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DIE STAMPING AND PRINTING METHODS AND APPARATUS

Filed March 2, 1961

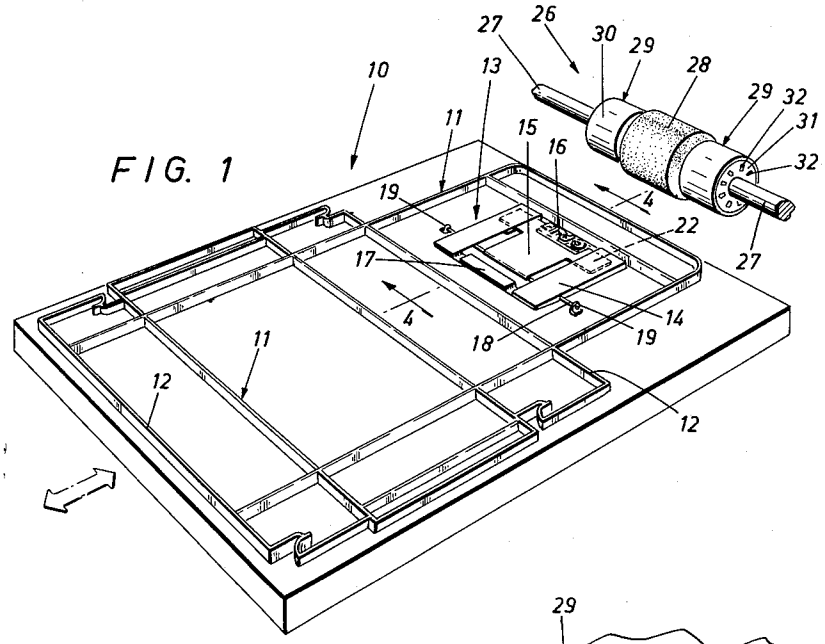


FIG. 1

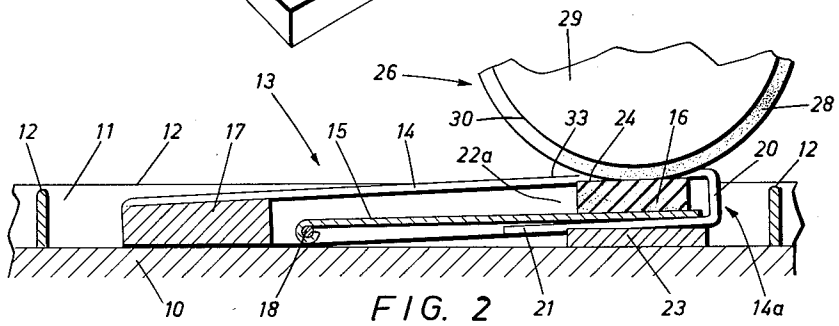


FIG. 2

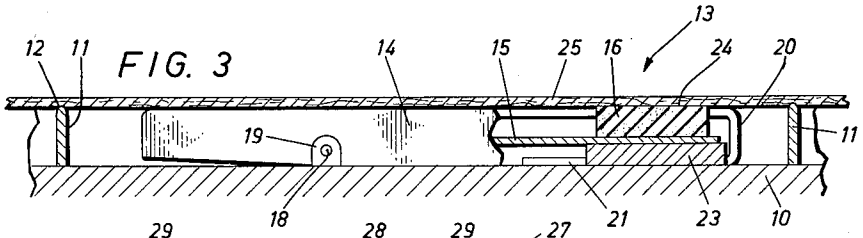


FIG. 3

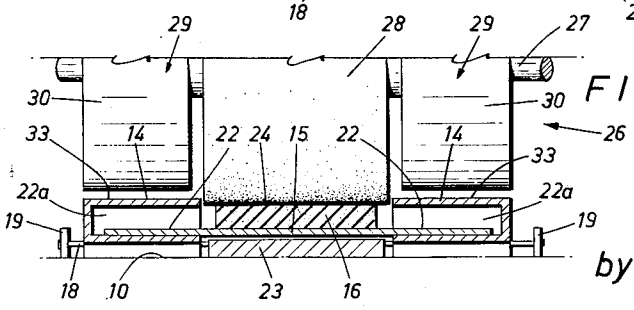


FIG. 4

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DIE STAMPING AND PRINTING METHODS AND APPARATUS

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This invention relates to new and useful methods and apparatus to perform the combined functions of die stamping and printing. More particularly, this invention relates to methods and apparatus for simultaneously performing the operations of cutting, creasing and/or perforating and printing. Still more particularly, this invention relates to methods and apparatus for cutting, perforating and/or creasing sheets from which cardboard cartons subsequently may be formed, the apparatus employing a magnetically actuated printing device to permit the apparatus to perform the functions of cutting, perforating and/or creasing and printing, these functions being carried out simultaneously.

