Nov. 27, 1962 A. O. SOHN 3,065,691

PRINTING AND DIE CUTTING MACHINE

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Fig. 1

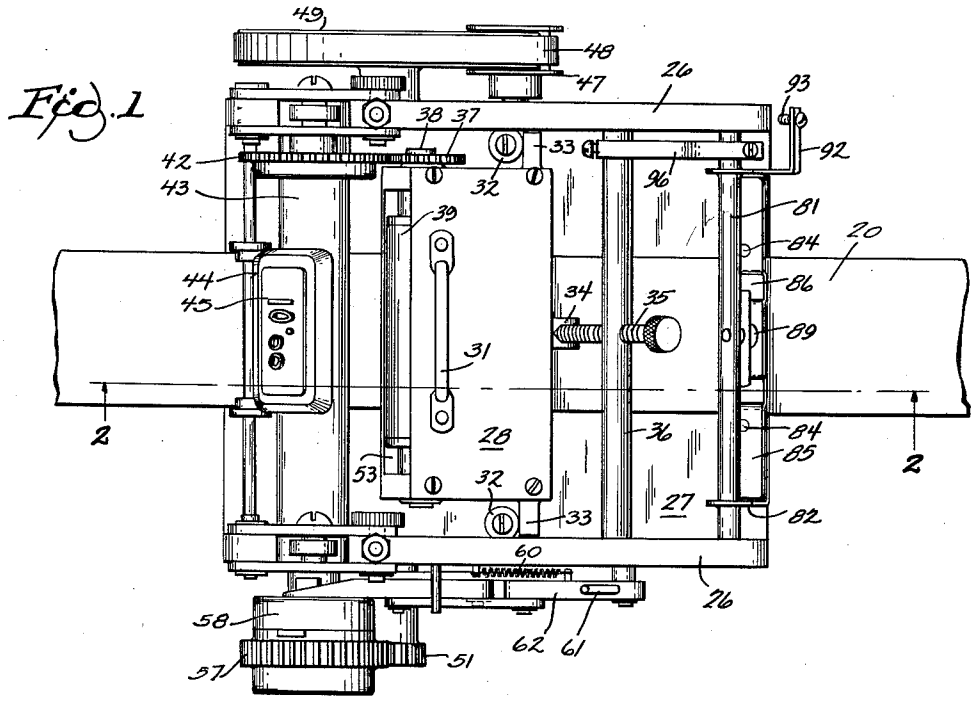
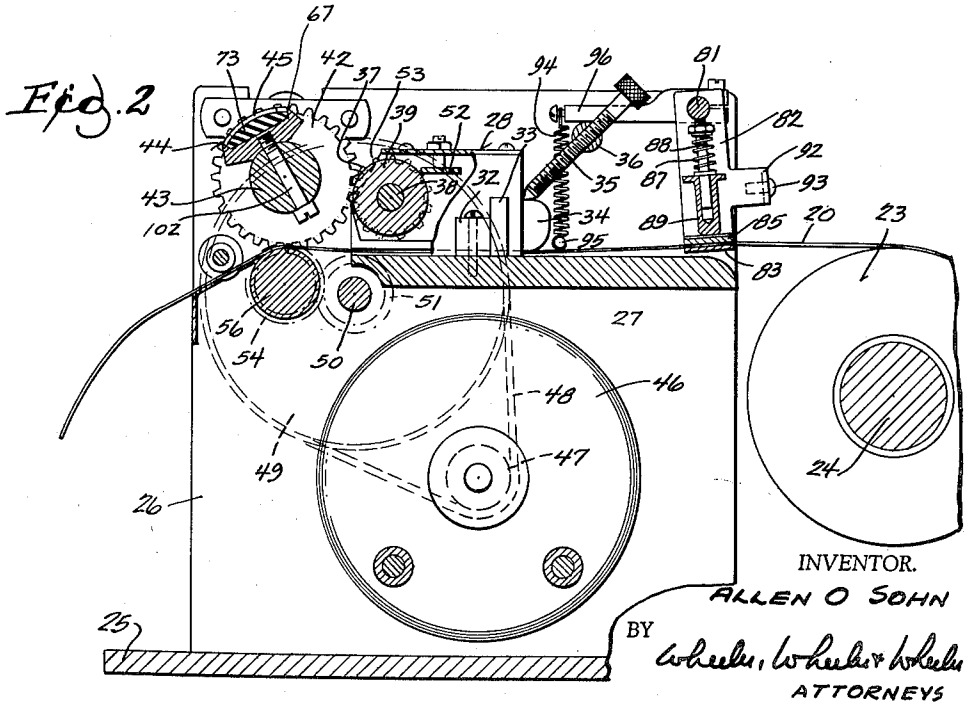


Fig. 2



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PRINTING AND DIE CUTTING MACHINE

