June 12, 1934. T. M. AVERY 1,963,041

PRINTING MACHINE

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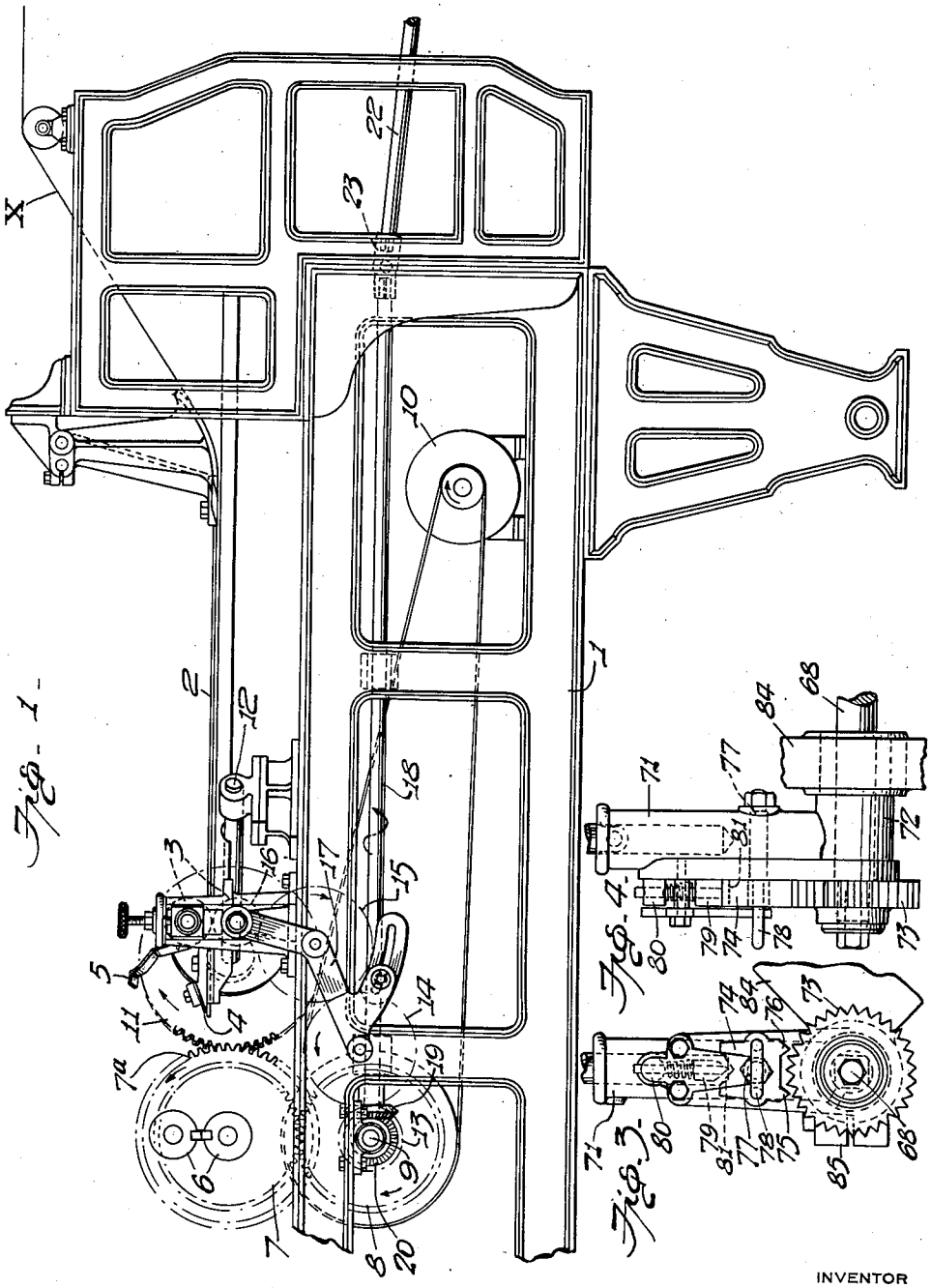


Fig. 1.

Fig. 4.

Fig. 3.

