

Feb. 21, 1967

I. H. BIRCH

3,304,856

MARKING APPARATUS

Filed Sept. 13, 1965

2 Sheets-Sheet 1

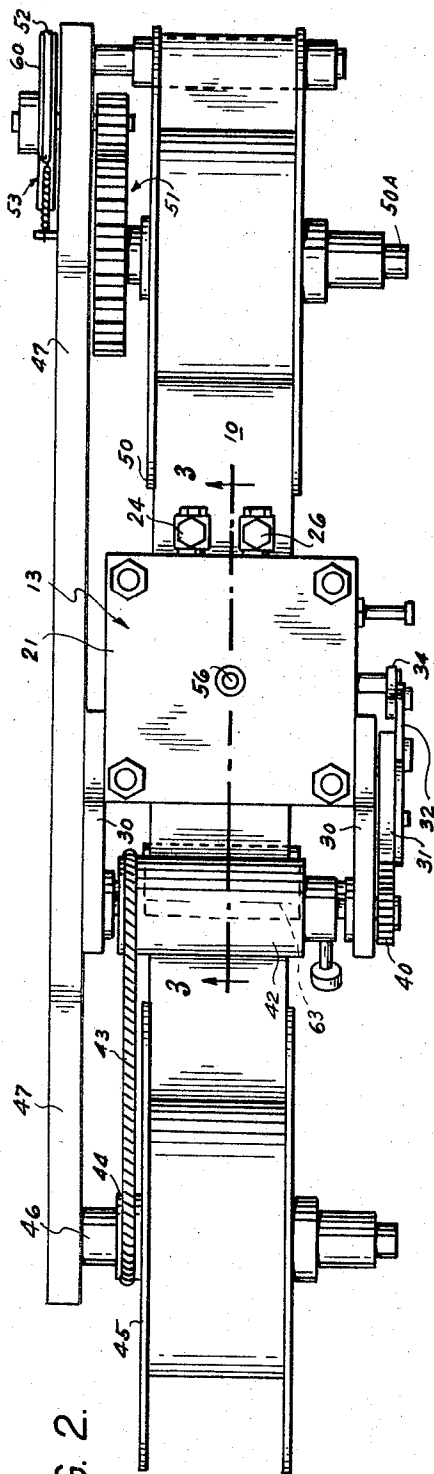


FIG. 2.