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Fig. 3

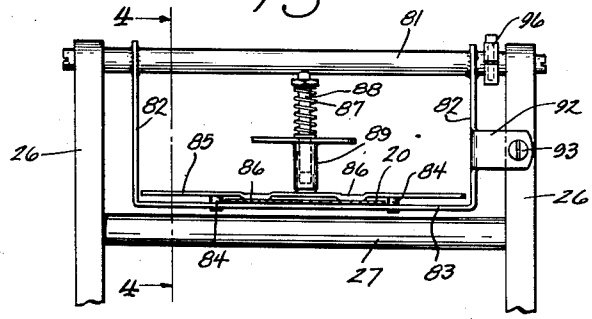
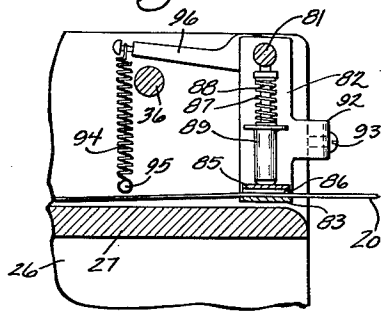


Fig. 4



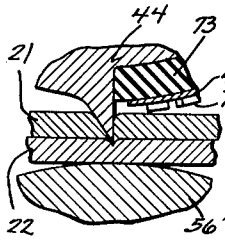


Fig. 5

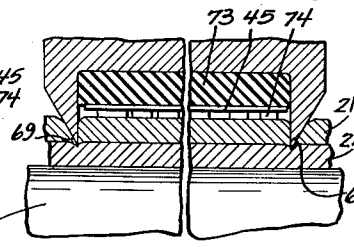


Fig. 6

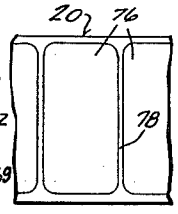


Fig. 7

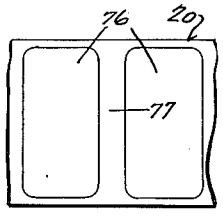


Fig. 8

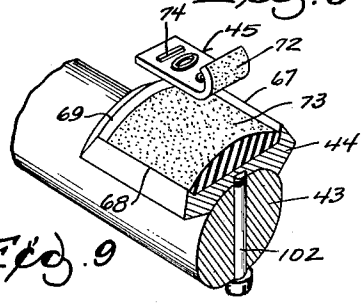


Fig. 9

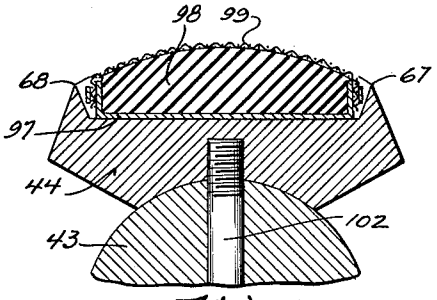
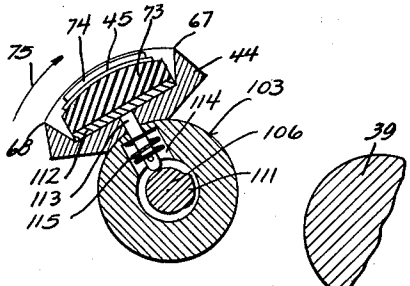


