the prongs 20, or because of the application of a synchronized roller (not shown) must move in a parallel direction with the blocks 10 at the same rate of speed as said blocks.

The prongs 20, knives 22 and projections 21, of each die-plate 12 are in turn withdrawn perpendicularly from the body of the material 24 as the downward pressure is released when the spindles 16 of each die-plate 12 successively engage with the upward sloping under side 25 of the cam 18, while the die-plate 12 and bearing-block 10 are still moving along a plane parallel to the face of the material 24, before that plane motion is changed to circular motion when the contact of the bearing-block 10 with the circumference of the right hand guiding wheel 13 changes that plane-motion into circular motion.

A bed 26 over which the sheet of material 24 moves, adjustable in height, by gears 27 operated by a hand wheel 28, regulates the depth of the penetration of the prongs 20, knives 22 and projections 21 of the die-plates 12 into the body of the material 24.

For convenience, the machine may be formed upon a plate 29 having channel irons 30 at the side. The rod or shaft operating gears 27 are jour-

nalled in such channel irons, while the gears in plate 26 are journalled in said plate and plate 29, upon the upper flange 31 of channel irons 30, there are mounted brackets 32 and 33, the former journalling the shafts 34 of the guide wheels 13, and the latter the shaft 35 of the gear wheel 14. The several gears 27 may be arranged to operate conjointly by a shaft 36 mounted in one of channel irons 30 and controlled by a single hand wheel 28.

In Figures 2, 3, and 4, there are shown in fragmentary plan, elevation and end view, semicircular lugs 37 associated with the internal corners of each bearing-block. These are bored at the line of the upper edge of the block 10 to receive the pin 38 of the flexible link 11 which joins adjacent blocks 10 in close contact when such blocks are moving along a plane and permitting the outer portions of adjacent blocks 10 to separate when the blocks are moving around the circumference of the guiding wheels 13.

Said Figures 2, 3 and 4 also disclose the sections of racks 15 on each of the bearing blocks 10 which sections form two continuous tracks cooperating with the driving gears 14 to transmit the motion imparted thereto by a prime mover (not shown) to the chain of connected bearing blocks 10 and their associated die-plates 12.

There may be one of two transverse grooves 40 in each bearing block 10, which form one or two continuous groove tracks receiving the flanges 41 of one of two sets of two wheels 13 each, revolving freely but mounted to prevent axial movement on the axles 34 located at the ends of the machine. The wheels 13 control the essential plane and circular motions of the blocks 10 and by their flanges 41 prevent any lateral motion of the blocks 10.

At each end of blocks 10, there are holes 42 bored vertically through each bearing block 10 acting as a sleeve bearing to contain, in freely slidable contact, the two spindles 16 secured to the die-plate 12, one near each of its two ends and on the median line thereof. When the spindles 16 of a die-plate 12 are inserted within the sleeves 42 of a bearing-block 10 as shown in Figures 3 and 4, the slidable contact between spindle and sleeve, permits of free separation of the die-plate 12 from its associated sleeve-block 10, but maintains, at every degree of separation, the horizontal surfaces of the die-plate and bearing block in parallel planes, and prevents any lateral displacement of the die-plate 12 from its vertical relation to the associated bearing block 10.

In both of Figures 3 and 4, the die-plate 12 is in position it occupies when moving along the lower plane separated from bearing block 10. Each spindle 16 within the sleeve 42 is furnished with a collar 43 near its free end, limiting the upward thrust of a coil spring 44 surrounding the spindle 16 and contacting at its other end with an upper surface 10 of a bearing block. The roller bearing 19 at the end of the spindle 16 is generally disposed between a bifurcated end on the spindle and is employed to provide a relatively frictionless contact with the under surface of the cam 18. The thrust of the compressed coil spring 44 against the collar 43 of the spindle 16 and an upper surface of the bearing block 10, maintains the close contact of the adjacent surfaces of the die-plate 12 and the bearing block 10 during the travel of each bearing block and its associated die-plate 12 around the guiding wheels 13 and along the upper plane between the wheels, during which no contact is made between the spindles 16 of the die-plate 12 and the surface of the cam 18.

During the travel of the bearing block 10 and its associated die-plate 12 in the lower plane of the machine, the roller bearings 19 of the spindles 16 of each die-plate 12 successively come into contact with the downward sloping under surfaces 17 of the two cams 18, whereby the die-plate 12 is depressed away from its associated bearing block 10 and pressed vertically into the body of the horizontal sheet of material 24 underneath, the prongs 20 remaining therein during part of the horizontal progress of the die-plate 12, and being vertically withdrawn as the spindles 16 of each die-plate 12 in turn contact with the upward-sloping under sides 25 of the other end of the cam 18 and before the completion of the horizontal travel of the bearing block 10 and the die-plates 12.

The prongs 20, projections 21 and knives 22 extend downward from the lower face of the die-plate 12. One knife 22 is shown extending lower than the prongs 20, to permit the sheet being completely severed by the knife 22, while perforations may be made which extend only partly through the material, when so desired. Such a severing knife 22 may be attached to one or more of the die-plates 12, and the prongs 20, projections 21 or knives 22 may be used separately, or in any combination, to produce any amount of perforation, or any design desired.

One of the two exactly similar cams 18 mounted in parallel position on either side of the machine is shown in Figure 6. The path of travel of the spindles 16 is along the lower plane of the cam 18 and both cams are spaced the same distance from the bed 26 on which the material 24 rests and travels, the distance 50 between the point of contact 51 between the horizontally moving spindle 16 with the downward sloping, under side 17 of the cam, and the point 52 at which the spindle 16 loses contact with the upward sloping under side 25 of the cam, is less than the distance between the points of tangency of the plane of travel. The lower surface of the cam 18 is shown as horizontal between the lowest point of the downward slope 17 and the lowest point of the upward slope 25. The vertical distance between the point of contact 51 of the spindle with the cam 18 and the lowest point of the cam is greater than the depth of penetration of the prongs 20 or knives 22 to permit their clearance of the sheet 24 when not depressed by the contact of spindle 16 with cam 18.

It will be seen that the penetration of the prongs 20, knives 22 and projections 21 into the body of the sheet of material 24 is accomplished while the die-plates 12 are moving in a horizontal plane parallel and at the same rate of speed as the movement of the sheet of material whereby this penetration is made and withdrawn perpendicularly to the sheet of material 24 without interrupting the motion of the sheet or distorting the penetration by any other than a truly perpendicular movement.

What is new, and is claimed as the invention herein, is:—

1. A means of indenting a flat sheet of material to provide indentations normal to the face thereof, comprising a series of die-plates having projections thereon, a series of flexibly connected blocks, each of said die-plates being slidably associated with one of said blocks, a stationary elongated base to receive material and

over which such material may be moved, each of said die-plates in turn being adapted to move in a plane adjacent and parallel to said base substantially its entire length, means for moving said die-plates successively away from its associated bearing block to force the projections thereon to extend perpendicularly into the body of material on said base but not therethrough, and means on said bearing blocks for successively withdrawing said die-plates from the material on said base and with said projections normal thereto.

2. That process of impressing a sheet of material with a series of impression plates which comprises the steps of moving a sheet of material over a supported plane concurrently moving the plates at the same speed and in parallelism therewith, and advancing and retracting the impression plate relative to such material and partly therethrough while so moving.

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