Feb. 27, 1962 F. C. WORTH 3,022,724

MARKING APPARATUS

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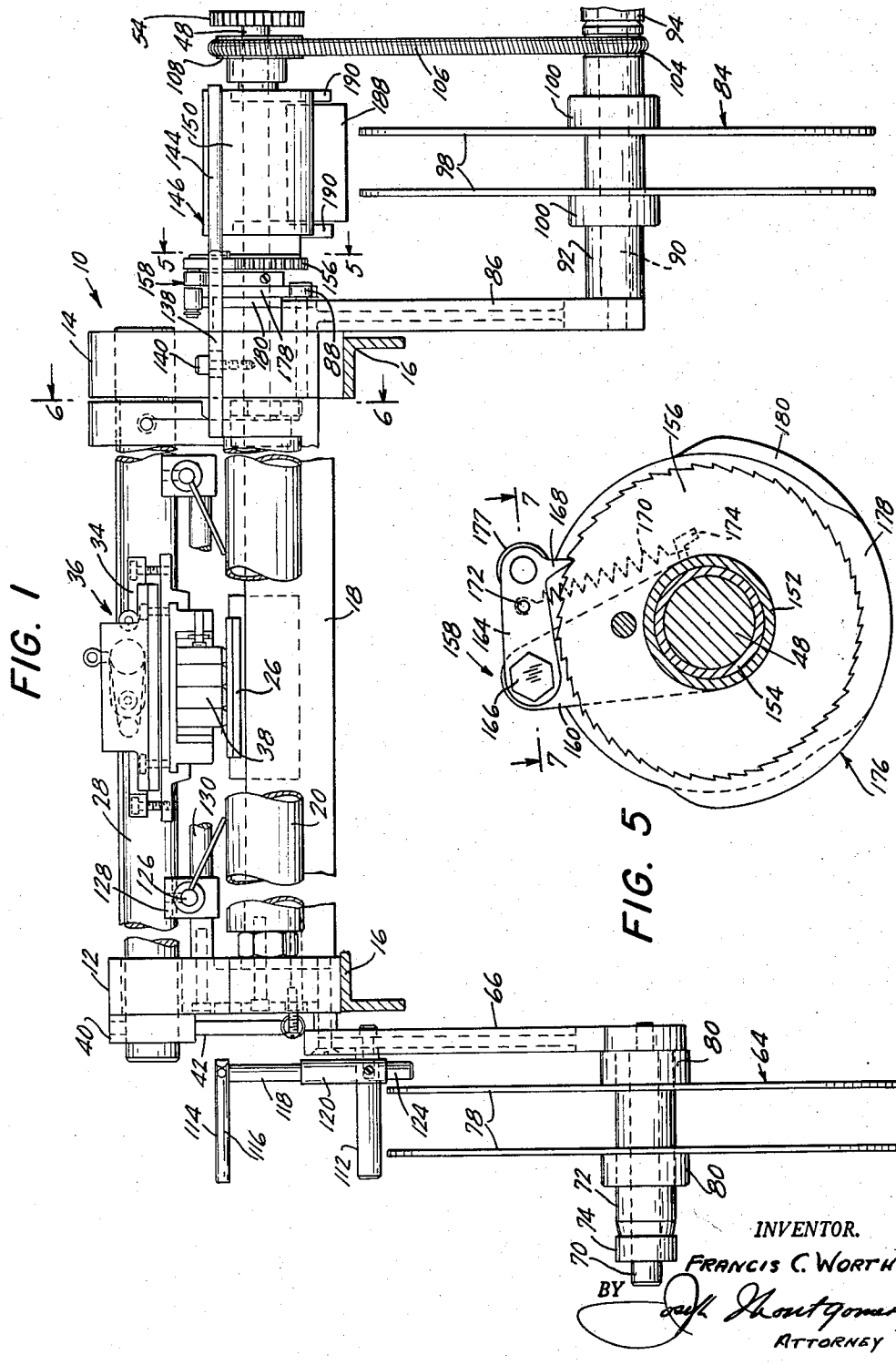


FIG. 1

FIG. 5

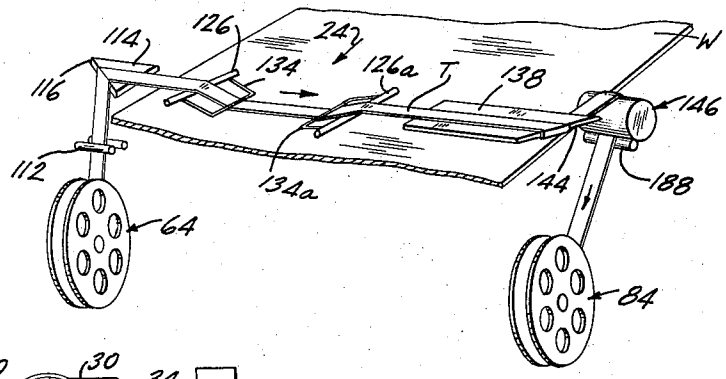
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MARKING APPARATUS