Fig. 10



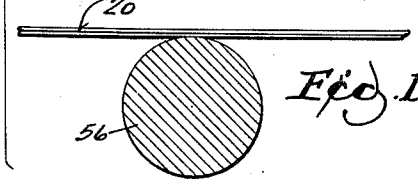


Fig. 11

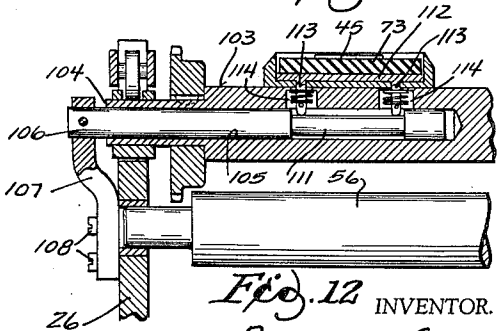


Fig. 12

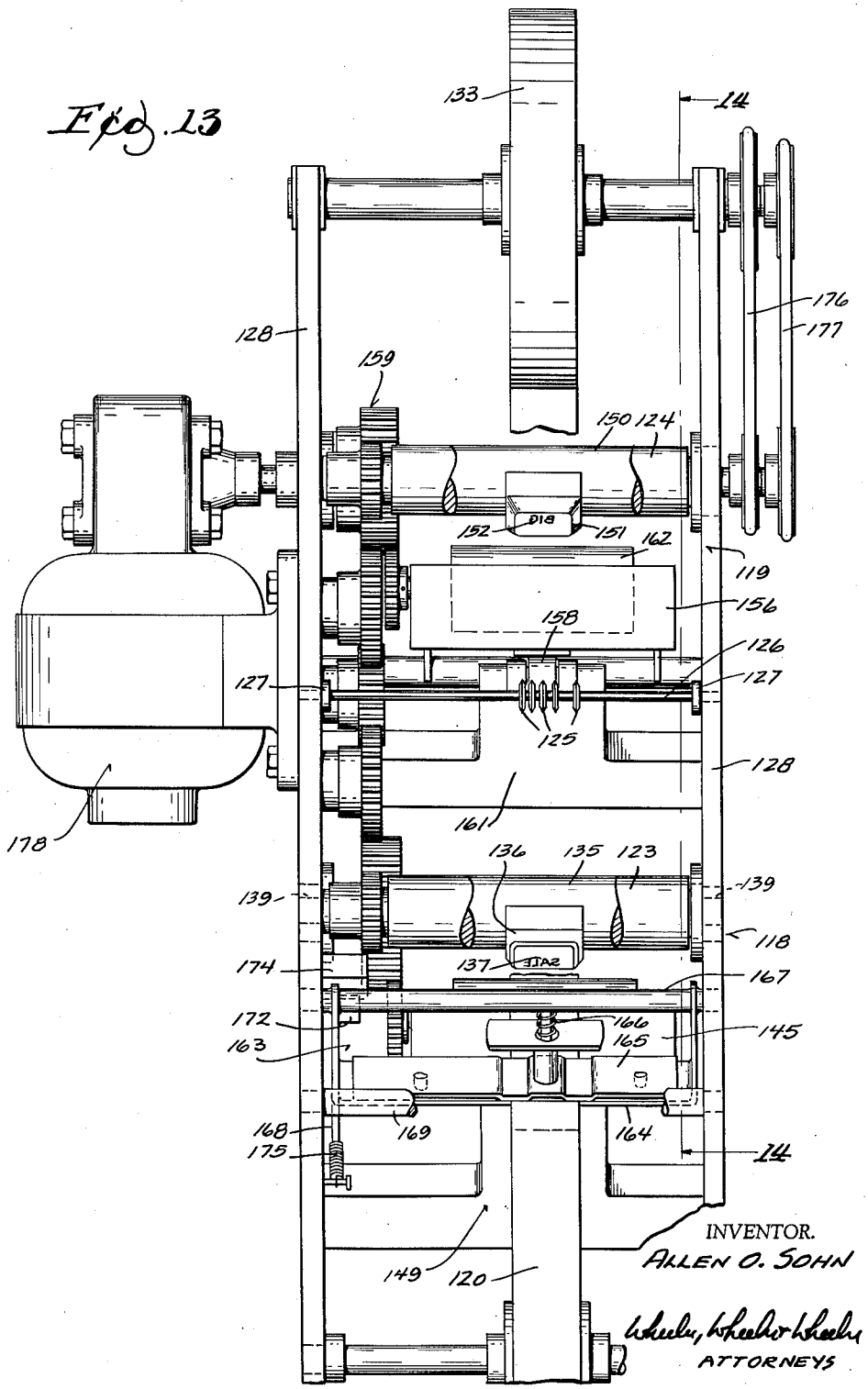
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Nov. 27, 1962 A. O. SOHN 3,065,691

PRINTING AND DIE CUTTING MACHINE

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Fig. 13



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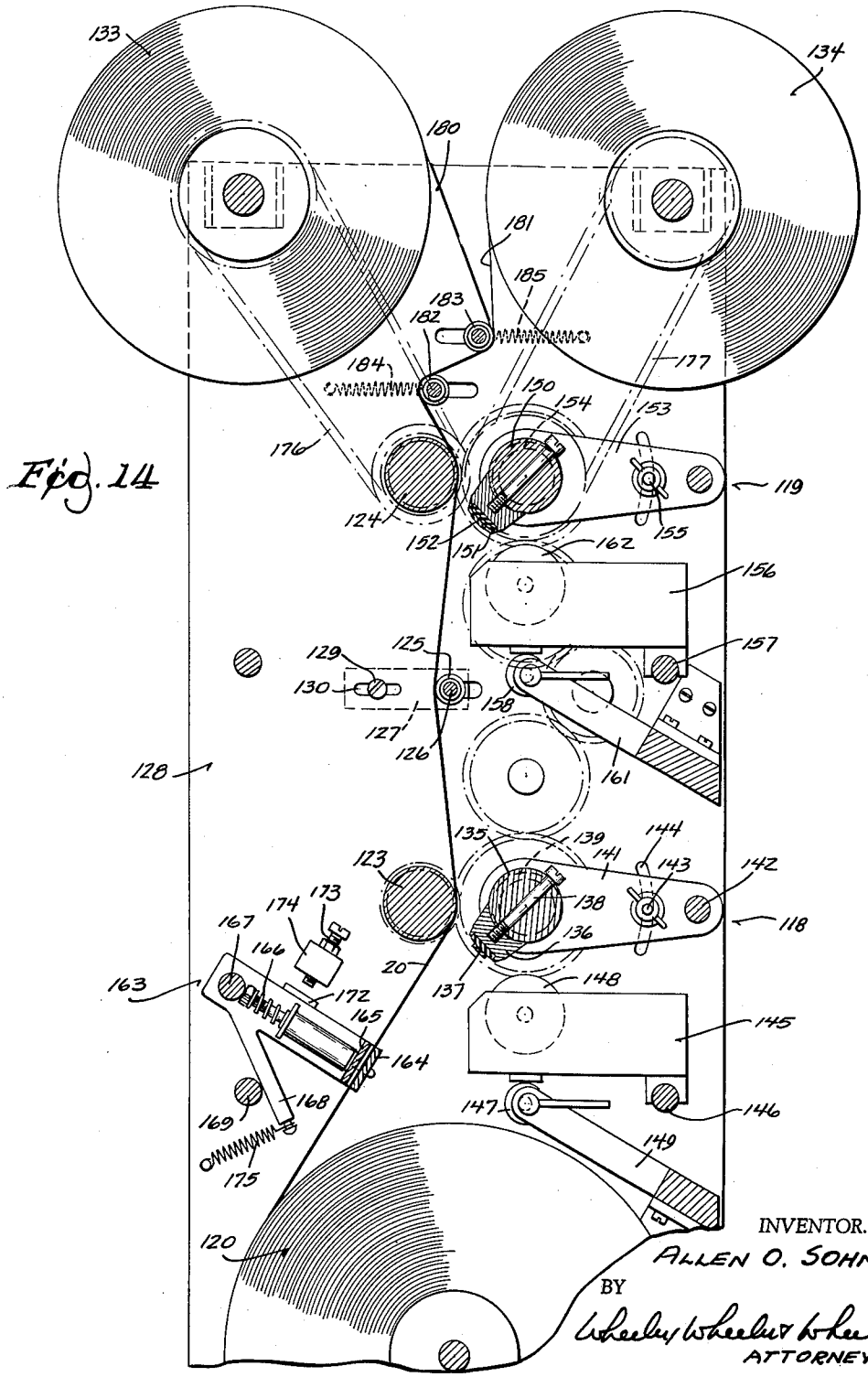
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PRINTING AND DIE CUTTING MACHINE