In the manufacture of devices such as cardboard carton blanks according to well established prior art methods, a die plate and back-up means in the form of a roller is provided. The die plate has upstanding from its upper surface a plurality of cutting, creasing and/or perforating members (herein called stamping members) in the form of thin, steel blades. The die plate is reciprocated back and forth along a straight line path. The back-up roller is positioned above the die plate at a cutting, creasing and/or perforating position. Cardboard sheets are individually fed to and picked up by the back-up roller. The back-up roller is movable up and down to a slight extent and is rotated at such a speed that its periphery, and the cardboard sheet thereon, travel at the same speed as the die plate on its forward stroke. As the die plate is executing its forward stroke, the back-up roller is lowered, and the cardboard carried thereon is forced against and rolls over the cutting, creasing and/or perforating edges of the stamping members on the die plate. At the completion of the forward stroke, the cut, creased and/or perforated blank formed as aforementioned is removed from the apparatus. The die plate then makes a quick return to its back position, and the operation is repeated. The aforementioned sequence of operations and the apparatus for performing the same, which may be a printing press, are well known and have been in use for many years.

In the past, when it has been desired to print material on the cardboard blanks so formed, this commonly has been done in a completely separate operation, and by another machine. This, of course, is costly because of the extra time involved, and also because two machines are required. It would be obviously desirable, therefore, to be able to perform simultaneously and with one machine the combined operations of cutting, creasing, perforating and printing.

The primary object of my invention is to provide methods and apparatus which permit the operations of stamping and printing to be performed simultaneously.

It should be noted that "stamping," as the term is used herein, refers to the operations of cutting, creasing or perforating, or any combination of these, and a "stamping member" is the device directly responsible for the aforementioned operations.

I fully realize that apparatus has been employed in the past to permit the operations of stamping and printing to be performed simultaneously. Such apparatus, however, is not practical and suffers from numerous disadvantages. The type of apparatus to which I refer employs the reciprocating die plate and back-up means as aforementioned, but also includes a printing plate or member

securely mounted on the upper surface of the die plate and an ink applying roller. The printing plate has a printing surface which is just below the stamping edges of the stamping members.

It should be noted at this point that while it would be most desirable from the ink applying point of view to have the printing surface of the printing member substantially above the level of the stamping edges, in practice this can not be done, as a very blurred impression of the characters on the printing member would appear on the cardboard blanks when creasing, cutting, perforating and printing were effected, this blurred effect resulting from the compression of the printing plate or member against the cardboard by the back-up means. The ink applying roller is located at an ink applying position which is at the rear of the stroke of the die plate. The roller is usually rubber coated and has a rubber, ink applying surface which is about level with the printing surface of the printing plate. It will be appreciated that generally there are stamping edges positioned between the printing plate and the rear of the die plate. Thus, when the die plate is reciprocated to the ink applying position, so that ink may be applied from the ink applying surface of the roller to the printing surface of the printing plate or member, the ink applying roller contacts the stamping edges, applying ink thereto. When cutting, creasing, perforating and printing are carried out in conjunction with the back-up means, ink appears at the creased, perforated and cut lines on the cardboard blank. In many cases this is not acceptable. This problem has been obviated by making cuts in the rubber surface of the ink applying roller, the cuts corresponding to the positions of the stamping edges of the die plate. This obviously is not practical, since usually a new inking roller must be provided each time the die plate is changed. Moreover, it may not be possible to so cut the roller where there are large numbers of stamping edges and/or more than one printing plate per die plate to be inked.

Accordingly, it is an object of my invention to provide apparatus which simultaneously performs stamping and printing operations, printing being effected only on that part of the object where it is desired, no ink marks appearing on creases, perforation lines or cuts.

It is a further object of my invention to provide die stamping and printing apparatus which permits the same inking roller to be used with die plates having any configuration of stamping edges, the roller not being cut in any way.

Yet another object of my invention is to provide die stamping and printing apparatus having a magnetically actuated printing device.