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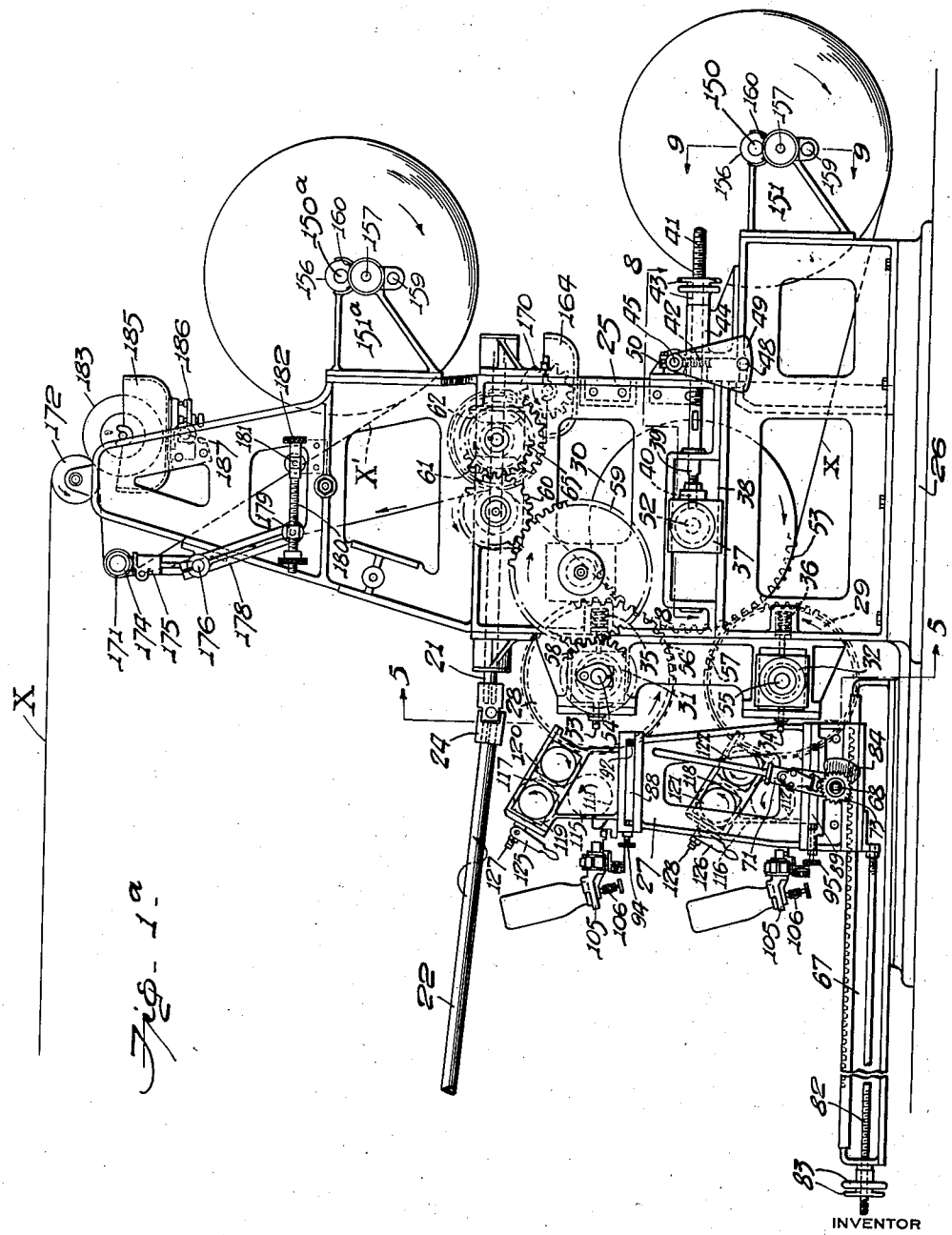


Fig. 1a

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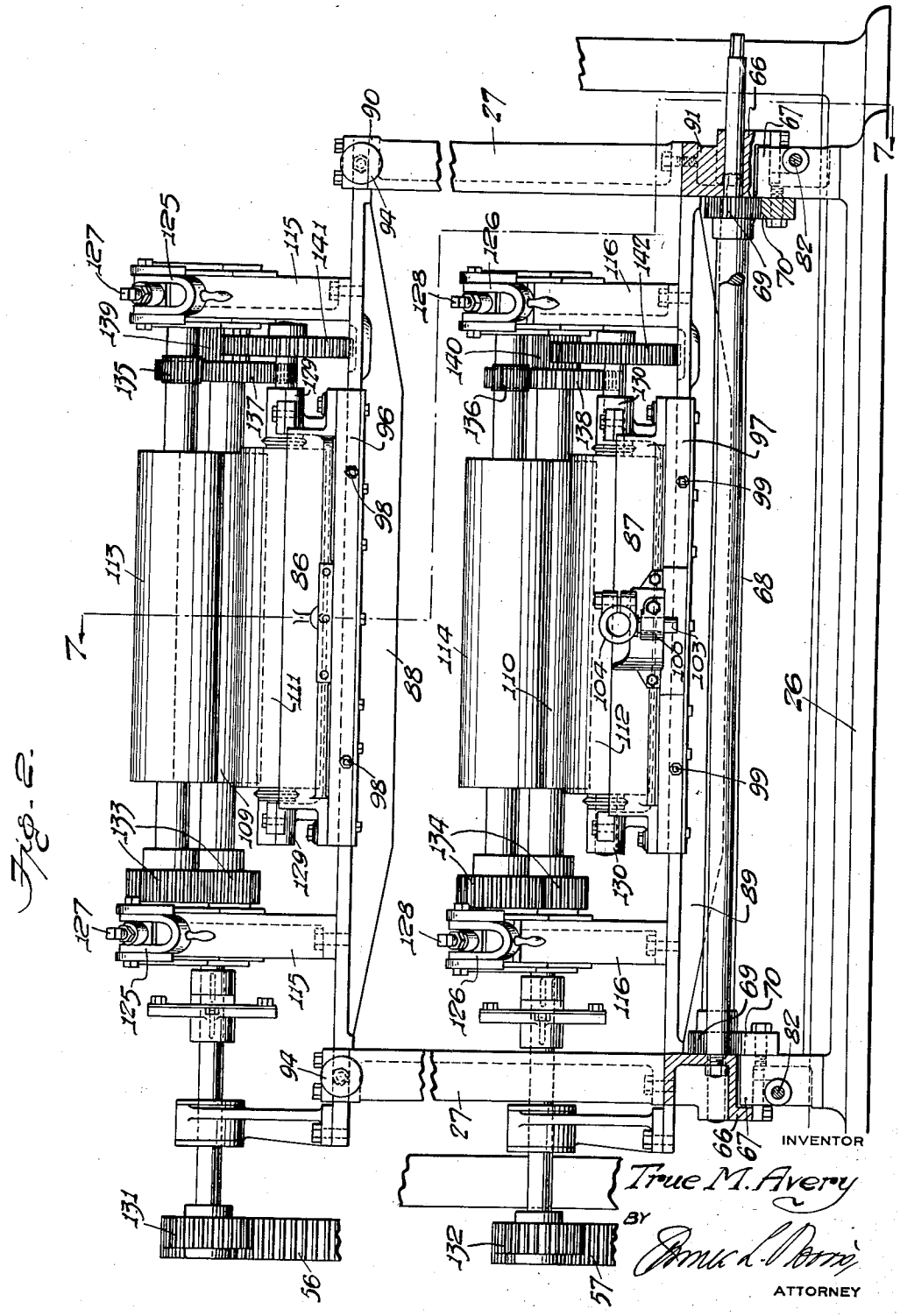


