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G. H. MACCHIONE ETAL

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Sheet 1 of 3

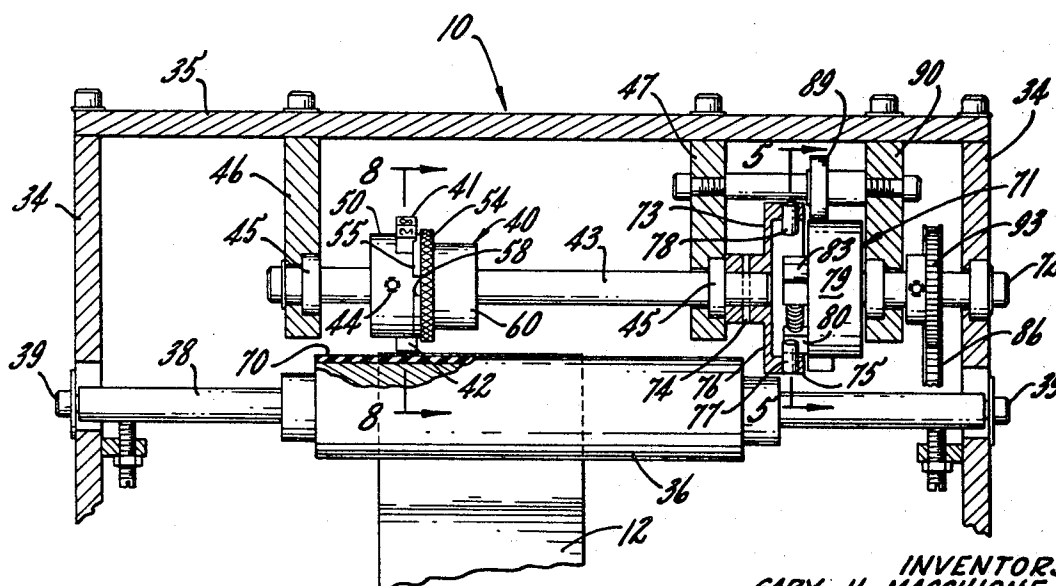
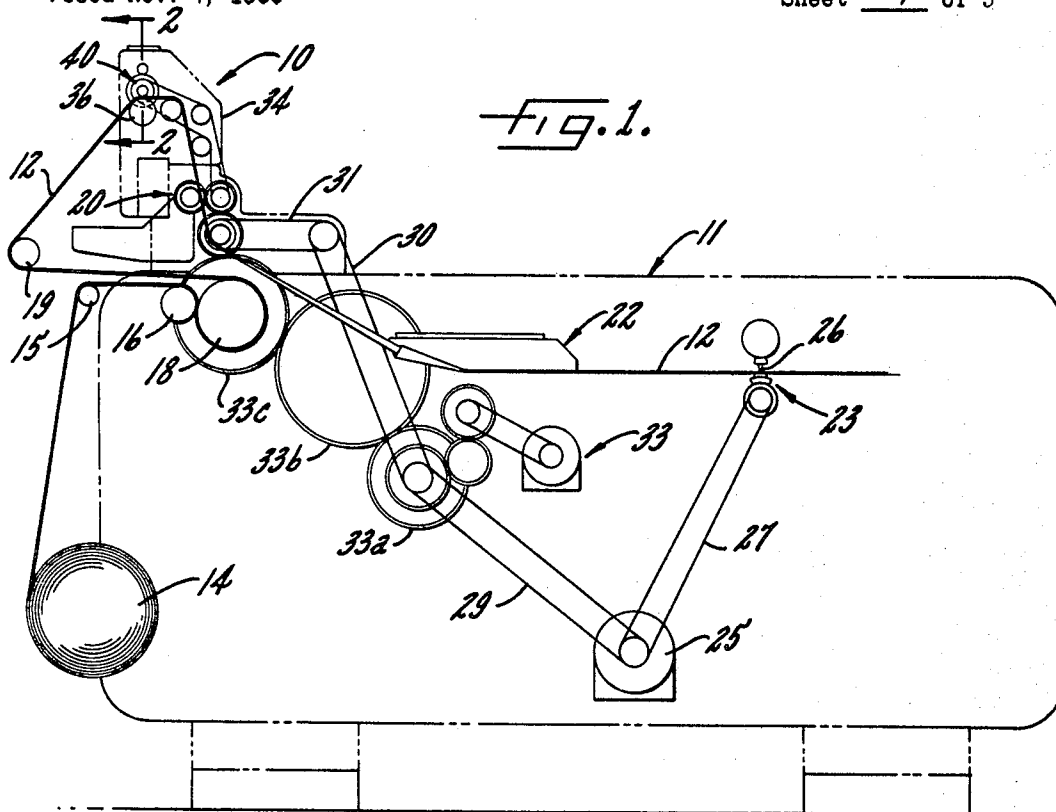