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Fig. 14



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United States Patent Office

3,065,691
Patented Nov. 27, 1962

3,065,691

PRINTING AND DIE CUTTING MACHINE

Allen O. Sohn, Plymouth, Wis.

Filed Mar. 27, 1959, Ser. No. 802,385
9 Claims. (Cl. 101—227)

This invention relates to a printing and die cutting machine.

The machine of the present invention is designed to be inexpensively manufactured for use by merchandising establishments having short notice requirements for short runs of printed and die cut pressure sensitive labels and the like.

Inexpensive printing and die cutting machines heretofore available have not been able to print clearly, nor in very small type. For neatly and clearly printed small type labels, the merchandiser has generally had to go to a large printing establishment having conventional printing presses. Such presses are not adapted to economically produce on short notice short runs of pressure sensitive labels, etc.

An advantage of the device of the present invention is that notwithstanding its inexpensive construction, small size and portability, pressure sensitive labels produced thereon are printed with great definition and clarity substantially equal to labels produced on large printing presses, even in the smallest type and fine print.

This advantage is achieved in the device of the present invention at least in part because of the unique structural association of the type means and the label die cutter in which the die cutter coacts with the paper web concurrently with the imprinting of the type on the paper web, thus to positively interlock the movement of the web to the movement of the type during interaction of the die cutter on the paper web. In the preferred embodiment of the invention the die cutter completely surrounds the type means so that labels printed by the machine are instantly available for removal from a backing web and use immediately after printing.

The device of the present invention is designed to accept and print upon and die cut labels, etc. from conventional multi-ply web strips of the type in which the top ply consists of label material having a pressure sensitive undersurface, the lowermost ply comprising a backing strip for the pressure sensitive undercoating on the label strip.

For speedy operation, the device of the present invention incorporates a rotary printer and die cutter. Because the type means is desirably surrounded by the die cutter and because of the curved surfaces of the roll upon which the printer and die cutter is carried, there would ordinarily be a substantial gap between adjacent printed and die cut labels. Accordingly, the device of the present invention desirably includes means to retract the web after each printing and die cutting operation, whereby to narrow the gap between printed labels, thus to reduce waste.

An optional feature of devices embodying the invention is novel apparatus to project the type means beyond the edge of the die cutting knife blades as the type means passes an ink roll to transfer ink from the roll to the type without fouling the knife edges with ink which might otherwise be transferred thereto by the ink roll.

In one embodiment of the invention the device is adapted to imprint a single ink color onto the web. In another embodiment of the invention, multi-color printing can be accomplished. Both embodiments incorporate novel features hereinbefore mentioned.

Other objects, features and advantages of the invention will appear from the following disclosure in which:

FIG. 1 is a plan view of one embodiment of the invention.

FIG. 2 is a cross section taken along the line 2—2 of FIG. 1.

FIG. 3 is a fragmentary rear elevation of the machine of FIG. 1 showing only the web retractor.

FIG. 4 is a cross section taken through the line 4—4 of FIG. 3.

FIG. 5 is an enlarged fragmentary transverse cross section taken through cooperating parts of the printer and die cutter roll, platen roll and multi-ply web therebetween.

FIG. 6 is a fragmentary axial cross section taken through the same parts as are shown in FIG. 5.