Fig. 2.

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PRINTING MACHINE

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Fig. 6.

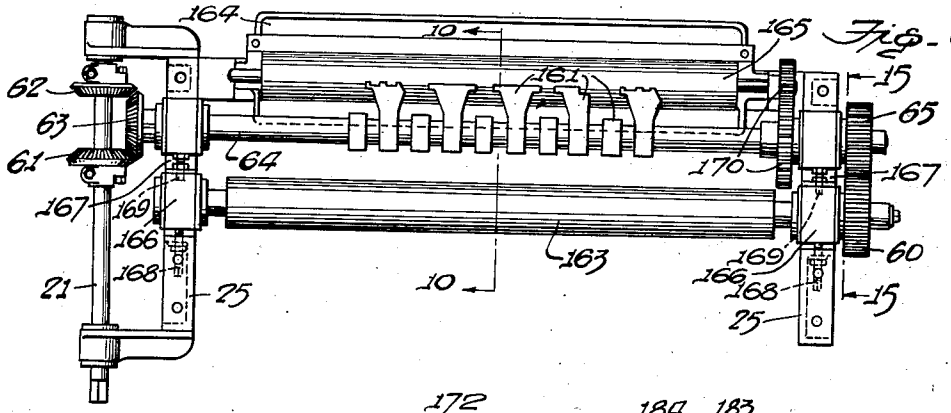
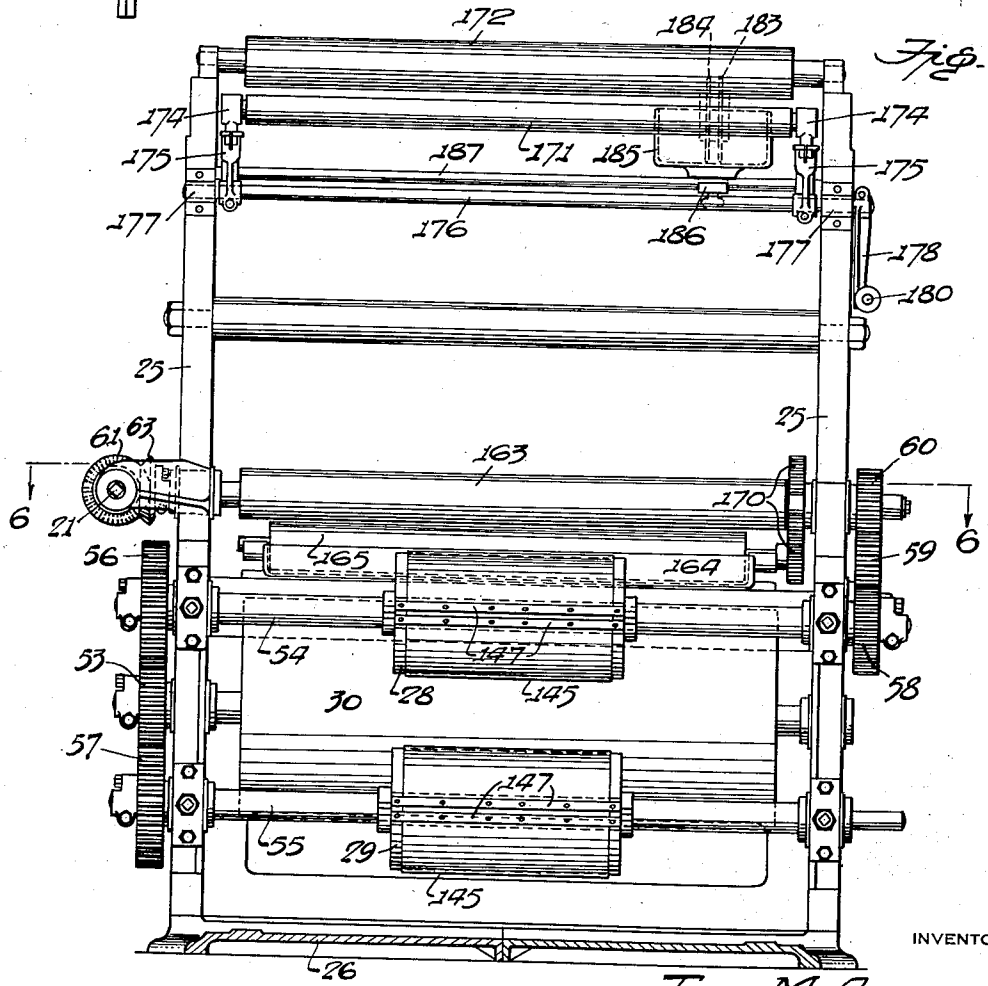