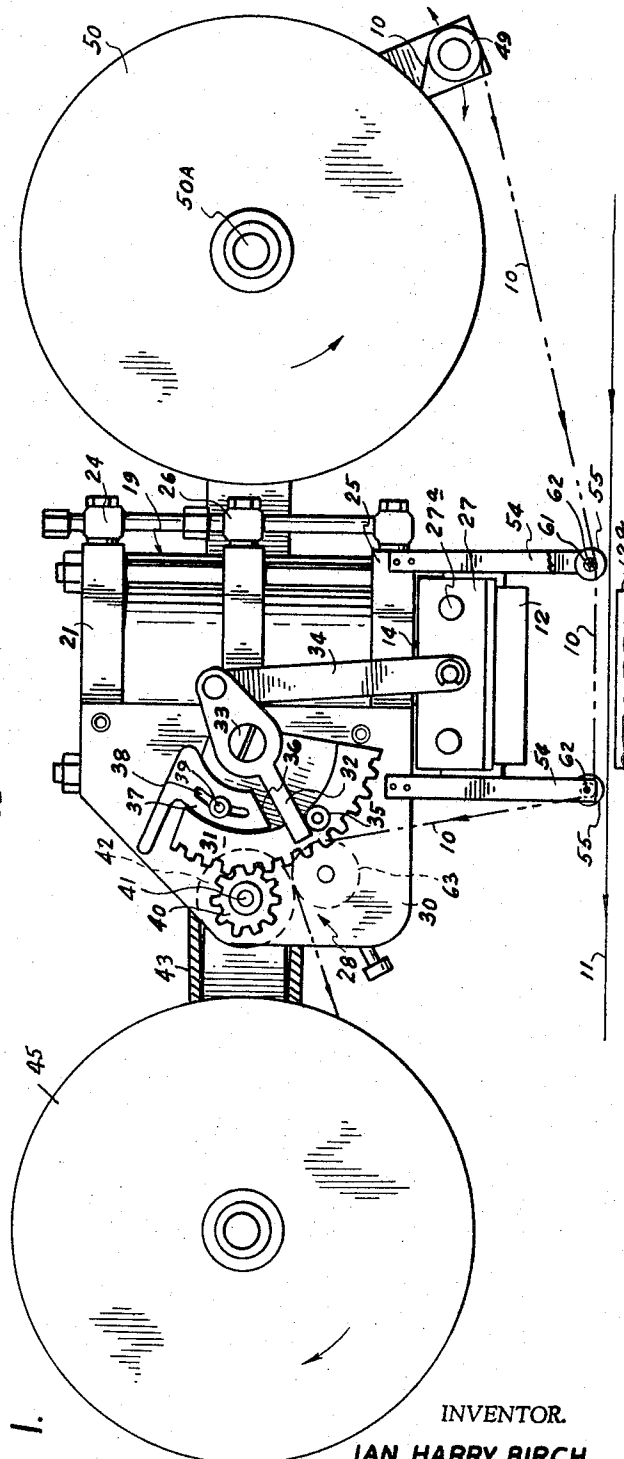


FIG. 1.

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2 Sheets-Sheet 2

FIG. 3.

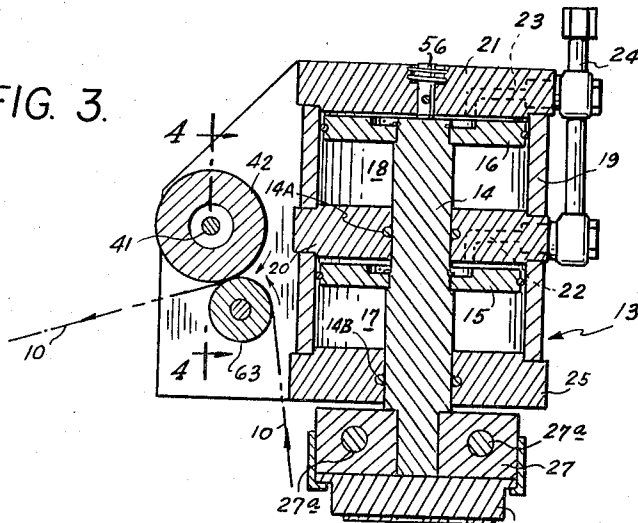


FIG. 4.

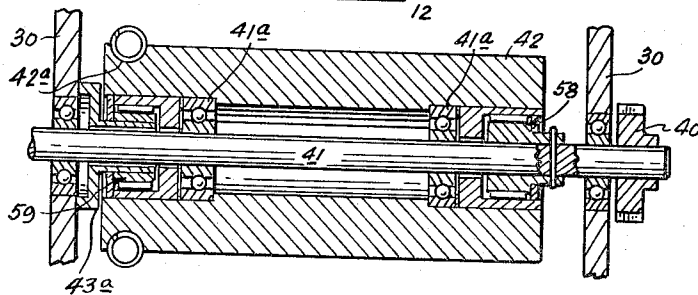
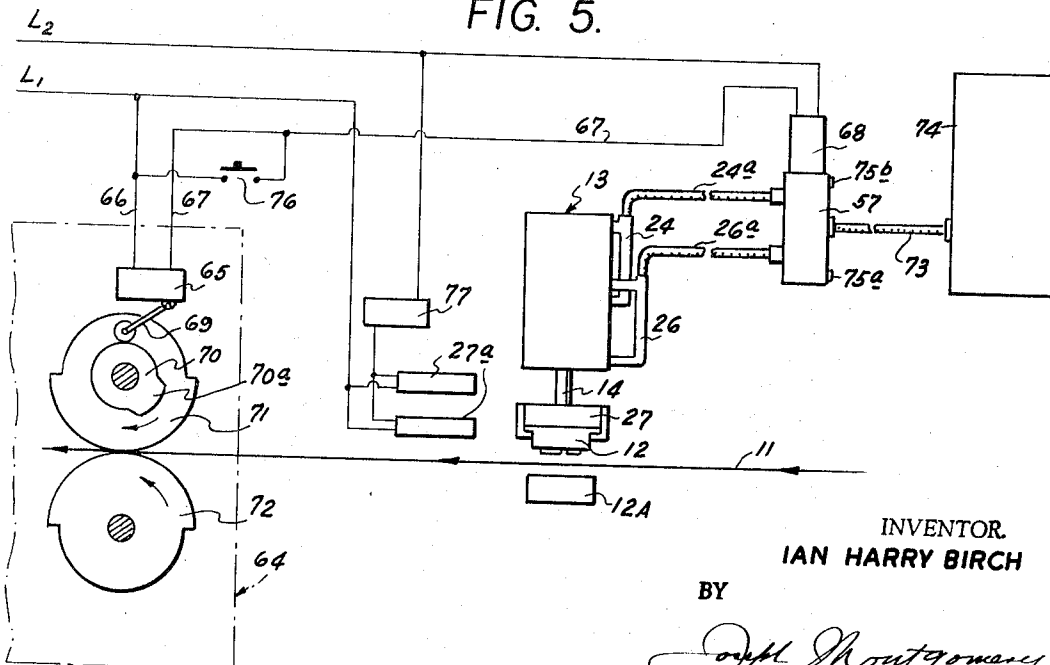