FIGS. 7 and 8 are fragmentary plan views of a web and showing different patterns of labels which can be cut on the device of the present invention.

FIG. 9 is a fragmentary view, partly in perspective and partly in transverse cross section, through the printing and die cutting roll, a type strip being shown in spaced relation thereto.

FIG. 10 is a fragmentary transverse cross section taken through a somewhat different form of type means mounted on the die cutter and roll.

FIG. 11 is a fragmentary transverse cross section taken through a combination printing and die cutting roll, a platen roll and an ink roll, showing the relative spaced relation of these parts.

FIG. 12 is an axial cross section taken through a modified embodiment which incorporates means for projecting the type against the ink roll.

FIG. 13 is a plan view of a multi-colored printer and die cutter embodying the invention.

FIG. 14 is an axial cross section taken along the line 14—14 of FIG. 13.

The device of the present invention is adapted to print and die cut labels from a web 20 of conventional pressure sensitive label stock which includes a label ply 21 having a pressure sensitive undercoating adherent to an under ply 22 of backing paper, as is shown in FIGS. 5 and 6. The web strip 20 is fed into the machine from a supply roll 23 supported by suitable means on a shaft 24.

The machine shown in the embodiment of the invention of FIGS. 1 through 12 comprises a base plate 25 having side plates 26 upon which the operating parts of the machine are mounted.

The side plates 26 are connected intermediate their height by an apron or table 27 on which is mounted a self-contained inking unit 28 having a handle 31 by which the inking unit 28 can be bodily removed entirely from the apparatus in order to conveniently change the color of the ink simply by substituting a different inking unit.

The inking unit is supported on the apron 27 in slightly spaced relation thereto to permit the web 20 to pass therebetween. The apron has upstanding guide pegs 32 against which lugs 33 on the inking unit bear to properly position the unit on the table 27. The rear wall of the inking unit has a rearwardly projecting abutment lug 34 to receive the pressure of the screw 35 which is threaded through shaft 36 which is freely rotatable in suitable bearing apertures in the walls 26 of the machine. Screw 35 can be retracted from engagement with the lug 34 and when its end clears the lug 34, shaft 36 may be rotated counterclockwise as shown in FIG. 2, thus clearing the inking unit 28 for removal from the machine, as by lifting it by its handle 31.

The inking unit 28 consists of a reservoir for ink adapted to be picked up by the inking roll 39 and doctored by the blade 52. The upper corner of the unit 28 is open at 53 to expose the ink roll 39 to ink the type, as is diagrammatically shown in FIG. 11.

When the inking unit 28 is properly positioned in the machine, gear 37 mounted on shaft 38 of its inking roll 39 meshes with gear 42 on the shaft 43 which carries the combination die cutter 44 and printing type means 45. Accordingly, the inking roll is driven in time with the roll 43. Roll 43 is driven by the electric motor 46 which has an armature pulley 47 for a belt 48 which drives a pulley 49 mounted on a cross shaft 50 having a gear 51 meshing with a gear 54 on platen roll 56. Gear 54 meshes with gear 57 on a one-revolution clutch 58 which transmits motion from gear 57 to the shaft 43.

Accordingly, both the platen roll 56 and the printer and die cutter roll 43 are power driven. Platen roll 56 is driven constantly, but the printing and die cutting roll 43 is driven intermittently through the one-revolution clutch 58 under control of lever 61 mounted on the control arm 62 for the clutch 58.

The clutch 58 is otherwise conventional and is similar to the clutch shown in my United States patent application Serial No. 481,374 and need not be further described herein. It is sufficient to point out for the purposes of this application that the clutch will engage each time the lever 61 is manipulated, thus to impart a single rotation to the printing and die cutting roll 43. Where a series of labels are to be printed and die cut successively, the lever 61 can simply be held down against the bias of spring 60 for continuous rotation of roll 43.

The coaction of the printing and die cutting elements with the multi-ply web 20 and the platen roll 56 is best shown in FIGS. 5, 6 and 11. The die cutter 44, best shown in FIG. 9, has a foremost knife edge 67, a rearmost knife edge 68, and side knife edges 69. These edges desirably completely surround the type means 45.

In the embodiment of the invention shown in FIG. 9, the type means 45 simply consists of a tape strip having a pressure sensitive undersurface 72 which will adhere to the resilient bed 73 mounted adhesively or otherwise within a recess in the die cutter 44. The strip 45 has appropriate type face means 74 affixed to the upper surface thereof.

As shown in FIG. 11, roll 43 will rotate in the direction of arrow 75 when suitably actuated by the clutch 58. The web 20 ordinarily lies relatively loosely between platen roll 56 and printing roll 43. As soon as the forward knife edge 67 of the die cutter 44 reaches a position somewhat prior to its position shown in FIG. 5, it will bite into the uppermost ply 21 of the web 20, both to cut into and through the uppermost ply 21 and to feed the web between the rolls 56, 43. The side knife edges 69 of the die cutter 44 will also cut into and through the upper ply 21 of the web, as shown in FIG. 6. The knife edges of the die cutter will positively feed the web through the rolls as well as sever the uppermost ply 21 into discrete labels 76 shown in FIGS. 7 and 8. Accordingly, the movement of the web is positively interlocked with the movement of the type face 74 so that there will be no tendency on the part of the web 20 to move or become displaced with respect to the type 74. The device of the present invention is thus adapted to print with very small type and very fine print can be effected without smudging and with remarkable clarity of the printed matter on the labels.