Fig. 5.



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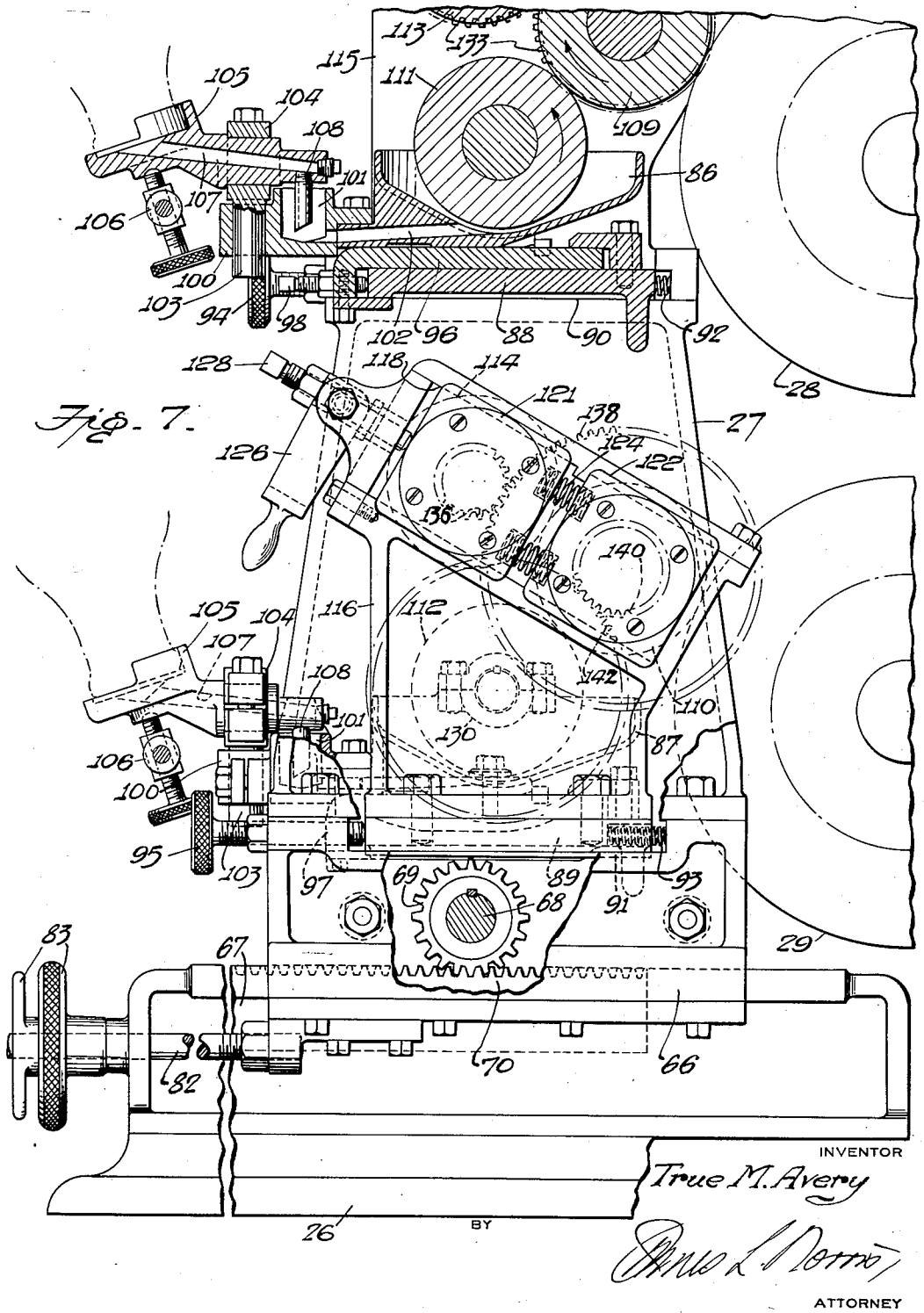


Fig. 7.