In brief, a preferred embodiment of die stamping and printing apparatus constructed in accordance with my invention comprises a die plate adapted to be reciprocated back and forth between a combined stamping and printing position and an ink applying position. The die plate has an upper surface with stamping members extending upwardly therefrom, the stamping members having upper edges located above the upper surface. A printing device, including a printing member having a printing surface, is carried by the die plate, the printing device being mounted for limited up and down movement with respect to the upper surface of the die plate, the printing surface of the printing member being above this upper surface. Ink applying means having an ink applying surface are positioned at the ink applying position, so that when the die plate is reciprocated under the ink applying means, at least some of the stamping members pass under the ink applying means, the ink applying surface of the ink applying means being above these last mentioned stamping members. Means are provided for establishing magnetic attraction between the ink apply-

ing means and the printing device, whereby, at the ink applying position, the printing member is raised into contact with the ink applying surface, and ink is applied to the printing surface of the printing member.

Other objects and advantages of my invention, or the manner in which the foregoing objects are achieved and the foregoing advantages are obtained, will become apparent from the following detailed disclosure, when taken in conjunction with the appended drawings, in which:

FIGURE 1 is a perspective view of one embodiment of my invention;

FIGURES 2 and 3 are sections taken along the line 2—2 in FIGURE 1, FIGURE 2 showing the apparatus at the ink applying position, and FIGURE 3 showing it at the combined stamping and printing position; and

FIGURE 4 is a front elevation of part of the apparatus seen in FIGURE 1.

Referring now to the drawings, I have shown a die plate 10 which is adapted to be reciprocated back and forth in a straight line path as indicated by the arrows. As aforementioned, the reciprocating mechanism is well known in the prior art and hence is not illustrated. Adjacent the left hand end of its path in FIGURE 1, die plate 10 is in a printing and stamping position. Adjacent the right hand, it is in an ink applying position.

Upstanding from die plate 10 are metal stamping members 11 which are firmly secured to the die plate. Stamping members 11 have upper stamping edges 12 which may be cutting, creasing or perforating edges, or a combination of these. The edges 12 of the outer ones of stamping members 11 are, of course, cutting edges. In FIGURE 1 stamping members 11 are arranged so as to permit the cutting out from a cardboard sheet of a box blank from which a box may subsequently be formed.

Positioned on the upper surface of die plate 10, and surrounded by stamping members 11, is a printing device 13. This printing device comprises a holder 14, a generally T-shaped plate 15, a printing member or plate 16 and a counter-weight 17. Holder 14 is pivotally mounted on the upper surface of die plate 10 for limited up and down movement with respect thereto by means of a rod 18 which is fastened to support members 19 secured to die plate 10. Plate 15 also is pivotally mounted on rod 18 independently of holder 14.

As best seen in FIGURES 2 and 3, one end 14*a* of holder 14 is bent downwardly at 20 and inwardly at 21. The arms 22 of T-shaped plate 15 are located in the channels 22*a* formed at end 14*a* of holder 14. Plate 15, being pivotally mounted at rod 18, is free to move up and down a limited amount in the channels. Lying on the surface of die plate 10 is a block 23 on which the end of plate 15 remote from rod 18 rests when the plate is in the down position (FIGURE 3). As best seen in FIGURE 3, when plate 15 is in the down position, the upper printing surface 24 of printing member 16 is slightly below the plane defined by the upper edges 12 of stamping members 11. In FIGURE 3 I have shown a cardboard blank 25 to be printed on, cut and creased.

At the ink applying position I provide ink-applying means 26. These means consist of a shaft 27 to which is secured a rubber surfaced roller 28. Roller 28 is mounted so that its surface is above edges 12 of stamping members 11, as seen in FIGURE 2. Positioned on either side of roller 28, and secured to shaft 27, are cylinders 29, each having an outer wall 30 of a non-ferromagnetic material. Positioned in cylinders 29, and retained therein by a filler 31, are a plurality of permanent magnets 32. It will be understood that shaft 27 is adapted to be driven in both directions by conventional means, and that except for cylinders 29, ink applying means 26 may be found on printing presses and the like and is part of the prior art.

It will be noted that the axis of shaft 27, the longitudinal axis of printing member 16 and the hinge axis of holder 14 are at 90° to the straight line path of die plate 10.

In the operation of the apparatus shown, and in accordance with the method of my invention, die plate 10 is reciprocated to and beyond the ink applying position (FIGURE 2). Normally, printing device 13 is in the down position with holder 14 and plate 15 both being down as shown in FIGURES 1 and 3. When die plate 10 reaches the ink applying position (FIGURE 2), magnets 32 attract the upper sides 33 of holder 14, holder 14 being of a ferromagnetic material. As seen in FIGURE 2, holder 14 pivots about rod 18 and raises printing surface 24 of printing member 16 above edges 12 of stamping members 11 and into contact with the ink applying surface of roller 28. As is readily apparent, roller 28 does not touch edges 12.