After the web has been printed, the rearmost knife edge 68 on the die cutter 44 will complete the severing of the label 76 from the top ply 21 of the web 20. Accordingly, in one rotation of the roll 43, the upper most ply of the web 20 has been both printed and severed. Of course, the label 76 will continue to adhere to the backing ply 22 by reason of the pressure sensitive undercoating thereof, but may be readily stripped manually or otherwise from the backing ply.

Because of the curvature of the rolls 56 and 43 and the consequent need for the knife edge 68 to move considerably past the roll center line before it disengages from the web, successive labels on the web 20 will ordinarily be relatively widely spaced, as shown in FIG. 8, with substantial waste gaps 77 therebetween. According to one aspect of the present invention, however, the web is retracted between successive rotations of roll 43 to narrow the gaps, as at 78 in FIG. 7.

The web retractor best shown in FIGS. 1–4 consists of a pintle 81 journalled in suitable bores in the side plates 26 of the machine. Welded to the pintle are radially projecting retractor side frame arms 82 which are interconnected by the cross strap 83. Cross strap 83 has suitable apertures in which the pegs 84 of a clamp bar 85 may slide. Clamp bar 85 desirably has presser buttons 86 which ride on the web 20 which is threaded between the cross strap 83 and the clamp bar 85.

The pressure of the respective clamp members 83, 85 on the web 20 is provided by a coil spring 87 coiled about a stem 88 which bears yieldingly on a presser foot 89 which bears on clamp bar 85. This pressure is adjusted to be insufficient to preclude movement of the web 20 through the machine under the positive feeding pressure of the die cutter 44, as aforesaid. However, when the roll 43 has rotated to the point where its rearmost knife edge 68 loses contact with the web and the web is no longer under the positive feeding pressure of the die cutter, the clamping presure of bars 83, 85 is sufficient to stop the web.

One of the arms 82 of the retractor frame has a laterally projecting ear 92 through which an adjusting screw 93 is threaded for contact with the edge margin of side plate 26 of the machine. Accordingly, the frame 82, 83 can swing from its position shown in FIG. 2 in a clockwise direction only until the screw 93 engages the edge of the frame plate 26, as shown in FIG. 4. In this position, however, the spring 94, which is anchored on a pin 95 to the inner face of plate 26 and which is connected to the pintle 81 of the retractor frame on the lever arm 96, is placed in tension. As soon as the positive feed of the web is discontinued, as aforesaid, spring 94 biases arm 96 counterclockwise from its FIG. 4 position until it contacts the pintle 36, as shown in FIG. 2. This movement swings the frame 82 through a small arc from its position shown in FIG. 4 to its position shown in FIG. 2, thus to retract the web 20 for a short distance, as determined by adjustment of the screw 93. This slight retraction of the web results in narrowing the gap between adjacent labels 76 on the web 20 and thus reduces wastage.

FIG. 10 shows an alternative form of printing type means. Within the die cutter 44 is mounted a shallow tray 97 in which is disposed an ink saturated pad 98. Over the pad 98 a silk printing screen 99 is stretched. In both the constructions shown in FIGS. 9 and 10 the cutting die 44 provides not only the knife edges for cutting the web, but also provides a mounting for the type means. The die cutter 44 may be removably fastened to the shaft 43 by means of a bolt 102.

Other forms of type means can be substituted for those illustrated.

The respective pads 73, 98 are sufficiently resilient so that the type face is normally disposed at a greater radius from the center of shaft 43 than the knife edges 67, 68, 69 of the cutting die 44. Accordingly, when the roll 43 rotates past the ink roll 39 which is exposed through the opening 53 in the inker unit 28, the type face will be inked, but the cutting edges of the cutting die 44 will not be fouled with ink which might otherwise smear the web. When the roll 43 coacts with platen roll 56, however, as shown in FIGS. 5 and 6, the yieldability of the pads 73, 98 permits the type to retract radially inwardly to expose the die cutter knife edges as aforesaid.

To more positively insure against fouling of the die cutting edges, the structure best shown in FIGS. 11 and 12 can optionally be adopted. In this construction the printing and die cutting roll 103 comprises a hollow sleeve. The end portion 104 thereof shown in FIG. 12 is of reduced diameter to provide a bearing upon which the sleeve 103 rotates. Within the hollow bore 105 of the

roll 103 is disposed an adjustably fixed rod 106 which is anchored externally on the bracket 107 which is fastened to the machine frame side plate 26 by the bolts 108. Rod 106 is rotatable in sleeve bore 105 to adjust the eccentric cam surface 111 thereon in proper relationship to the ink roll 39.