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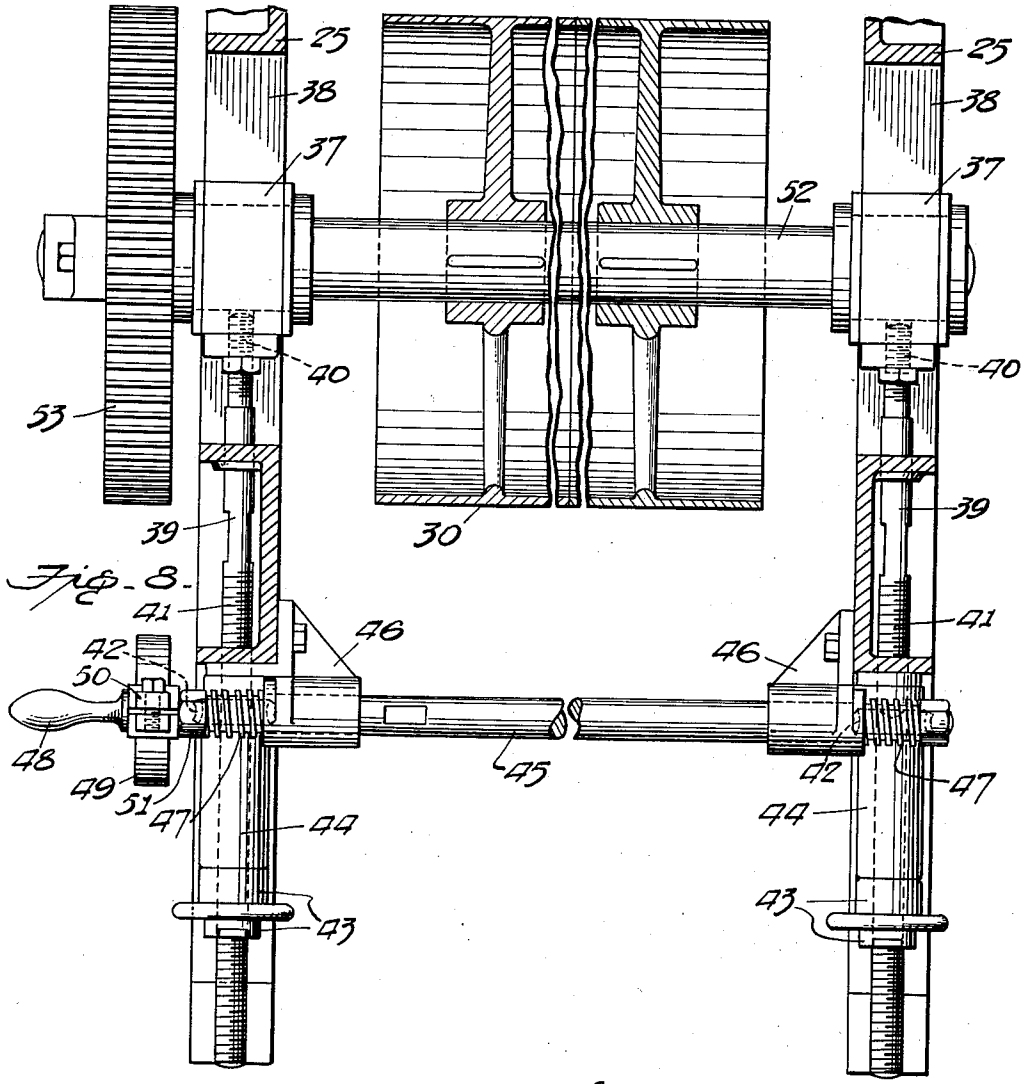


Fig. 8.

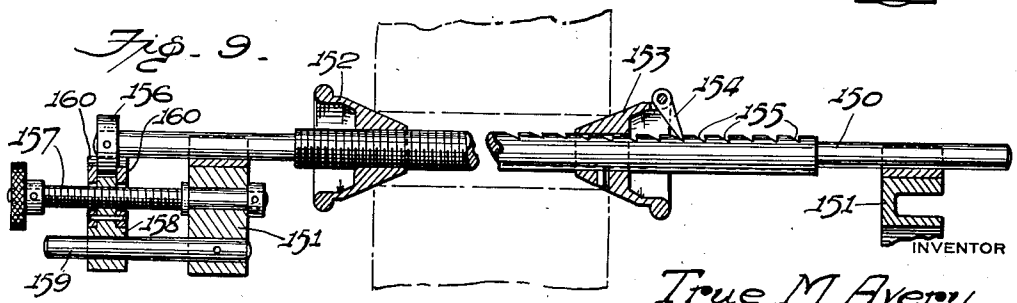


Fig. 9.

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June 12, 1934. T. M. AVERY 1,963,041