FIG. 5.



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1

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MARKING APPARATUS

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8 Claims. (Cl. 101—27)

This invention relates to improvements in printing or marking apparatus, particularly of the type in which a hot roll leaf stamping tape or blocking foil is pressed by a heated die or printing block against a web or sheet of sheet material so as to transfer pigment from the tape or foil to the sheet material and thereby form the desired marking or imprint on the latter.

Apparatus of the described type is frequently employed for marking a web of sheet material being advanced intermittently to a wrapping or other machine which utilizes the marked web, and in that case it is necessary to synchronize the operation of the marking apparatus with the intermittent advance of the web by the associated machine so that the heated die presses the tape or foil against the web only when the web is at rest. Further, in such marking apparatus, it is desirable to feed the tape or foil after each marking operation so as to expose a fresh or unused section thereof to the action of the heated die during the next marking operation. Although marking apparatus presently exists for performing the foregoing operations, such existing apparatus is relatively complex and of large overall dimensions so that it is not conveniently accommodated in the restricted space that is usually available therefor adjacent the web being advanced to the wrapping or other web utilizing machine.

It is an object of this invention to provide a marking apparatus of the described type that is relatively simple and compact for convenient mounting adjacent a web being intermittently advanced to a wrapping or other web utilizing machine, and that may have its operations conveniently controlled from such machine so as to be synchronized with the intermittent advancement of the web.

Another object is to provide a marking apparatus of the described type which is operated by fluid under pressure acting in a ram assembly so that the supplying of fluid under pressure thereto, and hence the operation of the apparatus, can be conveniently controlled from an associated wrapping or other machine by way of an electrical control circuit, and wherein such ram assembly occupies a relatively small space and is capable of exerting a relatively large force during the marking operation without requiring the use of high fluid pressures.

According to this invention, in a printing or marking apparatus that includes a holder for a die or printing block and a ram assembly for reciprocating the holder, such ram assembly comprises a piston rod and a cylinder structure one of which parts is fixed and the other of which parts has the holder connected thereto, and two or more pistons secured to the piston rod and spaced apart in a direction lengthwise of the rod, with the cylinder structure providing a plurality of cylinders each accommodating a piston. Thus, when fluid under pressure is supplied simultaneously to all cylinders to act against the pistons therein, the ram develops a relatively large force acting on the die or printing block even though the pistons are of relatively small diameter and the fluid is under a relatively low pressure to avoid sealing problems.

In preferred arrangements the piston and cylinders are double acting so as to be capable of moving the die toward and away from its marking position.

2

According to a feature of the invention, the means for feeding a hot roll leaf stamping tape or blocking foil across the path of movement of the die or printing block comprises a lost-motion mechanism connecting the drive for a feeding roller or other means engaging the tape or foil with the piston rod or a part which moves with the piston rod.