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FIG. 8



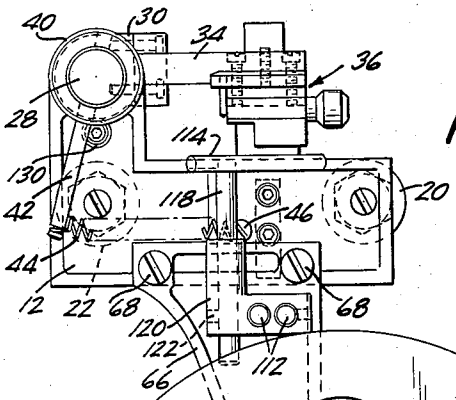


FIG. 2

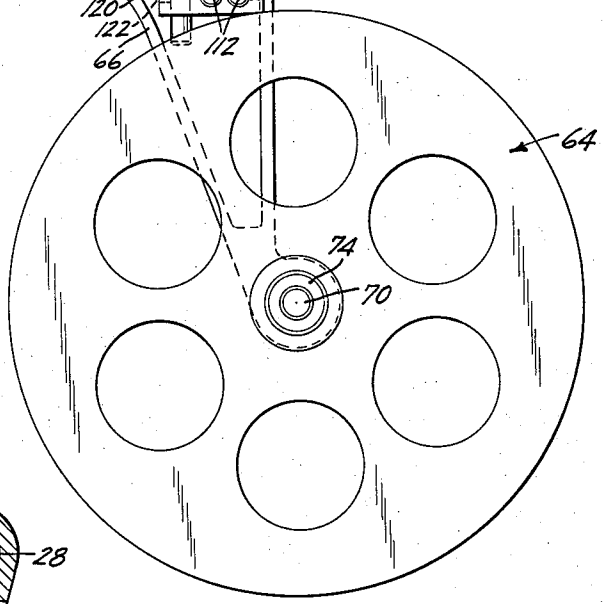
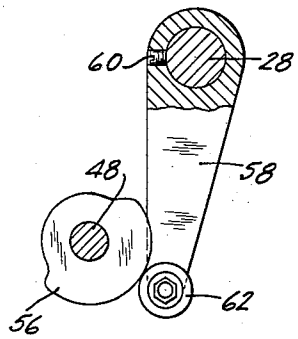


FIG. 6



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MARKING APPARATUS

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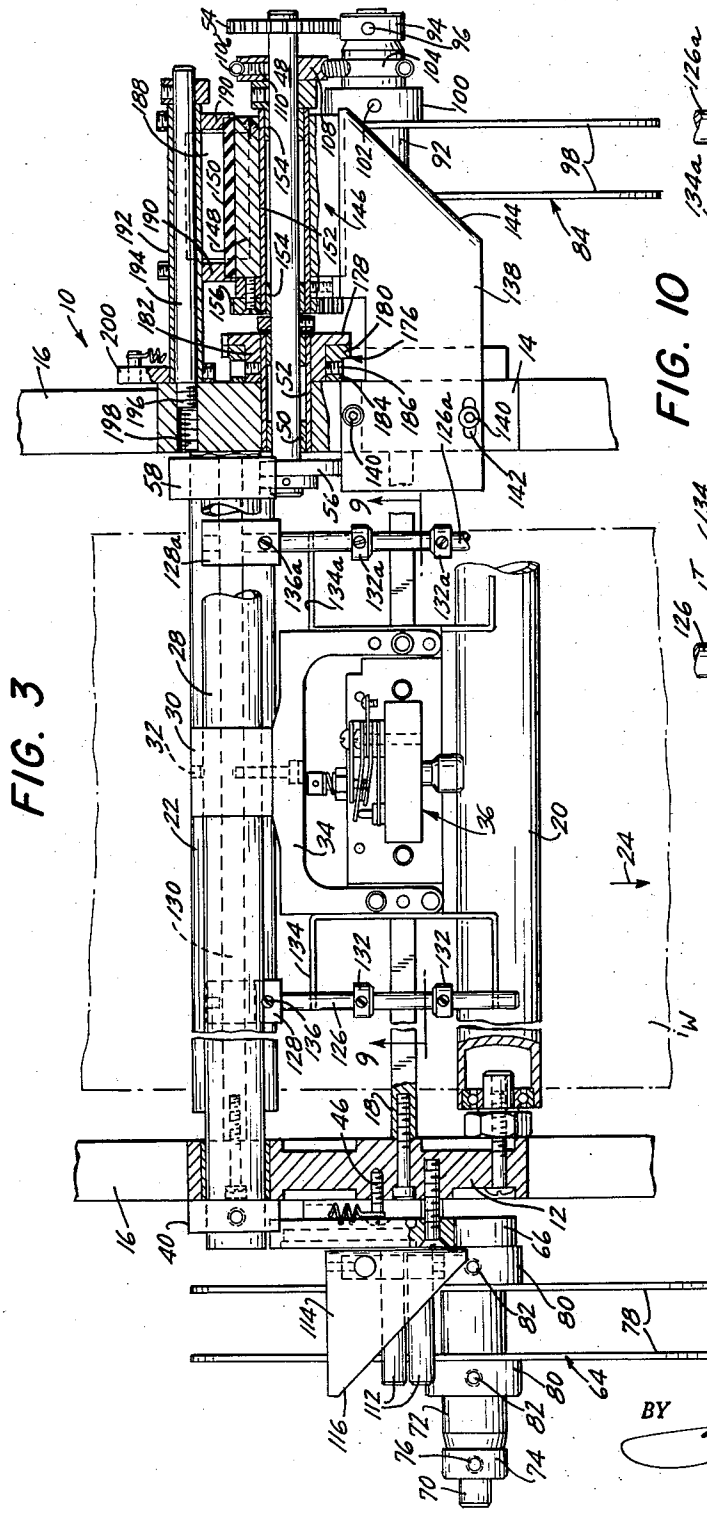