FIG. 2.

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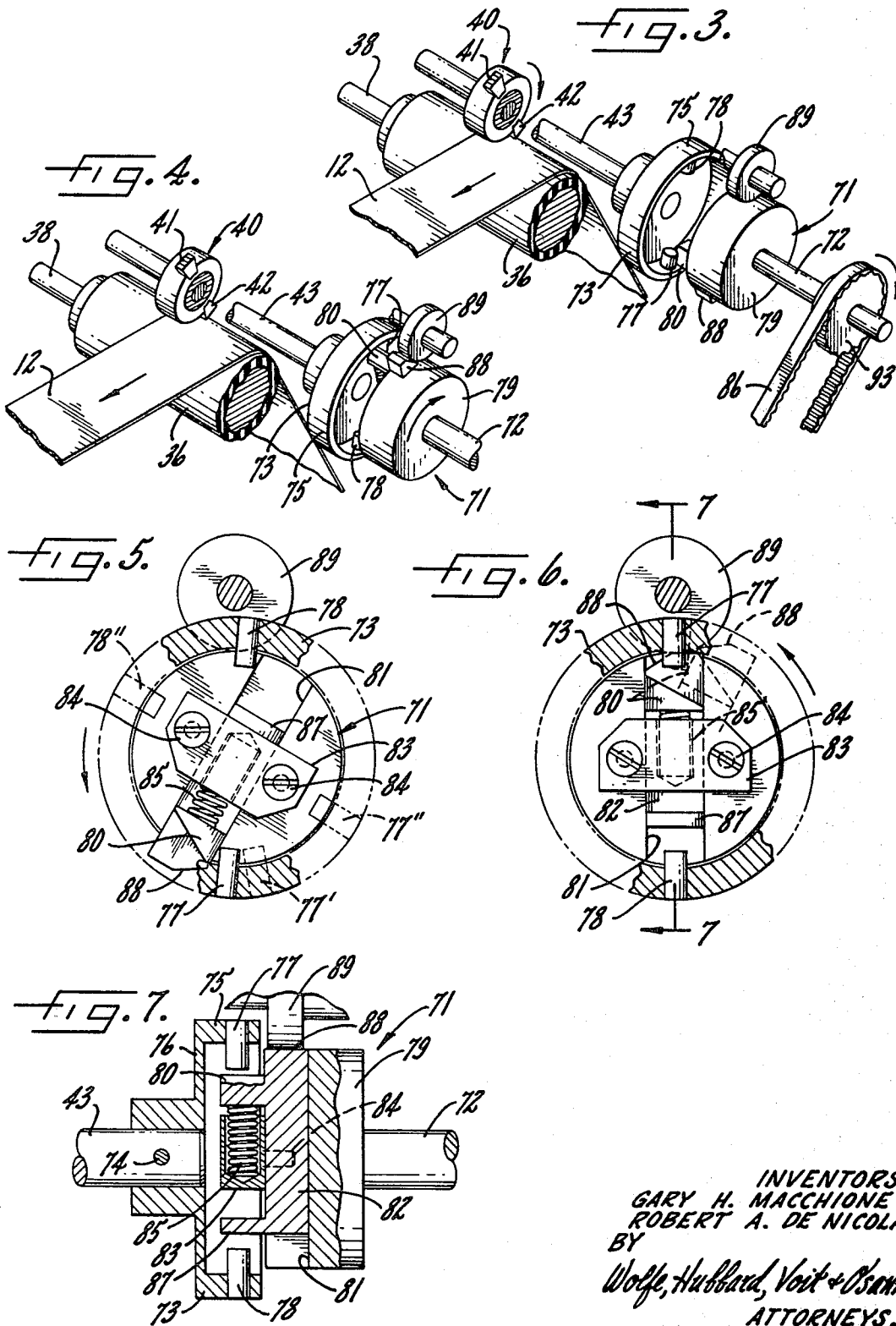
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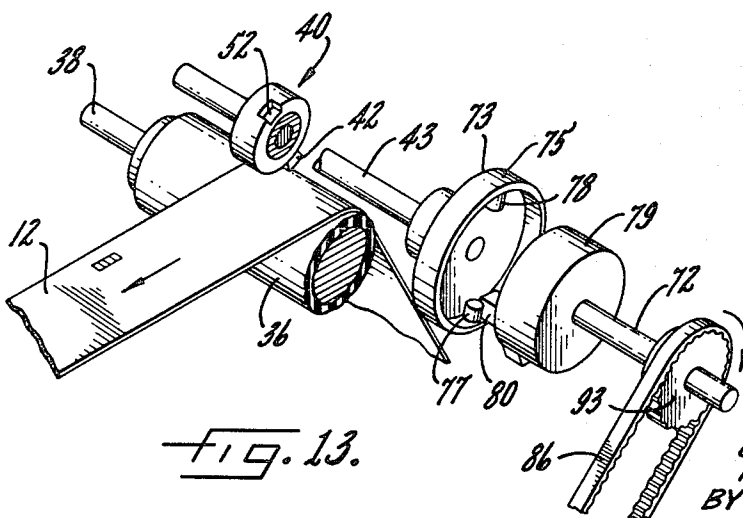
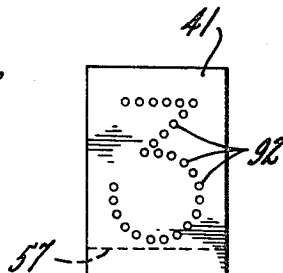