According to another feature of the invention, the lost-motion mechanism comprises a lever which is pivotally mounted on a fixed part of the apparatus and connected to the piston rod so as to be angularly displaced in response to movement of the latter, and a toothed quadrant which is also pivotally mounted on the fixed part of the apparatus and has two spaced abutments engageable by the lever to oscillate the quadrant through an angle smaller than that of the angular displacement of the lever, and the drive for the tape feeding roller transmits the angular displacement of the quadrant thereto only when the quadrant is rotated in one direction about its pivot.

According to yet another feature of the invention, the abutments of the lost-motion mechanism are relatively adjustable to vary the degree of lost motion, and thereby vary the feeding movement of the tape or foil after each marking operation.

An illustrative embodiment of the invention will now be described by way of example with reference to the accompanying drawings in which:

FIG. 1 is a side elevational view of a marking apparatus in accordance with the invention;

FIG. 2 is a top plan view of the marking apparatus;

FIG. 3 is a sectional view taken along the line 3—3 on FIG. 2;

FIG. 4 is a sectional view taken along the line 4—4 on FIG. 3; and

FIG. 5 is a schematic diagram of a system for controlling the marking apparatus from an associated wrapping or other web utilizing machine.

The illustrated apparatus is designed to print or mark insignia, prices and other legends on a continuous web of paper, for example, wrapping paper, or other sheet material. In one use of the apparatus, a hot roll leaf stamping tape or blocking foil 10 carrying transferable gold paint or other pigment on its underside is disposed over the web of paper, which is shown at 11, and a die or printing block 12 carrying the legend in raised relief on its under surface is disposed above the tape 10. The printing block 12 is heated and is moved downward by a ram assembly 13 to press the tape 10 and web 11 together between the printing block and a table 12a which, as is known, has a thin layer of a silicone rubber material on its upper surface. The desired imprint or legend is thus imprinted on web 11 in gold paint transferred from tape 10. The block 12 is then raised by means of ram assembly 13 and the tape 10 and web 11 are fed or advanced.

Referring now to FIG. 3 of the drawings, it will be seen that the ram assembly 13 comprises a piston rod 14 which has two axially spaced pistons 15 and 16 secured thereon. The pistons are slidably accommodated in respective cylinders 17 and 18 which are formed in a fixed cylinder structure 19. A partition or wall 20 intermediate cylinders 17 and 18 has a central axial bore through which piston rod 14 slidably extends, and this intermediate wall 20 and the top closure member 21 of the cylinder structure are formed with respective passages 22 and 23 opening into the upper ends of cylinders 17 and 18 and communicating with an external manifold 24. The cylinder structure 19 further has a bottom closure wall 25 formed with a central axial bore through which piston rod 14 projects, and bottom closure wall 25 and intermediate wall 20 are formed with respective passages (not shown)

which open into the lower ends of cylinders 17 and 18 and which communicate with a second external manifold 26 (FIGS. 1 and 2). The two manifolds 24 and 26 are alternately connected, through flexible conduits or hoses 24a and 26a and a valve 57 (FIG. 5), one to a source of compressed air and the other to atmosphere, so that the pistons 15 and 16 and piston rod 14 are reciprocated relative to cylinder structure 19. Seals 14a and 14b are provided between the piston rod and walls 20 and 25.

A block 27 containing electric heating elements 27a is secured to the lower end of the piston rod 14 and has the printing block 12 suitably suspended therefrom to heat the printing block.

A tape indexing mechanism 28 is operated by the ram assembly 13 to dispose a fresh or unused length of the tape 10 beneath the printing block at each stroke of the ram, and also acts upon a take-up reel or spool 45 for the tape 10. The indexing mechanism 28 is supported by two side plates 30 secured to the sides of the cylinder structure 19 and comprises principally a toothed quadrant 31 and a lever 32 which are pivotally mounted on a common pivot pin 33 secured to one of the plates 30. One end of lever 32 is connected by a link 34 to the heater block 27 so as to be oscillated in response to reciprocation of the piston rod 14. The other end of the lever 32 is disposed between a fixed abutment 35 and an adjustable abutment 36 both mounted on the quadrant 31. Abutment 36 is provided by an arcuate plate 37 formed with an arcuate slot 38 through which a clamp screw 39 extends into a threaded hole in the quadrant 31. When the screw 39 is loosened, the arcuate plate 37 can be moved (about pin 33) to adjust the space between abutments 35 and 36 and thereby vary the lost-motion between quadrant 31 and lever 32.