FIG. 3

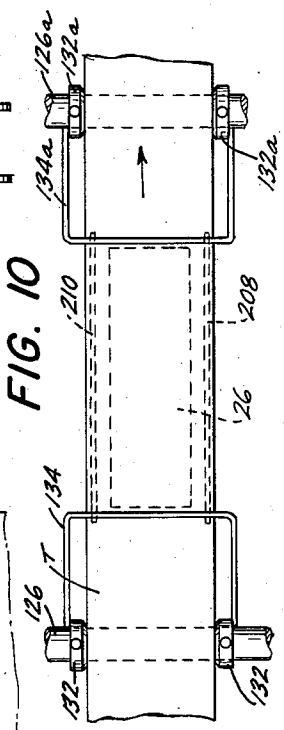


FIG. 10

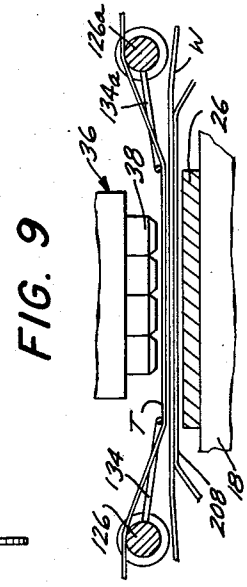


FIG. 9

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MARKING APPARATUS

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FIG. 7

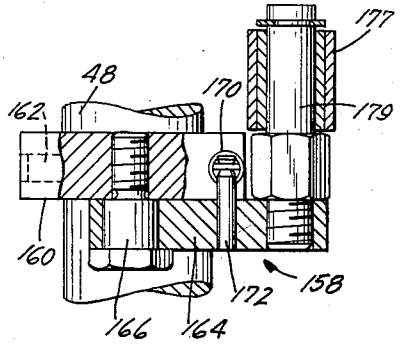
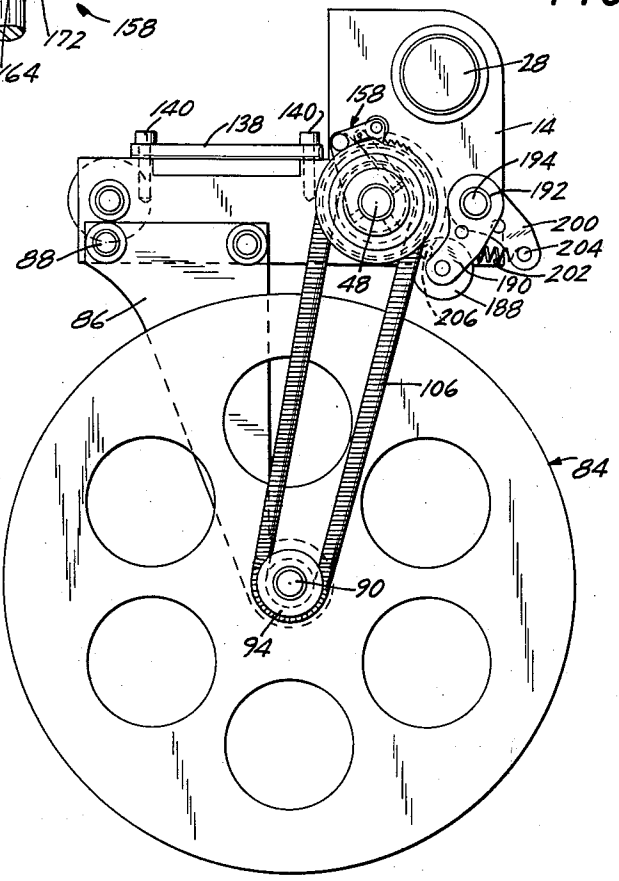


FIG. 4



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3,022,724

MARKING APPARATUS

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Filed Mar. 21, 1960, Ser. No. 16,430
13 Claims. (Cl. 101—27)

This invention relates generally to marking apparatus, and more particularly is directed to improvements in marking apparatus of the kind wherein the desired imprint is applied to a web or sheet of sheet material from a hot roll leaf stamping tape by pressing a heated die against the latter.

Difficulties have heretofore been experienced in applying markings to webs or sheets of plastic material having a glossy surface. If an attempt is made to apply inked markings to such material, the ink will not adhere sufficiently to the glossy surface so that the marking can be easily wiped or rubbed off and, if very quick drying inks are used in order to avoid this defect, the ink tends to dry in the ink reservoir or on the ink applying rolls, and thereby necessitates the frequent cleaning of the marking apparatus. It has been proposed to mark such glossy surfaced materials by transferring the desired imprint or marking from a hot roll leaf stamping tape by means of a heated die. In apparatus employing hot roll leaf stamping tape for the marking of glossy surfaced materials, it is necessary that an unused portion of the tape be exposed to the action of the heated die during each of the succesive marking operations in order to ensure the attainment of a clear marking of uniform intensity. Thus, during the intervals between successive marking operations, the heated die is moved away from the surface to be marked, and feeding of the hot roll leaf stamping tape is effected, while the tape is held at rest during each of the successive marking operations so as to avoid blurring of the marking or imprint. However, difficulties have been experienced with the existing marking devices or apparatus employing hot roll leaf stamping tape, particularly with respect to the intermittent feeding of the tape during the intervals between successive marking operations.

Accordingly, it is an object of the present invention to provide an improved marking apparatus of the described character having a reliable mechanism for effecting the intermittent feeding of the hot roll leaf stamping tape during the intervals between the successive marking operations.

Another object is to provide a marking apparatus of the described character with a feeding mechanism for the hot roll leaf stamping tape which maintains the latter in a taut condition and positively effects feeding movements of the tape during the intervals between the successive marking operations.

A further object is to provide a marking apparatus of the described character having a heated die which is moved toward and away from the surface to be marked during each marking operation with means for preventing sticking or adhering of the hot roll leaf stamping tape to either the heated die or to the web or sheet material being marked.

Still another object is to provide a marking apparatus of the described character with a feeding arrangement for the hot roll leaf stamping tape that includes a supply reel or spool and a take-up reel or spool which are arranged at opposite sides of the path of movement of the material to be marked so that the tape is fed laterally with respect to such path of movement, and wherein the arrangement of the reels or spools is such as to minimize the space occupied by the marking apparatus.

In accordance with an aspect of the invention, a marking apparatus of the described character includes a platen or support over which the material to be marked is intermittently advanced, a heated die mounted above the platen and movable toward and away from the latter, a supply reel or spool carrying fresh hot roll leaf stamping tape and rotatably mounted at one side of the path of movement of the material to be marked, a take-up rool or spool rotatably mounted at the other side of the path of movement of the material to be marked and intended to have the used tape rewound thereon, guide means guiding the tape between the supply and take-up reels along a path extending laterally above the path of movement of the material to be marked and between the heated die and the material to be marked disposed above the platen or support, feeding mechanism for the tape including a drive shaft which is rotated in synchronism with the advancement or movement of the material to be marked, a slip drive from the drive shaft to the take-up reel or spool in order to maintain tension in the tape between the supply and take-up reels or spools, a feeding roller frictionally engaging the tape at a location between the heated die and the take-up reel or spool and an intermittently operative transmission for positively driving the feeding roller from the drive shaft, thereby to intermittently effect the positive feed of the tape, and actuating means also driven from the drive shaft for effecting the movements of the heated die toward and away from the material to be marked in synchronism with the positive feeding movements of the tape.