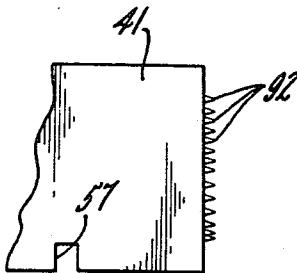
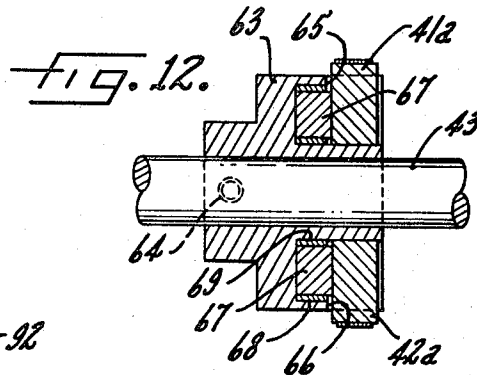
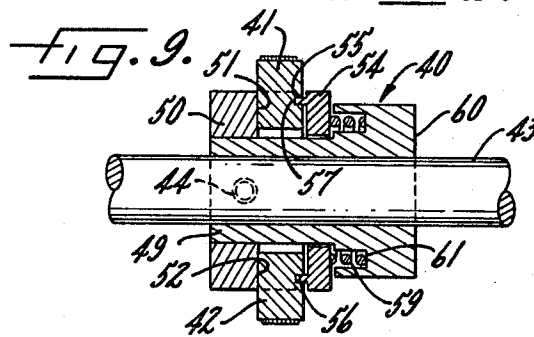
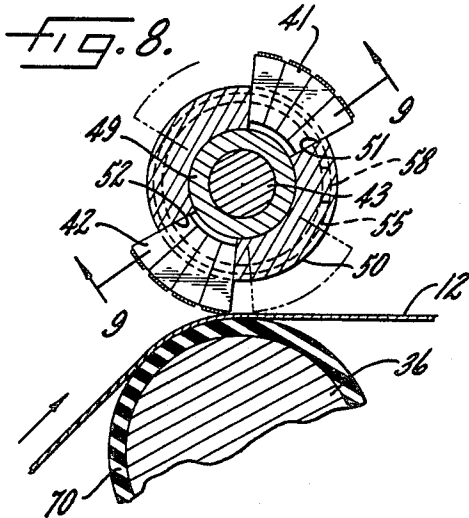
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ABSTRACT OF THE DISCLOSURE