It should be noted that in the aforementioned manner ink is applied twice to printing surface 24 of printing member 16. When die plate 10 is reciprocated to the right in FIGURE 2, ink is applied and roller 28 and shaft 27 are driven counter-clockwise at a speed such that the peripheral speed of roller 28 is the same as the speed of die plate 10. Die plate 10 then travels further to the right in FIGURE 2 slightly beyond the ink applying position. When the motion of die plate 10 is reversed, so that it travels to the left in FIGURE 2 and repasses roller 28, printing device 13 is again lifted by magnetic attraction and ink applied to surface 24 of printing member 16. At this time, however, the rotation of shaft 27 and roller 28 is reversed and is such that the peripheral speed of roller 28 in the clockwise direction is the same as the speed of die plate 10 to the left. As has been mentioned previously, the mechanism for rotating shaft 27 and synchronizing it with die plate 10 is well known in the art. It should also be noted that ink is applied to the ink applying surface of roller 28 by well known means, generally a series of rollers, one of which dips in an ink bath, the ink being transferred from roller to roller by surface contact.

After the ink has been applied to the printing surface 24 of printing member 16, die plate 10 is reciprocated to the left in FIGURES 1 and 2 to a printing and stamping position. At this position a back-up roller (not shown) is provided. This roller is mounted so that its surface is above edges 12, and the roller is capable of being moved upwardly and downwardly, as well as being rotated. The roller carries a cardboard sheet 25 fixed to its surface. As die plate 10 is moved to the left in FIGURE 1, the back-up roller is rotated clockwise so that its peripheral speed is the same as the speed of die plate 10. As die plate 10 reaches the printing and stamping position, the back-up roller is lowered, and the cardboard sheet 25 thereon engages edges 12 of stamping members 11. The sheet 25 is rolled over edges 12 and is sandwiched between the back-up roller and edges 12, these edges serving to cut, crease and/or perforate the blank. At the same time, as best seen in FIGURE 3, a portion of the cardboard blank is sandwiched between the back-up roller and printing member 16, and a printed impression is made on the blank. The height of printing surface 24 relative to the height of edges 12 is determined by the thickness of block 23 and the thickness of printing member 16, since, in all but the ink applying position, plate 15 rests on block 23 and is in the down position. The height of block 23, and the thickness of printing member 16 are preferably such that in the down position (FIGURE 3) of plate 15, printing surface 24 is just below the plane defined by edges 12. This permits blank 25 to be forced downwardly towards die plate 10 through any cutting edges 12 without casing blurred printing, as would result if printing surface 24 in FIGURE 3 were above the plane defined by edges 12. Depending on the type of material being stamped, it may be possible for printing surface

24 to be level with edges 12 or even slightly above these edges in the printing position.

It will be appreciated that the back-up roller, the drive mechanism for rotating it, and the mechanism for raising and lowering it, all in synchronism with the movement of die plate 10, is well known in the prior art.

After blank 25 has been cut, creased or perforated and printed, the die plate travels further to the left beyond the printing and stamping position and the blank is removed from die plate 10 by conventional means, the back-up roller is raised, the die plate is reciprocated back to the right underneath it and to the ink applying position. The operation then is repeated. In order to facilitate removal of the cut and creased blank which will be impaled on some of stamping members 11, springy pads (not shown) of sponge rubber are placed on both sides of stamping members 11 and level with edges 12. These pads form a cushion for blank 25, are compressed at the printing and stamping position, and upon the die plate travelling beyond the back-up roller, expand and urge blank 25 upwardly away from the die plate to facilitate removal of the blank.

The purpose of counterweight 17 is to reduce the amount of magnetic attraction required in order to raise holder 14 and printing member 16 to the position shown in FIGURE 2.

It should be noted that my invention also might be practised by placing small magnets on either side of holder 14 on members 33 adjacent members 20 and by providing ferromagnetic material in cylinders 29.

If desired, more than one printing device 13 may be mounted on die plate 10. It will also be appreciated that more than one ink applying means 26 may be mounted on shaft 27, and a number of die plates 10 provided. In this manner printed blanks can be formed more than "one up."