The pad 73 for the type means 45 in this embodiment is mounted on a plate 112 having one or more thrust stems 113 which extend through suitable apertures 114 in the sleeve 103 into sliding contact under thrust of the coil springs 115 with the surface of rod 106. As the sleeve 103 rotates in the direction of arrow 75 and just before the type face 74 reaches the ink roll 39, stems 113 will ride up on the cam surface 111 to positively project the type face into ink transfer contact with the ink roll 39. This projection of the type face 74 makes it possible to offset the knife edges 67, 68, 69 of the die cutter 44 sufficiently radially inwardly so that these knife edges will not need to come into proximity to the roll 39 and in danger of becoming fouled with ink.

The cam surface 111 desirably extends circumferentially only far enough so that the type face 74 will remain projected while in contact with the ink roller 39. It will retract under the bias of springs 115 after leaving the ink roller 39 to be retracted when printing the web.

The resilience of the sponge rubber pad 73 is such that the type face is free to retract as shown in FIGS. 5 and 6 to accommodate for irregularities in the thickness of the web, differences in thickness of various rubber printing plates 74, and to place the type face under resilient bias during the printing operation.

The multiple color printer and die cutter shown in FIGS. 13 and 14 embodies may of the features and advantages of the single color printer and die cutter shown in FIGS. 1 through 12 hereinbefore described. However, to provide for multi-color printing, two printing stations 118, 119 are provided. A multi-ply web strip 20 is fed from the supply roll 120 past platen roll 123 at station 118 and platen roll 124 at station 119. Intermediate the platen rolls 123, 124 is provided a shaft 126 for a series of take up discs 125. Shaft 126 is mounted on side plates 127 which are respectively adjustably mounted on the machine side plates 128 by reason of the screw 129 and slot 130. In this manner the length of web between stations 118 and 119 can be accurately adjusted by adjustment of the take up discs 125. Accordingly, labels of any appropriate size can be cut and variations in label size can be accommodated for by adjustment of the shaft 126 to the end that the length of web between the stations 118, 119 will always equal a whole number of labels plus the aggregate of the appropriate gap spaces therebetween. The discs 125 have narrow knife edges for minimum contact with the web and to avoid smearing the ink printed thereon.

In the device shown in FIGS. 13 and 14 two take-up spools 133, 134 are illustrated. Take-up spool 133 winds up the backing ply of the web with the spaced printed labels adherent thereto. Roll 134 winds up the strip border from around the die cut labels. Accordingly in the device illustrated, the backing web and labels are separated from the waste prior to further distribution of the printed and die cut labels. Of course, such a label and scrap rewinder could be provided for the device shown in FIGS. 1 through 12, if desired. Moreover, if desired, any one of the embodiments shown in this application can be provided with a scrap rewinder and automatic web feeding device of the type shown in my copending application Serial No. 649,958, filed on April 1, 1957, now abandoned.

Opposite platen roll 123, station 118 is provided with a roll 135 which carries a boss 136 having mounted thereon type means 137. The boss 136 is held to the roll 135 by the bolt 138. Roll 135 is supported at its ends on eccentric bearing pins 139. Roll 135 may be adjusted with respect to such pins by means of swing arms 141 which are interconnected by cross rod 142. The position of the arms 141 can be fixed by the wing nut 143 which engages a bolt extending through the slot 144 in the side walls 128 of the machine. Accordingly, the roll 135 may be adjusted for best cooperation with the platen roll 123.

An inking reservoir 145 is also provided and the inking reservoir is swingable on the pintle 146 to a position adjusted by the eccentric cam 147 on bracket 149 to bring the inking roll 148 thereof into proper position with respect to the adjusted position of the printing roll 135.

Station 118 is not provided with a die cutter, as the labels are not die cut until they reach station 119.

Station 119 is provided opposite platen roll 124 with a printing and die cut roller 150 which is substantially similar to roll 43 of the embodiment of the invention shown in FIGS. 1 through 12. This roll carries a die cutter 151 within which a type means 152 is surrounded by the knife edges of the die cutter. The roll 150 has eccentric mounting pins 154 and can be adjusted with respect to platen roll 124 by swinging arms 153 releasably held by bolt 155. An ink reservoir 156 is swingable about the pintle 157, as adjusted by the eccentric cam 158 mounted on the arm 161. Accordingly, the pintle and die cutter can be adjusted with respect to the platen roll 124 and after such adjustment, the ink roll 162 in the reservoir 156 can be brought into accurate alignment with the path of rotation of the type face 152.

Accordingly, the web 20 can be imprinted with ink of one color at station 118 and printed again with ink of a different color at station 119. The labels need not be die cut until they reach station 119. The die cutter 151 performs this function substantially the same as the die cutter 44 of the embodiment of the invention shown in FIGS. 1 through 12. The interlocking of the die cutter knife blades with the web 20 at station 119 will positively interlock the movement of the web with the movement of the respective rollers 150, 135, inasmuch as the rollers are interconnected by the gear train 159 shown in FIG. 13.