A device for printing a moving strip of material which has a plurality of sets of type spaced around a rotating printing head and a drive clutch with a cam controlled movable pawl for alternately engaging drive pins on the head to bring one set of type per revolution of an input shaft into printing contact and to permit the head to overrun the input shaft upon printing engagement of the type and moving strip.

The present invention relates to an improvement in printing mechanisms and in particular to such mechanisms for use with continuously moving webs of paper or like material which are to be printed.

It is an object of the present invention to provide a mechanism for printing on moving webs of paper at pre-selected spacing between imprints. A related object is to provide a printing mechanism particularly adapted for printing identifying marks on wrappers which are formed from a continuous web of wrapping material.

It is also an object of the present invention to provide a novel indexing mechanism for initiating a rotatory operation in timed relation to another operation or movement.

A more detailed object is the provision of a printing mechanism having a rotary printing head for holding type and permitting simple and quick type replacements. Another object of the invention is to provide a rotary printing mechanism in which the type is moved to effect printing by the movement of the material being printed and to provide an improved typeface to increase frictional engagement between the type and the material to assist in causing movement of the type.

In carrying out the present invention, means are provided for releasably mounting printing type in a rotatable holder and for indexing the holder to bring the type into engagement with a moving web of material to be printed. The movement of the paper pulls the engaged type into and through the printing operation free of further action by the indexing mechanism. Thereafter, the indexing mechanism again rotates the holder for repeating the printing at a spaced position on the web. In another phase of the invention the indexing means is arranged to time the printing in relation to another operation such as a cut-off operation in a wrapping machine which forms wrappers from a web of material.

The invention also contemplates an indexing mechanism in which a timed input as by a rotating input shaft is operative to index the output, such as a printing head, either a full revolution or a part of a revolution for each full rotation of the input shaft.

Other objects will become apparent as the following written description of a preferred embodiment of the invention proceeds taken in connection with the drawings in which:

FIG. 1 is an elevation of a wrapping folding machine, partly diagrammatic, embodying the present invention;

FIG. 2 is a section, taken along the line 2-2 of FIG. 1, illustrating the printing mechanism of the present invention;

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FIG. 3 is a partial perspective showing the printing mechanism immediately before printing takes place;

FIG. 4 is a view corresponding to FIG. 3 but showing the relative positions of the parts following printing by one set of type and before indexing to bring the second set into printing position;

FIG. 5 is a partial end section taken along the line 5-5 of FIG. 2;

FIG. 6 is a partial end section corresponding to FIG. 5 showing a subsequent position of the parts during indexing;

FIG. 7 is a partial section taken along the line 7-7 of FIG. 6;

FIG. 8 is a cross section of the printing head showing its relation to the backing roll and paper being printed;

FIG. 9 is a longitudinal section of the printing head taken along the line 9-9 of FIG. 8;

FIGS. 10 and 11 are elevation and plan views, respectively of printing dies;

FIG. 12 is a modified form of printing head; and

FIG. 13 is a partial perspective of the indexing mechanism adapted for indexing the printing head 360 degrees.

Referring now to the drawings in more detail, a printing mechanism 10 embodying the present invention is shown in connection with a wrapping machine 11 of known construction for printing identifying characters at spaced intervals on a strip or web 12 of paper or other sheet material. In the illustrated wrapping machine, the web of wrapping material is led from a supply roll 14 over first and second guide rollers 15, 16 to a power driven feed roller 18 and then over another guide roller 19 to the printing mechanism 10 of the present invention. From the printer, the web 12 passes around a glue spotter roll 20 from which it goes through a folding device 22 to a cut-off mechanism 23 for separating each wrapper from the web. The glue spotter 20 for applying adhesive to the web at spaced intervals, the folding device 22 and the cut-off mechanism 23 may be of any suitable form, the detailed construction of which is well known in the art.