The toothed periphery of quadrant 31 meshes with a pinion 40 (FIGS. 1, 2 and 4) which is secured on one end of a spindle or shaft 41 journaled in side plates 30. A one-way clutch 58 of the ramp and roller type is disposed between the spindle 41 and a tape feeding roller 42 which is rotatably mounted on the spindle, as by bearings 41a (FIG. 4). The clutch 58 functions to transmit rotation of the spindle 41 in the clockwise direction, as viewed on FIG. 3, to the roller 42, and to permit the spindle 41 to turn in the opposite or counter-clockwise direction relative to the roller 42. Another clutch 59 (FIG. 4) of the ramp and roller type is connected between the roller 42 and the side plate 30 remote from pinion 40 and permits turning of roller 42 only in the clockwise direction, as viewed on FIG. 3. The feeding roller 42 is grooved, as at 42a (FIG. 4), to receive a yieldable drive belt 43 which may be in the form of a coil spring and extends around the grooved hub 44 of the take-up reel or spool 45 for the tape 10. The take-up spool is mounted on a spindle 46 which is secured to a fixed frame member 47. A conventional slip clutch 43a is interposed between the spindle 41 and feed roller 42 so that if there be any slippage it will occur in the slip clutch and not in the belt.

As the ram assembly 13 moves the printing block 12 upward, after a printing or marking operation, link 34 turns lever 32 and the lever, after taking up the lost motion, engages abutment 35 and turns the quadrant 31, which in turn transmits a rotational movement through pinion 40, spindle 41 and clutch 58 to the roller 42 and from the latter through drive belt 43 to the take-up spool 45. When the ram assembly moves printing block 12 downward during the printing stroke, lever 32 moves from engagement with abutment 35 into engagement with abutment 36 and returns the quadrant 31 to its original position. During this movement of the quadrant, and hence of the pinion 40, the two one-way clutches 58 and 59 disposed respectively between the spindle 41 and roller 42 and between the roller and one of the side plates 30 operate to ensure that no drive or drag from the pinion causes reverse rotation of the roller 42.

A supply reel or spool 50 (FIGS. 1 and 2) is rotatably mounted on a spindle 50a secured to the fixed frame member 47 and carries a roll or supply of the tape 10. A flanged wheel 60 (FIG. 2) is rotatably mounted on frame member 47 and is driven by the spool 50 through a gear transmission 51. The periphery of flanged wheel 60 is encircled by the band 52 of a band brake mechanism 53, so that a light resistance to rotation is applied to the supply spool 50. The tape 10 extends from the supply spool around a guide roller 49, and then under guide rollers 61 which are freely rotatable on shafts 62 extending between the lower ends of fixed frame members 54 depending from bottom wall 25 at opposite sides of the path of movement of the printing block 12 (FIG. 1). Rollers 55 freely rotatable on the shafts 62 at the opposite ends of tape guiding rollers 61 are provided for guiding the web 11 which is to be printed. From the guide rollers 61, the tape 10 travels upwardly to a pressure roller 63 (FIG. 3) which is rotatably supported between plates 30 and located under feeding roller 42 so as to press the tape into frictional non-slip contact with roller 42.

It will be apparent that, during each rotational movement of roller 42, as described above, the tape 10 is advanced or fed through a distance which is predetermined by adjustment of the abutment 36. The position of abutment 36 on quadrant 31, which determines the extent of the lost-motion between lever 32 and quadrant 31, is selected so that during each rotational movement of roller 42, the distance through which tape 10 is moved is only sufficient to expose an unused or fresh section of the tape to the next action of printing block 12, thereby to avoid waste of the tape 10.