In accordance with another aspect of the invention, the transmission which is intermittently operative to directly drive the feeding roller from the drive shaft includes a ratchet wheel rotatably coupled to the feeding roller and engageable, at its periphery, by a pawl which is pivotally mounted on an arm rotatably coupled to the drive shaft, with the pawl being resiliently urged toward the periphery of the ratchet wheel and carrying a cam follower roller which engages a stationary radial cam assembly so that the pawl engages the ratchet wheel to couple the feeding roller to the drive shaft only when the cam follower roller rides upon a portion of the cam assembly having a relatively small radial extent. Preferably, the radial cam assembly includes two cam members which are arranged side by side and rotatably adjustable with respect to each other so that the angular extent of the lift or radially enlarged portion of the cam assembly, considered as a whole, can be conveniently varied, thereby to adjust the length of the tape advanced during each feeding operation. Thus, the length of the tape advanced during each feeding operation can be made to closely correspond to the distance covered by the type elements of the heated die, thereby to avoid waste of the hot roll leaf stamping tape.

In accordance with still another aspect of the invention, the guiding means for the hot roll leaf stamping tape includes guide rods extending parallel to the direction of movement of the material to be marked and located at opposite sides of the heated die, and wires extending from the guide rods and disposed at a level below that of the latter, with the tape passing over the guide rods and under the related wires, so that when the heated die is raised following the completion of a marking operation, the previously mentioned wires prevent the upward movement of the tape with the heated die and thereby avoid sticking of the tape to the type elements of the heated die. Further, since the tape follows an upwardly inclined path in moving from under the guide wire over the guide rod at the side of the heated die facing toward the take-up reel or spool, the pull exerted on the tape during the feeding movement thereof following a marking operation tends to pull the tape out of sticking contact

with the underlying web or sheet material that has been marked.

The above, and other objects, features and advantages of the invention, will be apparent in the following detailed description of an illustrative embodiment thereof which is to be read in connection with the accompanying drawings forming a part hereof, and wherein:

FIG. 1 is a front elevational view of a marking apparatus embodying the present invention;

FIG. 2 is a side elevational view showing the side of the marking apparatus of FIG. 1 at which the supply reel or spool is located;

FIG. 3 is a top plan view of the marking apparatus of FIG. 1 which is shown partly broken away and in section;

FIG. 4 is a side elevational view of the marking apparatus of FIG. 1, but as viewed from the side thereof at which the take-up reel or spool is located;

FIG. 5 is an enlarged detail sectional view taken along the line 5—5 of FIG. 1;

FIG. 6 is an enlarged detail sectional view taken along the line 6—6 of FIG. 1;

FIG. 7 is an enlarged sectional view taken along the line 7—7 of FIG. 5;

FIG. 8 is a diagrammatic perspective view illustrating the path of the hot roll leaf stamping tape in relation to the path of movement of the material to be marked;

FIG. 9 is an enlarged transverse sectional view taken along the line 9—9 of FIG. 3, and showing the relationship between the hot roll leaf stamping tape and guide members engageable therewith; and

FIG. 10 is a top plan view of the assembly of elements illustrated in FIG. 9, but with the die removed.

Referring to the drawings in detail, and initially to FIGS. 1 and 3 thereof, it will be seen that a marking apparatus embodying the present invention and there generally identified by the reference numeral **10** includes side frame members **12** and **14** which may be mounted on parallel, spaced apart angle members **16** or other suitable supports, and which have their lower portions joined to each other by a laterally extending bar **18**. A roller **20** extends laterally between side frames **12** and **14** at a location in front of bar **18** and has its opposite ends rotatably supported by the side frames, and a similar roller **22** extends laterally between the side frames and has its opposite ends rotatably supported by the latter at a location in back of laterally extending bar **18**.

The material to be marked, for example, a continuous plastic web indicated in broken lines at W on FIG. 3, is intermittently advanced in the forward direction, as indicated by the arrow **24** along a path extending between side frames **12** and **14** and passes over the guide rollers **20** and **22**. A suitable platen or anvil **26** is mounted on the laterally extending bar **18** and supports the web W during the marking thereof.

A shaft **28** extends laterally between side frames **12** and **14** at a location above the roller **22** and has its opposite ends rotatably mounted in suitable bearings provided in the side frames. A block **30** is adjustably secured on shaft **28**, for example, by a set screw **32** (FIG. 3) and has a bifurcated arm **34** extending forwardly therefrom. A heated die assembly generally indicated by the reference numeral **36** is suspended from the forward end of arm **34** and carries removable type elements **38** which project downwardly therefrom, as is apparent in FIG. 1. Since the heated die assembly **36** does not form a part of the present invention, it will not be described in detail, and it is merely indicated that the die assembly includes an electrical heating unit which is thermostatically controlled and which is effective to heat the type elements **38** corresponding to the desired marking to be applied to the web W.

It will be apparent that rocking of the shaft **28** is effective to raise and lower the heated die assembly **36** with respect to the platen **26**. As shown in FIGS. 1, 2 and 3, a collar **40** is secured on the end of the shaft **28** projecting through side frame **12**, and a rod **42** extends radially downward from collar **40** and, at its lower end, is connected to one end of a tension spring **44** which extends forwardly from the rod **42** and has its front end anchored to a screw **46** extending from side frame **12**. Thus, the sphing **44** tends to turn shaft **28** in the counterclockwise direction, as viewed in FIG. 2, that is, in the direction, as viewed in FIG. 2, that is, in the direction for raising the heated die assembly **36**.

In order to control the movements of the die assembly **36**, the marking apparatus **10** further includes a drive shaft **48** extending parallel to the shaft **28** with its axis disposed below and in front of the axis of the shaft **28**. As shown in FIG. 3, the drive shaft **48** is rotatably mounted in bearings **50** within a sleeve **52** which is fixed in side frame **14**. The outer end of shaft **48** carries a gear or sprocket **54** through which the drive shaft is suitably driven, for example, by a gear transmission or chain (not shown), from the conveyor or other device effecting the intermittent advancement of the web W or other material to be marked. Thus, the drive shaft **48** is turned through a single complete revolution during each operating cycle of the marking apparatus, that is, during the period of advancement of the web W and the following period during which the web is at rest. The inner end of drive shaft **48** carries a radial cam **56** (FIGS. 3 and 6), and a radial arm **58** is secured on the adjacent end portion of the shaft **28**, for example, by a set screw **60**, and extends generally downward from the shaft **28**, with a cam follower roller **62** being rotatably mounted on the lower end of arm **58** for engagement with the periphery of cam **56**. Thus, as the cam **56** rotates with the drive shaft **48**, the arm **58** and shaft **28** are rocked so as to permit the spring **44** to raise the die assembly **36** during advancement of the web W, and to move the die assembly downwardly for effecting marking of the web in the manner hereinafter described in detail during the period when the web W is at rest.