The various devices and mechanisms of the wrapping machine of the drawings are synchronized to provide uniform spacing for each cut-off operation and accurate spotting of the adhesive relative to the cut-off. In the wrapping machine of the drawings, this is accomplished by using a single electric motor 25 for driving the various mechanisms of the machine. The cut-off mechanism 23 which is a knife 26 mounted radially on a shaft extending transversely of the moving web of folded wrappers is driven by a belt connection 27 to the motor 25. Once in each revolution of the knife supporting shaft, the knife 26 is rotated into contact with the web for severing the leading wrapper from the remainder of the web 12. Similarly, the glue spotter mechanism 20 is driven from the motor through a series of belts 29, 30, 31. Each of the drives for the knife and the glue spotter are proportioned such that the speed of the knife shaft and the glue spotter shaft are the same. Preferably, the driving means are chain belts and sprockets to eliminate slip and maintain precise relationship between the knife and the spotter.

The feed roll 18 for the wrapping material is also driven by the single drive motor but the driving connection may include suitable automatic speed control gearing 33 to relate the speed of the roll 18 to the stretch of the web or other factors requiring a slight variation in speed at this point in the machine. It is also desirable to provide different sets of gearing for the feed roll drive 33a, b, c such that the web proceeds at greater or lesser speeds to form larger or smaller wrappers.

The foregoing type of wrapping machine is presently in commercial use and further details of its construction

need not be included herein since they are well known. For present purposes, it is sufficient to note that power driven feed and guide rollers transmit power from the motor to cause the material to move endwise through the printing mechanism at a selected speed.

In accordance with the present invention means are provided on the wrapping machine for printing desired indicia or characters on the web of material at precisely spaced positions along the length of the web. In the illustrative embodiment the indicia is printed in space relation such that each wrapper cut from the web is appropriately printed at a preselected location. By the present invention, such printing is made possible irrespective of the speed of the wrapping material as it goes through the machine and irrespective of the length of the wrapper to be formed.

For this purpose, a printer support means is attached to the wrapping machine on the upper left as viewed in FIG. 1 and intercepts the web 12 of wrapping material between the feed roll 18 and the glue spotter 20. The support comprises a pair of upright, spaced apart end plates 34 connected at their lower portions to the frame of the wrapping machine. A cross bar 35 extending between the end plates is fastened to the top of each to keep the plates aligned and to provide support for various parts of the printer mechanism. Supporting the web 12 of material and guiding it through the printing mechanism between the end support plates 34 is a backing roller 36. The roller is journaled for independent rotation on a crosswise, horizontal shaft 38 adjustably attached at its ends to the support plates by screws 39 threaded into the end of the shaft 38.

Positioned above the backing roller is a cylindrical printing head 40 to which is affixed printing type 41, 42. Supporting the printing head 40 is an indexing shaft 43 extending through a central bore in the printing head and in a direction parallel to the axis of the backing roller 36. For unison rotation with the indexing shaft 43, the printing head 40 is removably affixed to it by means of a set screw 44, and the shaft 43 is journaled in suitable bearings 45 supported by brackets 46, 47 depending from the overhead crossbar 35.

Printing is accomplished by affixing the type 41, 42 to the periphery of the printing head 40 such that the outer faces of the type lie on a portion of a circular arc having the indexing shaft at its center. In carrying out one aspect of the present invention, the printing head includes means for permitting quick replacement of type. Referring to FIGS. 2, 8 and 9, the components of the printing head 40 are shown supported on a cylindrical hub member 49 which has a central bore for receiving the indexing shaft. Overlying one end portion of the hub and concentric therewith is a cylindrical typeholder 50 which is provided with radial grooves or slots 51, 52 in its inside end face for receiving the body of the type 41, 42. In the present instance two diametrically opposed type receiving grooves are provided, either one or both of which may be used. Preferably the grooves 51, 52 are tapered such that their respective sides extend radially from the rotational axis of the holder 50, and the type have correspondingly tapered bodies.