Those skilled in the art will appreciate that while I have described preferred embodiments of my invention many modifications and changes may be made therein without departing from the spirit and scope of my invention as defined in the appended claims.

What I claim as my invention is:

1. Die stamping and printing apparatus comprising a die plate adapted to be reciprocated back and forth between a combined stamping and printing position and an ink applying position, said die plate having an upper surface, stamping members, said stamping members extending upwardly from said upper surface and having upper stamping edges located above said upper surface, a printing device including a printing member having an upper printing surface, said printing device being carried by said die plate and mounted for limited up and down movement with respect to said upper surface, said upper printing surface being above said upper surface, said printing device normally being in the down position and being in said down position at said printing position, ink applying means at said ink applying position, said ink applying means having an ink applying surface, said ink applying surface being above said printing surface when said printing device is in said down position, and means establishing magnetic attraction between said ink applying means and said printing device, whereby at said ink applying position said printing member is raised into contact with said ink applying surface and ink is applied to said printing surface of said printing member.

2. Die stamping and printing apparatus comprising a die plate adapted to be reciprocated back and forth between a combined stamping and printing position and an ink applying position, said die plate having an upper surface, stamping members, said stamping members extending upwardly from said upper surface and having upper stamping edges located above said upper surface, a printing device including a printing member having an upper printing surface, said printing device being carried by said die plate and mounted for limited up and down

movement with respect to said upper surface, said upper printing surface being above said upper surface, said printing device normally being in the down position and being in said down position at said printing position, ink applying means at said ink applying position, said ink applying means having an ink applying surface, said ink applying surface being above said printing surface when said printing device is in said down position, said die plate being adapted to be reciprocated under said ink applying means, whereby at least some of said stamping members are reciprocated under said ink applying means, said ink applying surface of said ink applying means being above the upper edges of said some of said stamping members, and means establishing magnetic attraction between said ink applying means and said printing device, whereby at said ink applying position said printing member is raised into contact with said ink applying surface and ink is applied to said printing surface of said printing member.

3. Die stamping and printing apparatus according to claim 2 wherein said means establishing magnetic attraction between said ink applying means and said printing device comprise at least one permanent magnet associated with said ink applying means, and material adapted to be attracted by said magnet associated with said printing device.

4. Die stamping and printing apparatus according to claim 2 wherein said upper edges of said stamping members lie in at least substantially the same first plane, said printing surface of said printing member in said down position of said printing device lying in a plane not higher than said first plane.

5. Die stamping and printing apparatus according to claim 4 wherein some of said upper stamping edges are creasing edges and some of said upper edges are cutting edges.

6. Die stamping and printing apparatus comprising a die plate adapted to be reciprocated back and forth between a combined stamping and printing position and an ink applying position, said die plate having an upper surface, stamping members, said stamping members extending upwardly from said upper surface and having upper stamping edges located above said upper surface, a printing device carried by said die plate and comprising a printing member having an upper printing surface and a holder for said printing member, said holder mounting said printing member for limited up and down movement thereof in said holder, said holder being mounted for limited up and down movement with respect to said upper surface, said upper printing surface being above said upper surface, said holder normally being in the down position and being in said down position at said printing position, ink applying means at said ink applying position, said ink applying means having an ink applying surface, said ink applying surface being above said printing surface when said printing member is in said down position, said die plate being adapted to be reciprocated under said ink applying means, whereby at least some of said stamping members are reciprocated under said ink applying means, said ink applying surface of said ink applying means being above the upper edges of said some of said stamping members, and means establishing magnetic attraction between said ink applying means and said holder, whereby at said ink applying position said printing member is raised into contact with said ink applying surface and ink is applied to said printing surface of said printing member.

7. Die stamping and printing apparatus comprising a die plate adapted to be reciprocated back and forth between a combined stamping and printing position and an ink applying position, said die plate having an upper surface, stamping members, said stamping members extending upwardly from said upper surface and having upper stamping edges located above said upper surface, a printing device carried by said die plate, said printing device comprising a printing member having an upper

printing surface and a holder, said printing member being retained by part of said holder, said holder being hingedly mounted for up and down movement of said part thereof with respect to said upper surface, said upper printing surface being above said upper surface, said printing device normally being in the down position and being in said down position at said printing position, ink applying means at said ink applying position, said ink applying means having an ink applying surface, said ink applying surface being above said printing surface when said printing device is in said down position, said die plate being adapted to be reciprocated under said ink applying means, whereby at least some of said stamping members are reciprocated under said ink applying means, said ink applying surface of said ink applying means being above the upper edges of said some of said stamping members, and means establishing magnetic attraction between said ink applying means and said holder, whereby at said ink applying position said part of said holder is magnetically raised, said printing member is raised into contact with said ink applying surface and ink is applied to said printing surface of said printing member.