In the apparatus **10** embodying the present invention, the type elements **38** of the heated die assembly **36** subject a hot roll leaf stamping tape, generally indicated at T (FIGS. 8, 9 and 10) to heat and pressure during each marking operation to effect the transfer of pigment from the tape T to the underlying web W supported by the platen **26**, thereby to provide a permanent and clear marking on the web. In order to insure that the successive applied markings will all have uniform intensities, it is necessary that an unused area of the tape T be exposed to the action of the type elements **38** during each of the successive marking operations. In order to achieve this objective, the marking apparatus **10** includes a feeding mechanism for the tape T which guides the tape laterally across the path of movement of the web W with a portion of the tape T passing between the type elements **38** and the underlying web, and the feeding mechanism is effective to intermittently advance the tape during the period when the type elements are elevated so that, when the die assembly **36** is next moved downwardly, an unused portion of the tape will be exposed to the action of the type elements.

In the marking apparatus embodying the present invention, the new or unused tape is rolled upon a supply reel or spool **64** (FIGS. 1, 2 and 3) which is disposed adjacent the side frame **12** and mounted for rotation in a vertical plane about an axis extending laterally with respect to the direction of movement of the web W so that the supply reel **64** lies relatively flat against the side of the marking apparatus and thereby occupies a relatively small space. The support for the supply reel or spool **64** includes a bracket **66** secured to the side frame **12**, as by screws **68** and extending downwardly from the side frame. An axle **70** defining the axis of rotation of the reel or spool **64** projects laterally outward from the lower end of the bracket **66**, and a bushing or sleeve **72** is rotatable on the axle **70** between the bracket **66** and a collar **74** which is secured on the outer end portion of the axle **70**, for

example, by a set screw 76 (FIG. 3). As shown in FIGS. 1 and 3, the supply reel or spool 64 includes a pair of disks 78 disposed in parallel, spaced apart relation and each having a hub 80 which is slidable on the sleeve 72 and secured in adjusted position relative to the latter, for example, by a set screw 82 (FIG. 3). Thus, the distance between the disks 78 may be varied in order to adjust the reel or spool 64 for accommodating tapes having different widths.

The used tape is rewound on a take-up reel or spool 84 which is disposed adjacent the side frame 14 and mounted for rotation in a vertical plane about an axis extending laterally with respect to the direction of movement of the web W. The mounting for the take-up reel or spool 84 includes a bracket 86 (FIGS. 1 and 4) secured to the outside of the side frame 14, as by bolts 88, and extending downwardly from the side frame. An axle 90 projects laterally outward from the lower end of the bracket 86 and defines the axis of rotation of the reel or spool 84. A bushing or sleeve 92 is rotatable on the axle 90 between the bracket 86 and a collar 94 that is secured on the outer end portion of the axle 90, for example, by a set screw 96 (FIG. 3). In order to permit the take-up reel or spool 84 to accommodate tapes having different widths, the reel 84 also includes a pair of parallel spaced apart disks 98 each having a hub 100 that is axially movable along the sleeve 92 and is secured in adjusted position relative to the latter, for example, by means of a set screw 102 (FIG. 3).

In order to drive the take-up reel or spool 84, the outer end portion of the sleeve or bushing 92 is formed with an annular groove 104 (FIGS. 1 and 3) defining a pulley groove which receives an endless coil spring 106 running around a grooved pulley 108 secured on the drive shaft 48, for example, by a set screw 110 (FIG. 3).

Thus, the take-up reel or spool 84 is yieldably driven from the drive shaft 48, and it is apparent that the spring 106 can stretch on one side and have its turns compacted on the other side to permit the reel or spool 84 to remain at rest while the drive shaft 48 continues to rotate.

In order to guide the tape T from the supply reel 64 through the take-up reel 84, the marking apparatus 10 has guiding means that includes a pair of guide pins 112 extending laterally outward in parallel, slightly spaced apart relationship from the bracket 66 at a location immediately above the supply reel 64 so that the tape T is drawn upwardly from the reel 64 and passes between the guide pins 112. During movement between the guide pins 112, the tape follows a vertically upward directed path and lies in a laterally extending plane, and it is necessary that the path of the tape be diverted to a lateral direction with the tape lying in a horizontal plane. This objective is achieved by a guide plate 114 which lies in a horizontal plane above the guide pins 112 and which has a diagonal edge 116 in guiding engagement with the tape T, as is shown in FIG. 8. In order to permit adjustment of the guide plate 114, the latter is mounted on a vertical, depending post 118 (FIGS. 1 and 2) which is vertically slidable in a bore formed in a mounting block 120, and which is held in vertically adjusted position relative to the block 120, for example, by means of a set screw 122 (FIG. 2). The mounting block 120 is, in turn, laterally slidable on the inner portions of the guide pins 112 and is held in laterally adjusted position with respect to the latter, for example, by means of a set screw 124 (FIG. 1). It will be apparent that, by moving the mounting block 120 laterally on the guide pins 112, the laterally directed run of the tape T extending from the guide plate 114 can be adjusted in the direction of movement of the web W, whereas, vertical adjustment of the post 118 relative to the mounting block 120 is effective to adjust the level of the laterally directed run of the tape with respect to the level of the web to be marked.

The laterally directed run of the tape extending from the guide plate 114 passes over a guide rod 126 which extends forwardly from a block 128 that is adjustably secured to a rod 130 extending laterally between the side frames 12 and 14 at a location between the back roller 22 and the shaft 28. As is apparent in FIG. 3, guide collars 132 are axially adjustable on the guide rod 126 so as to guide the tape therebetween. A U-shaped guide wire 134 has its opposite free ends secured in the guide rod 126 and extends inwardly and downwardly from the guide rod 126, and the tape T passes under the guide wire 134 at the side of the die assembly 36 facing toward side frame 12, as is apparent in FIG. 8. Since the guide rod 126 is adjustable about its axis relative to the block 128 and is secured in its adjusted position, for example, by a set screw 136 (FIG. 3) it is apparent that the level of the portion of the guide wire 134 engaging the tape T from above can be conveniently adjusted, thereby to determine the level of the tape passing between the die assembly 36 and the web overlying the platen 26.