To releasably hold the type in the holder, a notched retaining ring 54 is rotatably mounted on the hub member 49 adjacent the grooved face of the holder 50. Projecting from the side of the retaining ring is an annular locking ledge 55 which extends around a reduced annular shoulder 56 on the holder and into the type receiving grooves. Each of the bodies of the type has a nick or transverse slot 57 for receiving the locking ledge 55 of the retaining ring 54 when the type are properly positioned in the type holder. In order to insert and remove type from the holder the locking ledge is notched or discontinuous, having a small portion 58 of its length removed for a distance at least equal to the width of a type body. Thus by rotating the retaining ring 54 until

the removed portion is opposite a type receiving groove, type may be freely inserted or removed. By rotating the ring 54 after the type is inserted until the locking ledge 55 enters the nick of the type body the type is securely held in place.

Preferably, the retaining ring 54 is frictionally held against inadvertent rotation by means of a compression spring 59 resiliently forcing the locking ledge 55 against the holder. To accomplish this, the end portion 60 of the hub member 49 opposite the holder 50 is enlarged and provided with an annular groove 61 opening toward the locking ring. The compression spring 59 is seated in the annular groove 61 and its outer end presses against the retaining ring 54 forcing it into frictional contact with the holder. To assemble the printing head, the holder portion 50 is formed separately from the hub 49 but upon assembly the holder has a press fit with the hub so that the two components are substantially integral.

A modified form of printing head is illustrated in FIG. 12 and comprises a hub and holder portion 63 of cylindrical shape having a set screw 64 in one reduced end portion. As in the previously described holder, tapering grooves 65, 66 with radially extending sides are formed in one end face of the holder 63 to receive the type bodies 41a, 42a. To hold the type in these grooves, the modified form has inserts of magnetized material 67 in the closed back face of the grooves 65, 66. The type which would be of magnetic material is slipped into the grooves and held in position by the magnets. The holder would be made of non-magnetic material, such as aluminum, and, if desired, appropriate iron or steel pieces 68, 69 can be placed along opposite sides of the magnets to distribute the magnetic flux.

So that printing contact is made between the type 41, 42 and the web 12, the tracking roll is adjusted upwardly until the surface of the roll and the paper are tangent to the arc formed by the type 41, 42. Thus as the type swings about the indexing shaft 43, it comes into contact with the paper at the point of tangency, and rolls over the surface of the web 12 as the latter moves forwardly through the point of tangency. Preferably the backing roller 36 has a resilient covering or blanket 70 to insure good contact between the type and the paper or other material to be printed.

Means are provided for indexing the type such that proper spacing of the printing is accomplished. For this purpose, an indexing clutch mechanism 71 is mounted coaxial with the indexing shaft 43 and provides a power transmitting connection between a power input shaft 72 and the indexing shaft 43. The input shaft 72 also constitutes the timing shaft since it is driven in a one to one ratio with the cutoff knife 26 by a drive chain 86 and sprocket gear 93 from the adhesive spotter mechanism 20. In the form of mechanism illustrated in FIGS. 1-8, the indexing of the printing head is arranged for the use of two sets of type 41, 42 located 180 degrees apart on the periphery of the head. The sets of type are usually identical, each printing alternately with the other, but may, of course, be different if desired.

In more detail, the clutch 71 includes a driven member 73 fixed to the indexing shaft, as by a pin 74 extending through a hub of the driven member and the indexing shaft. An enlarged portion of the driven member is formed by a cylindrical wall 75 attached to the hub by a circular portion 76. Extending inwardly from the cylindrical wall are a pair of diametrically disposed abutments which in the illustrative form are short pins 77, 78 pressed into holes in the wall 75. Cooperating with the driven clutch member 73 is a driving member 79 having a pawl 80 for abutting engagement with the pins 77, 78. The driving member 79 is a solid cylinder and is supported coaxially with the driven member 73 by the input shaft 72 fixed to the outer center portion of the cylinder. The inner face of the driving member 79 has a diametrically positioned slot 81 for receiving a pawl slide bar 82 to permit sliding of the