After passing between the rollers 42 and 63, the tape 10 is rewound on spool 45 which is turned through belt 43 from roller 42 so as to take-up the tape as the latter is fed by roller 42.

Although the direction of the intermittent advancement of the web 11 may either be opposed to, or at right angles to the direction of the feeding movement of the tape 10 extending between guide rollers 61, it is preferred, as shown on FIG. 1, to arrange the printing or marking apparatus so that the direction of the feeding movement of the tape 10 is the same as the direction of the intermittent advancement of the web 11. With the preferred arrangement of the printing apparatus, the path of movement of the tape 10 from guiding rollers 61 up to pressure roller 63 diverges with respect to the path of movement of the web 11 so that, when the tape 10 and web 11 are advanced after a printing or marking operation, the divergence of the respective paths results in a peeling action for separating the tape 10 from web 11 and thereby assists in the production of high quality imprints.

As is apparent from FIG. 2, the width of the marking apparatus embodying this invention is substantially determined by the diameter of the cylinder structure 19 of ram assembly 13. Since the fluid under pressure for operating the ram assembly acts simultaneously in two cylinders 17 and 18 against the respective pistons 15 and 16, a relatively low fluid pressure may be employed to provide the necessary force exerted on printing block 12 during each printing operation while maintaining the diameter of cylinder structure 19 within the limits necessary for accommodation of the printing apparatus in the restricted space usually available therefor when such apparatus is used for marking a web which is being intermittently advanced to a wrapping or other web utilizing machine.

If it is desired to reduce the overall dimension of the marking apparatus in the direction along the path of movement of the web 11, the take-up and supply spools 45 and 50 can be disposed above the ram assembly 13 with suitable additional guides (not shown) being there

5

provided to further guide the tape to the extent that may be necessary.

As shown particularly on FIGS. 2 and 3, the top wall 21 preferably has a tapped, central hole 56 opening upwardly to receive a single bolt or screw (not shown) for securing the printing apparatus to a suitable support structure (not shown). Such a simple arrangement for supporting the printing apparatus has the advantage of permitting adjustment or swivelling thereof about the axis of hole 56 so as to dispose the apparatus in the most convenient position.

Although the described printing apparatus may be used as a bench-type unit for marking individual sheets, book covers or the like that are successively inserted between tape 10 and table 12a, the printing apparatus embodying this invention is particularly adapted and suited for the repetitive marking or printing of a continuous web which is being intermittently advanced to a wrapping or other web utilizing machine. In the latter case, the operation of the marking apparatus must be controlled in synchronism with the operations of the associated machine so that printing block 12 is stroked downwardly to imprint the web only when the latter is at rest and block 12 is moved upwardly to free tape 10 and web 11 and to effect feeding movement of the tape 10 during each advancement of the web.

As shown schematically on FIG. 5, a suitable system for controlling the operation of the printing or marking apparatus in association with a wrapping or other web utilizing machine indicated at 64 may include a normally open switch 65 connected by leads 66 and 67 to a power supply line L₁ and to one side of a solenoid 68 having its other side connected to the other power supply line L₂ so that solenoid 68 is energized only when switch 65 is actuated to its closed position. Switch 65 may have an actuating member 69 engaging a cam 70 which rotates with one of the web advancing rolls 71 and 72 included in the machine 64 for intermittently advancing the web 11. Cam 70 has a rise 70a which engages actuating member 69 to close switch 65 when rolls 71 and 72 are rotationally positioned to release web 11, that is, during the interval when the web is at rest between successive advancements thereof.

In the illustrated control system, valve 57 functions to connect conduit 24a and manifold 24 with a compressed air supply line 73 extending from a source 74 of compressed air, and to connect conduit 26a and manifold 26 with an exhaust port or vent 75a when solenoid 68 is energized by closing of switch 65, thereby to stroke piston rod 14 downwardly for effecting a printing operation. When solenoid 68 is deenergized in response to opening of switch 65 during each advancement of web 11 by rolls 71 and 72, valve 57 connects conduit 26a with compressed air supply line 73 and connects conduit 24a with a vent 75b, thereby to cause upward movement of piston rod 14 for freeing tape 10 and web 11 and for causing mechanism 28 to effect a feeding movement of the tape, as described above.