PRINTING MACHINE

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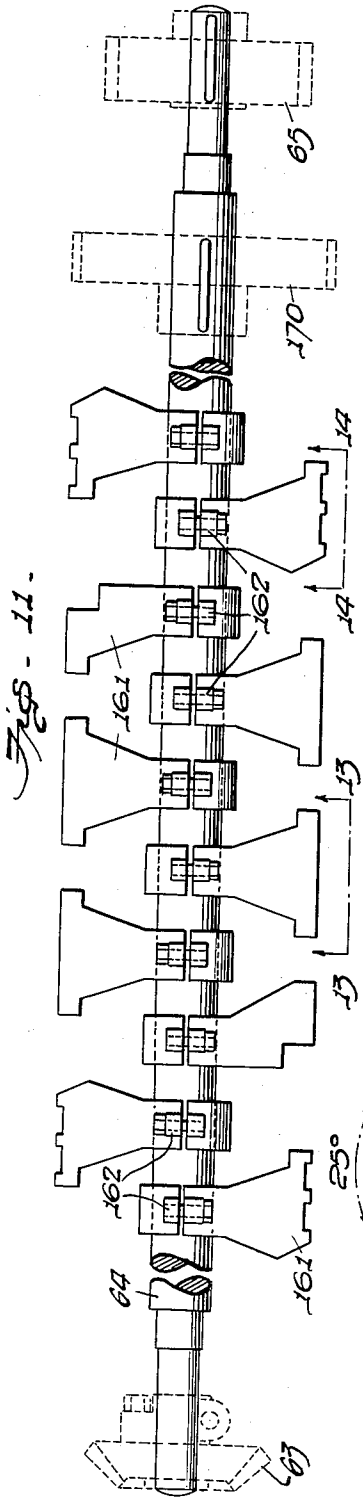


Fig. 11.

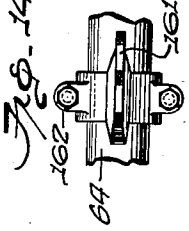


Fig. 14.

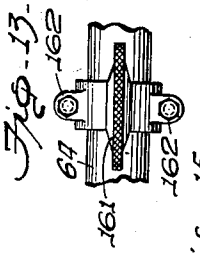


Fig. 13.

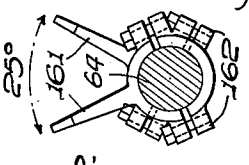


Fig. 12.

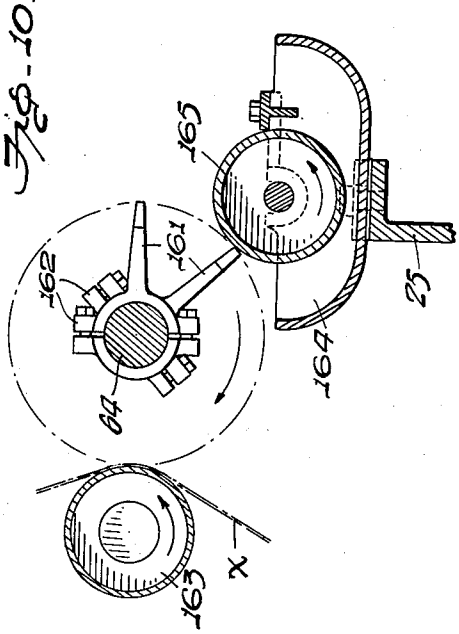


Fig. 10.

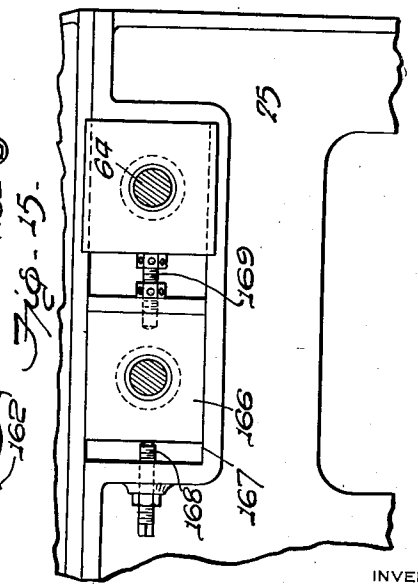


Fig. 15.

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PRINTING MACHINE

Filed Nov. 11, 1931 8 Sheets-Sheet 8

Fig. 16.

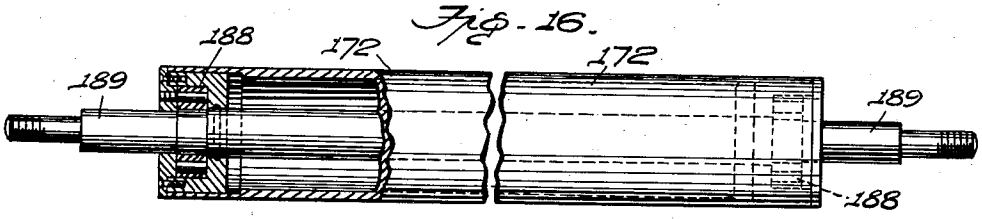


Fig. 17.

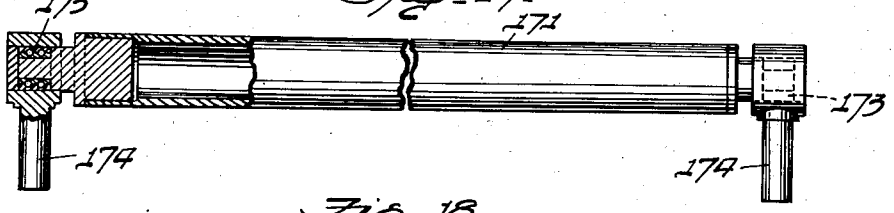


Fig. 18.