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bar transversely of the cylinder and clutch axis. Spaced from one end of the bar is the pawl 80 formed as a projection on the bar and extending toward the driven clutch member 73 into the path of movement of the abutment pins 77, 78. Overlying the bar receiving slot 81 is a retaining bracket 83 fixed to the inner face of the driving cylinder member 79 by screws 84. To urge the pawl in a radially outward position, a resilient coil spring 85 is interposed between the radially inner face of the pawl and the bottom of a pocket or spring holding bore formed in the bracket. Limiting radial outward movement of the pawl and slide bar is a stop 87 positioned on the second end of the bar 82 to engage the bottom surface of the bracket. The stop 87 is located such that the pawl in its outward position has a small clearance from the inside of the cylindrical wall 75 of the driven clutch member.

As thus far described, the indexing mechanism is adapted for use with a single set of type as shown in FIG. 13 to give one imprint per revolution of the input shaft or two imprints per revolution if two sets are used. In operation, rotation of the input shaft 72 causes the pawl 80 to move in a circular path into engagement with one of the abutment pins 77 on the driven member 73. Continued rotation of the input shaft 72 causes the pawl 80 to push on the engaged abutment pin 77 and rotate the indexing shaft 43 until one type set 42 comes into contact with the moving paper 12. The direction and speed of rotation of the indexing mechanism and the type are correlated to the direction and speed of movement of the paper such that the type is moved by the indexing mechanism in the same direction as the paper but at a slower peripheral speed than the linear speed of the paper. As a result, frictional engagement between the moving paper and the type pulls the type forwardly and rotates the printing head 40, indexing shaft 43, and driven clutch member 73 ahead of the driving member 79. During this period of printing and faster rotation of the driven clutch member 73, the abutment pin 77 swings out of contact with the driving pawl 80. When the engagement between the type and the moving paper is completed, that is at the time the printing is finished, the movement of the paper no longer acts to rotate the printing head and driven clutch member, so that the continuously rotating pawl 80 again catches up with and engages the abutment pin 77 to rotate the printing head 40 and type 42 until the latter again contacts the moving paper.

With this operation, only one abutment pin is engaged by the pawl and with two sets of type mounted on the printing head, printing will occur twice for each revolution of the input shaft. In order to provide only a single printing operation for each revolution of the input shaft with two sets of type, means are provided in carrying out the invention for transferring engagement of the pawl from one abutment pin to the other between each printing operation. For this purpose the end portion of the slide bar 82, which carries the pawl 80, extends radially outwardly beyond the end of the receiving slot 81 and projects outwardly past the end face of the cylindrical surface of the driving member. The projecting end 88 of the slide bar is beveled or shaped in the direction of rotation of the input shaft 72 to form a cam surface for moving the slide bar 82 inwardly out of a position of interfering engagement with the pins 77, 78 on the driven member. Coacting with the cam surface is a cam roller 89 mounted on a short cam shaft which is supported at its ends by two of the brackets 47, 90 depending from the cross bar 35.

Considering now the operation of the printing mechanism with the cam release mechanism and two sets of type in the printing head, the mechanism first operates as previously described to bring the pawl 80 into engagement with the pin 77 immediately ahead of it and to rotate it to position 77' for bringing the corresponding type set 42 into engagement with the paper as shown in FIGS. 3 and 5. After the pin 77 has pulled ahead of the pawl

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80 during the printing operation to position 77'', the pawl again catches up to the pin and rotates the driven clutch 73 until the engaged pin 77 and pawl 80 are positioned adjacent the cam roller 89 as shown in dashed outline in FIG. 6. Further rotation of the pawl causes coaction of the slide bar cam surface 88 and the roller cam 89 to press the pawl 80 and slide bar 82 radially inwardly against the force of the bias spring 85 until the pawl 80 clears the pin 77 as shown in solid lines in FIGS. 6 and 7. At this time, the second type set 41 has not been moved into contact with the paper and since the pawl 80 is disengaged from the upper pin 77, no further movement of the driven member 73 takes place until the pawl 80 has moved past the upper pin, returns to its radially outward position and is rotated into abutting engagement with the second pin 78. At this time the second pin 78 has been rotated to a position substantially the same as that shown in solid outline in FIG. 5 for the first pin 77. Thereafter the described operation repeats except that now the second pin 78 and second type set 41 are being engaged and pressed into contact with the moving paper for another printing operation. Subsequently, the pawl 80 is cammed away from and passes the second pin 78 so that the full cycle of operation can be repeated.