At the opposite side of the die assembly 36, that is, at the side facing the side frame 14, the marking apparatus 10 further includes a guide rod 126*a* which is similar to the guide rod 126, and thus is adjustably held by a set screw 136*a* in a mounting block 128*a* adjustably secured on the lateral rod 130, and further carries guide collars 132*a* and a guide wire 134*a* projecting downwardly and inwardly toward the location of the die assembly. After passing between the die assembly 36 and the web W overlying the platen 26, the tape T travels under the guide wire 134*a* and then over the guide rod 126*a* between the collars 132*a* on the latter, as is apparent in FIGS. 8, 9 and 10. From the guide rod 126*a*, the tape T travels laterally over a guide plate 138 which is disposed in a horizontal plane and secured on the side frame 14, for example, by screws 140, at least one of which extends through an elongated slot 142 in the guide plate 138 so as to permit swinging adjustment of the latter in its horizontal plane. The outer edge 144 is cut on the diagonal, that is, at forty five degrees with respect to the direction of movement of the web W, and, as shown in FIG. 8, the tape T travels around the diagonal edge 144 and then rearwardly under the guide plate 138 so as to pass over and in back of a feeding roll assembly which is generally identified by the reference numeral 146.

As is shown in FIG. 3, the feeding roll assembly 146 includes a tubular body 148 having a rubber or other layer 150 thereon providing a good frictional grip with respect to the tape T. The tubular body 148 is fixed on a sleeve 152 which telescopes over the drive shaft 48 and is rotatably mounted with respect to the latter by means of bearings 154. Thus, the feeding roll assembly 146 can remain at rest while the drive shaft 48 continues to rotate.

In order to effect the positive intermittent rotation of the feeding roll assembly 146, the apparatus 10 further includes an intermittently operative transmission or coupling device that has a ratchet wheel 156 secured on the sleeve 152 adjacent the inner end of the tubular body 148, and a pawl assembly 158 that rotates with the drive shaft 48 and intermittently engages the ratchet wheel 156 so as to drive the feeding roll assembly from the drive shaft. As shown in detail in FIGS. 5 and 7, the pawl assembly 158 includes an arm 160 extending radially from the shaft 48 at the side of the ratchet wheel 156 facing toward the adjacent side frame 14, the arm 160 being secured to the shaft 48 for rotation with the latter, for example, by a set screw 162 (FIG. 7). A pawl member 164 is rockably mounted, at one end, on a pivot 166 carried by the free end of arm 160, and has a nose 168 which is engageable with the peripheral teeth of the ratchet wheel 156, as shown in FIG. 5. A tension spring 170 is connected, at its upper end, to a pin 172 projecting laterally from the pawl 164, and the lower

end of the spring 170 is connected to a bent pin 174 projecting from the arm 160, so that the spring 170 urges the pawl 164 to rock in the clockwise direction relative to the arm 160, as viewed in FIG. 5, that is, in the direction for engaging the nose 168 of the pawl with the teeth of the ratchet wheel 156.

So long as the nose 168 of the pawl 164 engages the teeth of the ratchet wheel 156, as shown in FIG. 5, the feeding roll assembly 146 is positively driven from the drive shaft 48. In order to intermittently disengage the drive for the feeding roll assembly 146, the apparatus 10 further includes a radial cam assembly 176 which is fixedly mounted on the sleeve 52 (FIG. 3) and is located between the arm 160 of the pawl assembly and the adjacent side frame 14. The periphery of the cam assembly 176 is engaged by a cam follower roller 177 which is rotatable on an axle 179 extending laterally from the free end of the pawl 164. Thus, when the cam follower roller 177 rides onto a radially enlarged portion of the cam assembly 176, the pawl 164 is rocked relative to the arm 160 in the direction for disengaging the nose 168 of the pawl from the teeth of the ratchet wheel 156. On the other hand, when the cam follower roller 177 engages the portion of the cam assembly 176 having a relatively small radial dimension, the spring 170 can then act to rock the pawl 164 so as to engage the nose 168 with the ratchet wheel teeth.

It will be apparent that the cam assembly 176 is formed and is rotatably positioned on the shaft 48 in relation to the cam 56 which controls the movements of the die assembly 36, so that, when the die assembly is raised, the pawl assembly 158 positively drives the feeding roll assembly 146 from the rotated drive shaft 48, thereby to effect feeding of the tape laterally under the raised die assembly 36, and so that powl assembly 158 is disengaged from the ratchet wheel 156 to permit the feeding roll assembly to remain at rest, when the die assembly 36 is lowered in order to effect marking of the web W by transfer of pigment from the tape T.

Although the spring belt 106 continuously urges the take-up reel 84 to rotate with the drive shaft 48, the spring belt 106 is sufficiently yieldable so that the driving force that can be transmitted thereby to the take-up reel is less than the normal drag on the tape extending from the supply reel 64 to the take-up reel and, if desired, the drag on the tape may be suitably increased, for example, by providing a yieldable braking force on the supply reel 64. Thus, while the yieldable drive of the take-up reel 84 always maintains the tape in a taut condition, the tape is actually advanced only when it is positively driven by rotation of the feeding roll assembly 146 with which the tape is in frictional engagement.

It will be seen that the distance through which the tape T is advanced during each operating cycle of the marking apparatus, that is, during each revolution of the drive shaft 48 will depend upon the angular extent of the radially large portion of the cam assembly 176 which determines the portion of each revolution during which the pawl assembly 158 is disengaged from the ratchet wheel 156. Since the type elements 38 are removably carried by the heated die assembly 36, and may be conveniently replaced, it is apparent that the lateral extent of the type elements may vary for different markings to be applied to the web W. Thus, it is desirable that the distance through which the tape T is advanced during each operating cycle should substantially correspond to the lateral extent of the type elements 38, thereby to avoid waste of the tape T. In order to adjust the length of the tape fed during each operating cycle of the marking apparatus, the cam assembly 176 preferably includes two radial cams 178 and 180 which are disposed side by side, with the cam 178 having a hollow hub 182 turnable on the sleeve 52 and adjustably secured to the latter by a set screw, and with the cam 180 having a larger hollow hub 184 which is adjustably rotatable on the hollow hub 182 and adapted to be secured to the latter by a set screw 186 (FIG. 3). Thus, the cam 180 can be angularly adjusted relative to the cam 178 in order to vary the effective overall angular extent of the radially raised portions of both cams.