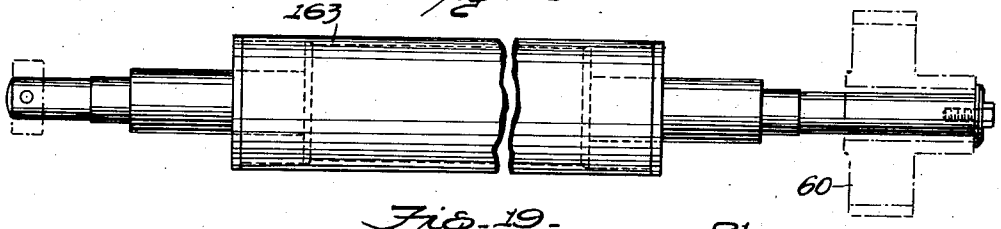


Fig. 19.

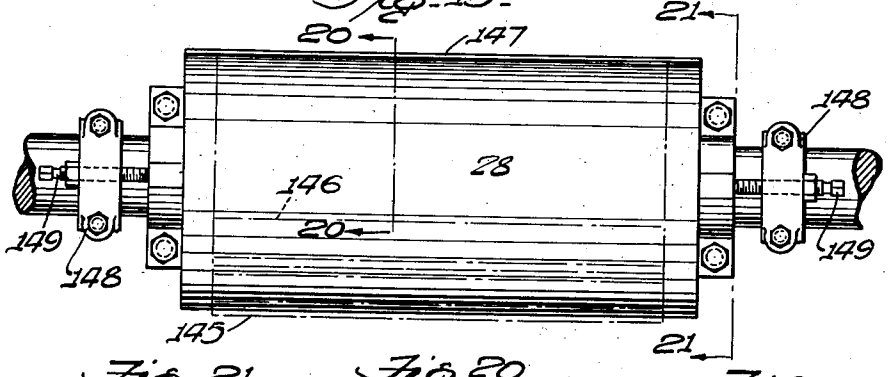


Fig. 21.

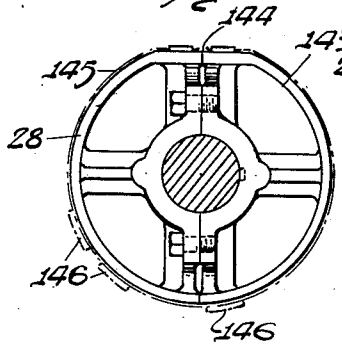


Fig. 20.

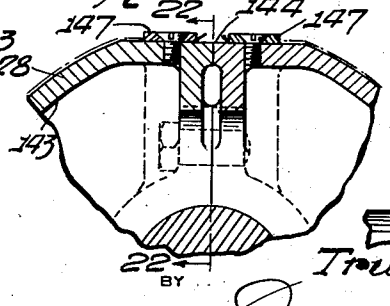
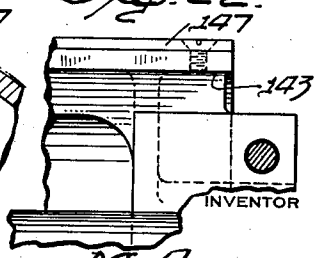


Fig. 22.



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Patented June 12, 1934 1,963,041

UNITED STATES PATENT OFFICE

1,963,041

PRINTING MACHINE

True M. Avery, Glens Falls, N. Y., assignor to Union Bag & Paper Corporation, Hudson Falls, N. Y., a corporation of New Jersey

Application November 11, 1931, Serial No. 574,407

7 Claims. (Cl. 93—34)

The present invention relates to printing machines and more especially to machines for printing strips of paper or the like to be used for the making of paper or similar bags whereby the bags will bear desired printed impressions on a side or face thereof.

One of the objects of the invention is to provide a novel and improved printing machine of this class, the construction of which is such that printing rolls of different diameters may be used for the printing of bags of different lengths, the inking and impression rolls being readily adjustable to conform with the different diameter printing rolls.

Another object is to provide novel and improved means for driving printing rolls of different diameters from the bag machine so that the printed impressions applied to the bag strip will conform with the lengths of the bags made by the bag machine.

Another object is to provide a novel and improved means for producing and maintaining proper registration between the printed impressions on the bag strip and the cut-off and other devices of the bag machine, so that the printed impressions will be located at the proper height on the side or face of each bag.

Another object is to provide novel and improved means for retracting or withdrawing the impression roll and the inking rolls relatively to the printing roll or rolls whereby the latter will be rendered readily accessible for changing thereof or other purposes and also to relieve the pressure between such rolls while the machine is idle or not in operation, means being provided for insuring the immediate return of the impression roll and the inking rolls accurately to operative positions.

To these and other ends, the invention consists in certain improvements and combinations and arrangements of parts all as will hereinafter appear, the features of novelty being pointed out particularly in the claims at the end of the specification.