The present invention is not limited to a particular form of printing and includes ink printing or embossing. It has been found that an interrupted typeface 92 such as shown in FIGS. 10 and 11 is particularly well suited for use with the present mechanism for embossing. In this type, the characters are formed by a series of raised points approximately ten thousandths of an inch high and twenty thousandths of an inch apart. This construction gives clear impressions and assists in providing the desired frictional engagement between the type and the paper to insure that the moving paper pulls the type through the actual printing operation.

From the foregoing, it will be seen that a practical and precise timing mechanism is provided to printing on moving webs of paper. For accurate spacing of the printed material on wrappers, for example, it is only necessary that the drive of the input shaft be in a one to one ratio with the cut-off knife. When this ratio of speeds is maintained, the actual speed of the paper web or the diameter of the printing head and type set therein does not affect the ability of the mechanism to print each and every wrapper. As previously noted, the printing head may be of any diameter so long as the peripheral speed of the type when rotated by the indexing clutch is less than the speed of the paper.

It will be appreciated that where spacing between the consecutive imprints is greater than the circumference of the circle through which the type moves, the single acting indexing mechanism and a single set of type may be used. However, if the spacing between imprints is smaller than the circumference of the circular path of the type, the double acting indexing mechanism provides a proper correlation of peripheral speed of the type and the paper to be printed down to a spacing of about one-half the spacing permitted by the single acting mechanism. The double acting mechanism thus permits the use of a larger diameter printing head than could otherwise be used.

The necessity of changing printing heads from larger to smaller sizes for different lengths of wrappers or speeds of the moving paper is eliminated, a single size head serving for a wide range of lengths and speeds.

What is claimed is:

1. A mechanism for printing a strip of material moving at a given lengthwise speed at spaced intervals along its length comprising in combination, a printing head mounted for rotation, a plurality of sets of type equally spaced around the periphery of said head for movement in a circular path upon rotation of said head, backing means for guiding material to be printed tangent to the path of movement of said type for frictional printing

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contact by the latter at the point of tangency, drive means for rotating an input shaft one revolution for movement of said material through each of said predetermined space intervals, and indexing means including a one way clutch between said input shaft and said printing head for rotating said printing head to bring said sets of type means successively into contact with said material, the length of the circular path of said type between successive contacts of said sets of type being less than said predetermined space intervals whereby the speed of movement of said material moves said type during frictional printing contact independent of said drive means, said one way clutch including an abutment connected to said printing head for each of said sets of type, each abutment being equally positioned relative to its corresponding set of type, a pawl rotated by said input shaft and movable between a first position for engaging said abutments and a second position for by-passing said abutments and means for moving said pawl from said first position to said second position during a part of a revolution of said input shaft following printing contact by one of said sets of type and back to said first position for engaging the abutment of the next succeeding set of type such that only one of said sets of type is brought into printing contact upon each revolution of said input shaft.

2. The mechanism for printing according to claim 1 in which said one way clutch means includes a cylindrical driving member on said input shaft for slidably supporting said pawl between a radially extended first position and a radially retracted second position, spring means for resiliently urging said pawl to its extended first position, and said means for moving said pawl including a projection thereon defining a cam face and stationary cam means mating therewith for moving said pawl to retracted second position.

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3. The mechanism for printing according to claim 1 in which there are two sets of type and in which said one way clutch means includes a cylindrical driving member on said input shaft and a cylindrical driven member positioned coaxially therewith and connected to said printing head, said driving member having means for supporting said pawl for sliding movement between a radially extended first position and a radially retracted second position, said pawl having a cam projection and a driving projection extending toward said cylindrical driven member, said abutments being mounted on said driven member in the path of said driving projection when said pawl is in its extended first position, and stationary cam means for engaging said pawl cam projection to move the latter to its retracted second position.

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