In order to ensure the positive frictional engagement of the tape T with the frictional surface of the feeding roll assembly 146, so that the tape will be positively advanced when the feeding roll assembly is rotated, the marking apparatus 10 further includes a pressure roller 188 disposed in back of the feeding roll assembly 146 and arranged with its axis parallel to the latter. The pressure roller 188 is rotatably mounted, at its opposite ends, in arms 190 that extend radially from a tube or sleeve 192 (FIGS. 3 and 4) rotatable on an axle 194 extending parallel to the drive shaft 48 and having an inner threaded end 196 that is secured in a tapped bore 198 in the side frame 14 (FIG. 3). An arm 200 extends radially from the inner end of the tube 192 and is secured to the latter, and a spring 202 is secured, at one end, to a pin 204 projecting from the free end of the arm 200 and extends forwardly from the latter for connection, at its opposite end, to a pin 206 (shown in broken lines on FIG. 4) which projects from side frame 14. Thus, spring 202 urges the tube 192 to turn in the clockwise direction, as viewed in FIG. 4, and thereby presses the roller 188 towards the surface of the feeding roll assembly 146 for positively gripping the tape T therebetween prior to the rewinding of the used tape on the take-up reel 84, as shown in FIG. 8.

It will be apparent from the above description of a marking apparatus embodying the invention that such apparatus effects the positive feeding movement of the tape T through an adjustably predetermined distance during that portion of each operating cycle when the heated die assembly is in its raised position, and that the tape is maintained under tension during all portions of the operating cycle, thereby to ensure that the tape will lie smoothly under the type elements 38 when the die assembly is moved downwardly to effect marking of the underlying web W. Referring to FIG. 9, it will be apparent that the guide wires 134 and 134*a* which engage above the tape T at the opposite sides of the heated die assembly 36 ensure that the tape will separate from the type elements 38 when the die assembly is raised at the conclusion of a marking operation. Further, since the tape is fed in a direction at right angles to the direction of movement of the web W, and such movements of the tape T and web W occur simultaneously at the conclusion of the marking operation, a shearing action is achieved in order to prevent adherence of the tape to the marked web. The separation of the tape T from the marked web is further assisted by the upwardly inclined path of the tape between the guide wire 134*a* and the guide rod 126*a*, whereby the pull exerted on the tape has an upwardly directed component, that is, in the direction away from the marked surface of the web W.

Further, in order to prevent sticking of the marked web to the underlying platen 26, the apparatus 10 may further include additional wires 208 and 210 respectively extending laterally in front of the platen 26 and in back of the platen 26, and being disposed at a level above the top surface of the platen (FIGS. 9 and 10). The additional wires 208 and 210 engage the undersurface of the web W so that if the web W sticks to the platen 26 between the wires 208 and 210 during the marking of the web, the web will be inclined upwardly from the area where it is stuck to the platen in the direction toward the wire 208 at a higher level, and the subsequently applied force for effecting advancement of the web W will have an upwardly directed component effective to pull the web away from the surface of the platen 26.

Although a particular embodiment of the invention has been described in detail herein with reference to the accompanying drawings, it is to be noted that the inven-

tion is not limited to that precise embodiment, and that various changes and modifications may be effected therein without departing from the scope or spirit of the invention, except as defined in the appended claims.

What is claimed is:

1. In a marking apparatus for applying markings to a surface that is intermittently advanced along a predetermined path; the combination of support means underlying the path and adapted to support the surface during the marking thereof, a heated die means disposed above said support means and movable cyclically toward said support means, so as to apply heat and pressure to a hot roll leaf stamping tape disposed between the surface to be marked and said die means for transferring a marking from said tape to said surface, and away from said support means, so as to release the marked surface for advancement of the latter, a supply reel rotatably mounted at one side of said path and carrying a supply of the stamping tape, a take-up reel rotatably mounted at the other side of said path and adapted to have the used stamping tape rewound thereon, guide means engaging the tape between said supply and take-up reels and directing the stamping tape laterally across said path between said die means and the surface to be marked, a continuously rotated drive shaft, yieldable transmission means between said drive shaft and said take-up reel for urging the latter to rotate in the direction maintaining the tape in taut condition between said reels, means actuated by said drive shaft for controlling the movements of said die means toward and away from said support means, and feeding means for the stamping tape including a feeding roll rotatably mounted on said drive shaft for rotation independently of the latter and frictionally engaging the stamping tape at a location along the latter between said die means and said take-up reel to positively feed the stamping tape when said feeding roll is rotated, a ratchet wheel rotatably coupled to said feeding roll, a pawl assembly rotatably coupled to said drive shaft and having a pawl spring urged into engagement with said ratchet wheel so that said feeding roll is thereby rotatably coupled to said drive shaft, and control means operative to disengage said pawl from said ratchet wheel during a predetermined portion of each revolution of said drive shaft so that said feeding roll is only rotated during the remaining portion of each revolution and feeds the tape a corresponding predetermined distance.

2. In a marking apparatus, the combination as in claim 1; wherein said control means for the pawl includes a stationary cam assembly disposed adjacent said pawl assembly and having a radially raised peripheral portion, and a cam follower roller on said pawl riding on the periphery of said cam assembly to disengage said pawl from said ratchet wheel when said cam follower roller engages said radially raised peripheral portion.

3. In a marking apparatus, the combination as in claim 2; wherein said cam assembly includes at least two radial cams mounted side-by-side for rotational adjustment relative to each other, each of said radial cams having a portion of relatively large radial extent so that the radially raised peripheral portion of the cam assembly is defined by the portions of relatively large radial extent of all of said radial cams.

4. In a marking apparatus, the combination as in claim 2; wherein said means controlling the movements of the die means includes spring actuated means urging said die means to move in the direction away from said support means, a cam fixed on said drive shaft to rotate with the latter, and cam follower means connected to said die means and urged against said cam by the movement of the die means away from said support means by said spring actuated means, said cam having a portion thereof effecting movement of said die means toward said support means when engaged by said cam follower means during each revolution of said drive shaft.