To retract the web between successive die cutting operations, a web retractor 163 is provided between supply roll 120 and the first station 118. The web retractor may be substantially the same in structure as the web retractor shown in FIGS. 1 through 12 and consists of clamp bars 164, 165 biased towards each other by the spring 166. The retractor is pivotally mounted on the pintle 167 and is normally biased toward engegement of its arm 168 against the stop bar 169. When the web is positively fed by engagement thereof of the die cutter 151, the retractor will be swung to a position in which a striker plate 172 thereon will engage with the screw 173 mounted on the fixed lug 174. However, as soon as the die cutter 151 loses positive contact with the web, the tension of spring 175 will retract the retractor and the web to its position shown in FIG. 14 in which the arm 168 engages the bar 169, thus to narrow the gap between successive die cut labels, as hereinbefore described.

The respective take-up spools 133, 134 are driven by belts 176, 177 mounted on the ends of the respective shafts 124, 150, all of the shafts being driven from the motor 178 connected through suitable gearing 159 as shown in FIG. 13.

The respective web components 180, 181 leading to the respective take-up spools 133, 134 are trained over idler rolls 182, 183 under bias of springs 184, 185. Accordingly, when web retractor 163 functions to draw back the web, the springs 184, 185 will yield to release some of the slack in webs 180, 181. Accordingly, spools 133, 134 need not reverse their direction of rotation on retraction of the web and undue strain is not imposed on the webs 180, 181.

Accordingly, in the device shown in FIGS. 13 and 14, multi-colored printing and die cutting is made possible in a relatively light weight inexpensive machine and in

which the travel of the web is positively interlocked with the movement of the printing and die cutting elements. The web is retracted equally for both printing stations 118, 119 by the retractor 163 and any necessary adjustment in the length of the web between the respective stations 118, 119 is accomplished by adjustment of the take up discs 125.

What is claimed is:

1. A web retractor for a printing and die cutting machine including a roll having web feed means and a platen between which the web is fed, said web being positively engaged between said feed means and platen during one part of the rotation of the roll and being free of engagement during another part of rotation of the roll, said retractor comprising means behind said roll and platen for yieldingly engaging said web under pressure insufficient to hold the web against movement between the roll and platen during said one part of roll rotation but sufficient to stop web travel during said other part of roll rotation, and means for moving said retractor rearwardly for a limited distance during said other part of roll rotation, said retractor further comprising a pintle, a web clamp swingable on said pintle, a first spring yieldingly engaging said clamp with said web, and a second spring biasing said clamp in a rearward direction about said pintle.

2. The device of claim 1 in which said retractor further comprises stop means for limiting the swing of the clamp in its rearward direction.

3. In a device of the character described, the combination with a printing roll and a platen between which a web of paper is fed, type means on the printing roll for successively imprinting said web, web feed means on said printing roll and associated with said type means for engaging and advancing the web forwardly between the printing roll and platen a distance greater than the extent of said imprint and in timed relation to the imprinting thereof, and to release the web intermediate successive imprints thereon, said feed means comprising a die cutter having knife edges respectively in advance of and rearwardly of said type means and in which there will be a substantial gap between a cut line made by said rear-most knife edge during one rotation of the roll and a cut line made by the foremost knife edge on the next succeeding rotation of said roll, of a web retractor biasing the web rearwardly against the advance of the web feed means, said web feed means, when engaged with the web, overcoming the bias of the web retractor to advance the web notwithstanding said bias and when released therefrom permitting the bias of the web retractor to retract the web to narrow the gap between said cut lines and between successive imprints.

4. The device of claim 3 in further combination with an adjustable stop to selectively limit the amount of web retraction.

5. The device of claim 3 in which said web retractor comprises spring means which yields under pressure of the advancing web when it is engaged by the web feed means.

6. The device of claim 3 in which the web retractor comprises a clamp yieldably engaging the web.

7. In a device of the character described, the combination with a printing roll and a platen between which a web of paper is fed, type means on the printing roll for successively imprinting said web, web feed means on said printing roll and associated with said type means for engaging and advancing the web forwardly between the printing roll and platen a distance greater than the extent of said imprint and in timed relation to the imprinting thereof, and to release the web intermediate successive imprints thereon, of a web retractor biasing the web rearwardly against the advance of the web feed means, said web feed means, when engaged with the web, overcoming the bias of the web retractor to advance the web notwithstanding said bias and when released therefrom permitting the bias of the web retractor to retract the web to narrow the spacing between successive imprints, in further combination with a second printing roll and platen, said web being threaded successively through the first and second mentioned printing roll and platen, said retracting means being disposed rearwardly of the second mentioned printing roll and platen whereby the web is retracted equally with respect to both of said first and second printing rolls and platens.

8. The device of claim 7 in further combination with means between said first and second printing rolls and platens for adjusting the length of the web therebetween.

9. The device of claim 8 in further combination with a take up roll for the web, means for introducing slack in said web between the first mentioned printing roll and platen and said take up roll and including idler means for keeping web slack taut regardless of retraction of the web.

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