If desired, a normally open, manually actuable push-button switch 76 may be connected between leads 66 and 67 for manual control of the operation of the printing apparatus. Further, as shown, the electrical heating elements 27a contained in block 27 for heating the printing block or die 12 may be connected to lines L₁ and L₂ through a thermostatic switch 77 which is adjustable to obtain a desired, substantially constant temperature of the die.

Although an embodiment of the invention has been described in detail herein with reference to the accompanying drawings, it is to be understood that the invention is not limited to that precise embodiment, and that various changes and modifications may be effected therein by one skilled in the art without departing from the scope or spirit of the invention as defined in the appended claims.

6

What is claimed is:

1. In a marking apparatus for applying markings to a web advanced intermittently in a predetermined path to a web utilizing machine; a fluid pressure operated ram assembly for moving a heated die toward and away from said path of the web; guide means extending a hot roll leaf stamping tape between the heated die and the web so that the heated die, when moved toward said path, presses said tape against the web and thereby marks the latter; a feeding mechanism for said tape comprising a rotatable feeding roller engaging said tape for effecting feeding movement thereof when said roller is turned in one direction so as to expose a fresh length of the tape to the action of the heated die, an oscillatable quadrant member having two spaced abutments thereon, a rockable lever extending between said abutments of the quadrant member so as to have a lost motion connection therewith, means mechanically connecting said lever with said ram assembly so as to be rocked in response to movement of the die by operation of the ram assembly, and means connecting said quadrant member with said feeding roller to effect turning of the latter only in said one direction when said quadrant member is rocked with said lever in response to operation of said ram assembly causing movement of the die away from said path of the web; and means controlling the supplying of fluid under pressure to said ram assembly in synchronism with the intermittent advancement of the web to said machine so that said die is moved toward said path to mark the web when the latter is at rest and said die is moved away from said path to free said tape and web and to effect feeding movement of the tape during each advancement of the web.

2. A marking apparatus as in claim 1; wherein said ram assembly comprises relatively movable parts which are respectively fixed and connected with the die for effecting reciprocation of the latter, one of said parts including a piston rod having a plurality of pistons secured thereon at spaced apart locations along the rod, the other of said parts of the ram assembly including a cylinder structure defining a plurality of axially arranged and separated cylinder chambers, each of said chambers slidably receiving a respective one of said pistons, and means for supplying fluid under pressure to all of said cylinder chambers at one side of the pistons therein and for simultaneously exhausting fluid from all of said chambers at the opposite side of said pistons therein.

3. A marking apparatus as in claim 1; wherein at least one of said abutments is adjustably movable relative to the other abutment so as to vary the space therebetween, thereby to change the extent of the lost motion between said lever and said quadrant member for varying the length of tape fed by said roller during each operating cycle of said ram assembly.

4. A marking apparatus as in claim 1; wherein said quadrant member has a toothed periphery, and said means connecting the feeding roller with the quadrant member includes a pinion turnable coaxially with said feeding roller and meshing with said toothed periphery, and one-way clutch means for coupling said pinion to said feeding roller.

5. A marking apparatus as in claim 4; wherein said feeding roller drives a take-up spool for used tape through a spring belt with a slip clutch interposed between said belt and spool.

6. A marking apparatus as in claim 4; wherein the guide means guides the tape from a supply spool, and a brake mechanism providing resistance to the rotation of said spool.

7. A marking apparatus as in claim 1; wherein said feeding roller is spaced further from said path of the web than said guide means so that a run of said tape extending from the guide means to said feeding roller diverges with respect to said path, and said tape moves in the same direction, at said guide means, as the direction of advance-

7

ment of the web in said path, thereby to effect peeling of the tape from the web during the simultaneous feeding of the tape and advancement of the web.

8. A marking apparatus as in claim 5; wherein said guide means includes parallel rollers engaged by the tape and disposed at opposite sides of the path of movement of said die toward and away from the path of the web, and additional rollers coaxial with said rollers engaging the tape and of larger diameter to engage and guide the web.

8

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