8. Die stamping and printing apparatus according to claim 7 wherein said means establishing magnetic attraction between said ink applying means and said holder comprise at least one permanent magnet associated with said ink applying means, at least said part of said holder being of a material adapted to be attracted by said magnet.

9. Die stamping and printing apparatus according to claim 8 wherein said printing member is mounted in said holder for limited up and down movement with respect to said holder.

10. Die stamping and printing apparatus comprising a die plate adapted to be reciprocated back and forth in a straight line path between a combined stamping and printing position and an ink applying position, said die plate having an upper surface, stamping members, said stamping members extending upwardly from said upper surface and having upper stamping edges located above said upper surface, a printing device carried by said die plate comprising a printing member having an upper printing surface and a holder, said printing member being retained by part of said holder, said printing member having its longitudinal axis lying across said straight line path at at least substantially 90°, said holder being hingedly mounted about an axis lying across said straight line path at at least substantially 90° for up and down movement of said part thereof with respect to said upper surface, said upper printing surface being above said upper surface, said holder normally being in the down position and being in said down position at said printing position, ink applying means at said ink applying position, said ink applying means having its longitudinal axis lying across said straight line path at at least substantially 90° and having an ink applying surface, said ink applying surface being above said printing surface when said printing device is in said down position, said die plate being adapted to be reciprocated under said ink applying means, whereby at least some of said stamping members are reciprocated under said ink applying means, said ink applying surface of said ink applying means being above the upper edges of said some of said stamping members, at least one permanent magnet associated with said ink applying means, at least said part of said holder being of material adapted to be attracted by said magnet, whereby at said ink applying position said part of said holder is magnetically raised, said printing member is raised into contact with said ink applying surface and ink is applied to said printing surface of said printing member.

11. Die stamping and printing apparatus according to claim 10 wherein said printing member is mounted in said holder for limited up and down movement with respect to said holder.

12. Die stamping and printing apparatus according to claim 11 wherein said holder has a pair of ends one on each side of said axis about which said holder is hingedly mounted, said printing member being mounted at one of said ends, the other of said ends being slightly heavier than said other of said ends, whereby said printing plate is normally in the down position.

13. Die stamping and printing apparatus according to claim 11 wherein some of said upper stamping edges are creasing edges and some of said upper edges are cutting edges.

14. Die stamping and printing apparatus comprising a die plate adapted to be reciprocated back and forth between a combined stamping and printing position and an ink applying position, said die plate having an upper surface, stamping members, said stamping members extending upwardly from said upper surface and having upper stamping edges located above said upper surface, a printing device including a printing member having an upper printing surface, said printing device being carried by said die plate and mounted for limited up and down movement with respect to said upper surface, said upper printing surface being above said upper surface, said printing device normally being in the down position and being in said down position at said printing position, ink applying means at said ink applying position, said ink applying means having an ink applying surface, said ink applying surface being above said printing surface when said printing device is in said down position, and magnetic means at said ink applying position, said magnetic means being adapted to magnetically attract said printing device, whereby at said ink applying position said printing member is raised into contact with said ink applying surface and ink is applied to said printing surface of said printing member.

15. Die stamping and printing apparatus comprising a die plate adapted to be reciprocated back and forth between a combined stamping and printing position and an ink applying position, said die plate having an upper surface, stamping members, said stamping members extending upwardly from said upper surface and having upper stamping edges located above said upper surface, a printing device including a printing member having an upper printing surface, said printing device being carried by said die plate and mounted for limited up and down movement with respect to said upper surface, said upper printing surface being above said upper surface, said printing device normally being in the down position and being in said down position at said printing position, ink applying means at said ink applying position, said ink applying means having an ink applying surface, said ink applying surface being above said printing surface when said printing device is in said down position, said die plate being adapted to be reciprocated under said ink applying means, whereby at least some of said stamping members are reciprocated under said ink applying means, said ink applying surface of said ink applying means being above the upper edges of said some of said stamping members, and magnetic means at said ink applying position, said magnetic means being adapted to magnetically attract said printing device, whereby at said ink applying position said printing member is raised into contact with said ink applying surface and ink is applied to said printing surface of said printing member.

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