5. In a marking apparatus, the combination as in claim 4; wherein said yieldable transmission means between the drive shaft and the take-up reel includes pulleys rotatably coupled with said drive shaft and take-up reel, respectively, and a spring belt running around said pulleys and operative to transmit a limited driving force so that said take-up reel is held against rotation when the drag on said stamping tape exceeds said limited driving force.

6. In a marking apparatus for applying markings to a surface that is intermittently advanced along a predetermined path; the combination of support means underlying the path and adapted to support the surface during the marking thereof, a heated die means disposed above said support means and movable cyclically toward said support means, so as to apply heat and pressure to a hot roll leaf stamping tape disposed between the surface to be marked and said die means for transferring a marking from said tape to said surface, and away from said support means, so as to release the marked surface for advancement of the latter, a supply reel mounted at one side of said path and carrying a supply of the stamping tape, a take-up reel rotatably mounted at the other side of said path and adapted to have the used stamping tape rewound thereon, means operative to intermittently effect the feeding movement of the stamping tape across said path and to rewind the used stamping tape on said take-up reel, and guide means directing the stamping tape laterally across said path between said die means and the surface to be marked and including adjustably fixed guide rods disposed above said path of the surface to be marked at the opposite sides of said die means and extending in the direction of advancement of the surface along said path, and guide wires extending downwardly and inwardly from said guide rods, the stamping tape passing over said guide rods and under said guide wires so that the tape is separated from the die means by said guide wires during movement of the die means away from said support means and the tape moves along an upwardly inclined path from said guide wire to said guide rod at the side of the die means facing toward said other side of the path so as to be pulled free of the marked surface during feeding movement of the stamping tape.

7. In a marking apparatus, the combination as in claim 6; further comprising laterally extending wires fixedly mounted in front and in black of said support means and projecting above the latter to separate the marked surface from said support means upon the intermittent advancement of the surface.

8. In a marking apparatus for applying markings to a surface that is intermittently advanced along a predetermined substantially horizontal path; the combination of support means underlying the path and adapted to support the surface during the marking thereof, a heated die means disposed above said support means and movable cyclically toward said support means, so as to apply heat and pressure to a hot roll leaf stamping tape disposed between the surface to be marked and said die means for transferring a marking from said tape to said surface, and away from said support means, so as to release the marked surface for advancement of the latter, a supply reel mounted at one side of said path at a level below the latter and being rotatable in a substantially vertical plane extending parallel to said path and carrying a supply of the stamping tape, a take-up reel mounted at the other side of said path also below the level of the latter and being rotatable in a plane parallel to the plane of rotation of said supply reel and adapted to have the used stamping tape rewound thereon, guide means engaging the tape between said supply and take-up reels and directing the stamping tape laterally across said path between said die means and the surface to be marked, said guide means including horizontal guide plates disposed above the supply and take-up reels, respectively, and having guiding edges engageable by the stamping tape and being disposed at acute angles with respect to said path for turning the stamping tape through ninety degrees between the directions of the stamping tape required for removal

from the supply reel and rewinding on the take-up reel and the direction of the tape required for lateral movement thereof across the path of the surface to be marked, and means operative to effect the intermittent feeding movement of the stamping tape when said die means is moved away from said support means and to rewind the used stamping tape on said take-up reel.

9. In a marking apparatus, the combination as in claim 8; wherein said guide means further includes adjustably fixed guide rods disposed above said path of the surface to be marked at the opposite sides of said die means and extending in the direction of advancement of the surface along said path, and guide wires extending downwardly and inwardly from said guide rods, the stamping tape passing over said guide rods and under said guide wires so that the tape is separated from the die means by said guide wires during movement of the die means away from said support means and the tape moves along an upwardly inclined path from said guide wire to said guide rod at the side of the die means facing toward said other side of the path so as to be pulled free of the marked surface during feeding movement of the stamping tape.

10. In a marking apparatus, the combination as in claim 9; further comprising laterally extending wires fixedly mounted in front and in back of said support means and projecting above the latter to separate the marked surface from said support means upon the intermittent advancement of the surface.

11. In a marking apparatus for applying markings to a surface that is intermittently advanced along a predetermined path; the combination of support means underlying the path and adapted to support the surface during the marking thereof, a heated die means disposed above said support means and moved cyclically toward said support means, so as to apply heat and pressure to a hot roll leaf stamping tape disposed between the surface to be marked and said die means for transferring a marking from said tape to said surface, and away from said support means, so as to release the marked surface for advancement of the latter, a source of stamping tape at one side of said path, a take-up reel mounted at the other side of said path and rotated for rewinding of the used stamping tape thereon, guide means engaging the tape between said source and said take-up reel and directing the stamping tape laterally across said path between said die means and the surface to be marked, a continuously rotated drive shaft, and feeding means for the stamping tape including a feeding roll rotatably mounted on said drive shaft for rotation independently of the latter and frictionally engaging the stamping tape at a location along the latter between said die means and said take-up reel to positively feed the stamping tape when said feeding roll is rotated, a ratchet wheel rotatably coupled to said feeding roll, a pawl assembly rotatably coupled to said drive shaft and having a pawl spring urged into engagement with said ratchet wheel so that said feeding roll is thereby rotatably coupled to said drive shaft, and control means operative to disengage said pawl from said ratchet wheel during a predetermined portion of each revolution of said drive shaft so that said feeding roll is only rotated during the remaining portion of each revolution and feeds the tape a corresponding predetermined distance.

12. In a marking apparatus, the combination as in claim 11; wherein said control means for the pawl includes a stationary cam assembly disposed adjacent said pawl assembly and having a radially raised peripheral portion, and a cam follower roller on said pawl riding on the periphery of said cam assembly to disengage said pawl from said ratchet wheel when said cam follower roller engages said radially raised periphery portion.

13. In a marking apparatus, the combination as in claim 12; wherein said cam assembly includes at least two radial cams mounted side-by-side for rotational adjustment relative to each other, each of said radial cams having a portion of relatively large radial extent so that the radially raised peripheral portion of the cam assembly is defined by the portions of relatively large radial extent of all of said radial cams.

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