In the accompanying drawings:

Figures 1 and 1ª show collectively a bag-making machine and printing mechanism embodying the present invention combined therewith,

Figure 2 is an elevation, on an enlarged scale, of the inking mechanism as viewed from the left in Figure 1ª,

Figure 3 is a view on an enlarged scale, of the ratchet mechanism for shifting the inking mechanism to and from operative position,

Figure 4 is a detail view of the ratchet mechanism shown in Figure 3 as viewed from the right in that figure,

Figure 5 is an end elevation of the printing mechanism as viewed from the left in Figure 1ª, the lower portion of this figure being in section on the line 5—5 of Figure 1ª,

Figure 6 is a horizontal section taken on the line 6—6 of Figure 5 and looking in the direction of the arrows,

Figure 7 is an enlarged vertical section taken on the line 7—7 of Figure 2,

Figure 8 is a section, on an enlarged scale, taken on the line 8—8 in Figure 1ª,

Figure 9 is a detail section, on an enlarged scale, of the paper roll shaft and roll-adjusting means, the section being taken on the line 9—9 of Figure 1ª,

Figure 10 is an enlarged vertical section through the paste-applying mechanism taken on the line 10—10 of Figure 6,

Figure 11 is an enlarged detail view of the paster shaft and the pasters mounted thereon,

Figure 12 is a transverse section through the paster shaft, showing the pasters set in angular working relation thereon,

Figures 13 and 14 are end views of two of the pasters as viewed on the lines 13—13 and 14—14 respectively in Figure 11,

Figure 15 is a section on an enlarged scale through the paster and paste roll shafts, taken on the line 15—15 of Figure 6,

Figure 16 is a detail view, partly in section, of the idler roll over which the paper strip passes from the printing machine to the bag machine,

Figure 17 is a detail view, partly in section, of the tension roll which tensions the paper strip and maintains registration between the printing and bag machines,

Figure 18 is a detail view, partly broken away, of the paster roll,

Figure 19 is a detail view of one of the printing rolls,

Figure 20 is a transverse section through the printing roll, taken on the line 20—20 of Figure 19,

Figure 21 is a transverse section through the printing roll shaft, taken on the line 21—21 in Figure 19 and showing the printing roll in end elevation, and

Figure 22 is a detail section taken on the line 22—22 in Figure 20.

Similar parts are designated by the same reference characters in the different figures.

Printing mechanism embodying the present

invention is adapted for use generally wherever the printing of a traveling strip or web is desirable, but it is particularly applicable in conjunction with a bag-making machine whereby the printing of the impressions which it is desired to appear on bags may be made upon the bag strip while the same is being fed into the bag-making machine, the present invention providing means by which correct registration between the impressions printed on the bag strip and the cut-off and other devices acting on the bag strip in the bag machine may be readily produced and maintained and also providing means by which the printing mechanism may be readily adjusted or altered to conform with adjustments or alterations of the bag-making machine for the making of bags of different sizes or lengths.

In the present instance, the invention is shown applied to a bag-making machine of common or well known construction such, for example, as that shown and described in United States Letters Patent, No. 417,346, granted December 17, 1889, to C. B. Stilwell. Since the construction and mode of operation of bag-making machines of the class shown are well known, it is deemed sufficient for the purposes of the present invention to describe such machine briefly as comprising a main frame 1 on which the various parts of the machine are mounted, a former 2 beneath which the paper bag strip X is fed and over which the longitudinal edges of the strip are turned so as to form a tube, a pair of draw rolls 3 between which the bag tube passes and by which the bag tube is continuously fed forwardly to a knife blade 4 arranged at the end of the former and to a revolving striker or cut-off device 5 which moves past the knife blade 4 and, in so doing, severs the bag tube successively into bag lengths, a pair of pinch rolls 6 engaging the bag tube between them during the cutting off operation and the severed bag lengths being advanced in the usual manner to the bottom folding and other mechanisms commonly used in machines of this class for completing the bags. The pinch rolls 6, which are usually geared together, are driven by a gear 7 fixed to the shaft of one of these rolls and by a gear 8 which meshes therewith and is mounted on a shaft 9, the latter being driven from a suitable source of power such, for example, as an electric motor 10. The striker or cut-off device 5 is driven by a gear 11 which is fixed to its shaft 12 and meshes with a gear 7^a of equal size fixed on the same shaft with the gear 7. The draw rolls 3 which advance the bag strip to the striker and pinch rolls and the speed of which determines the length of the bag sections, are driven from a gear 13 which is fixed on the shaft 9, through intermediate gears 14 and 15 and by the gear 16 which latter is fixed to the shaft of one of the draw rolls, and in order to vary the speed of the draw rolls relatively to that of the striker or cut-off device and hence, vary the length of the bag lengths formed from the bag tube, the gear 13 is one of a number of change gears of different diameters which may be mounted on the drive shaft 9 to obtain the proper speed of the draw rolls, the intermediate gears 14 and 15 being mounted on a bracket 17 which may swing from the shaft carrying the gear 16 so that the intermediate gears may be brought into proper mesh with the gear 13 according to the variation in its diameter. The printing mechanism, in the present instance, is driven in timed relation with the bag-making machine by the longitudinal shaft 18 thereof, this shaft having a bevel gear 19 thereon which meshes with a bevel gear 20 of equal diameter on the drive shaft 9, the shaft 18 thus making one revolution to each revolution of the striker or cut-off device 5.

The printing mechanism is driven from a shaft 21 which is connected to turn in unison with the shaft 18 of the bag-making machine, by a connecting shaft 22 which is connected to the shafts 18 and 21 by suitable universal joints 23 and 24.

The printing mechanism, according to the present invention, comprises a main frame 25 which rests on a suitable base 26 and provides a support for the various parts of the printing mechaninsm with the exception of the auxiliary frame 27 which supports the inking mechanism so that it may be shifted into and out of co-operative relation with the printing mechanism, as will be hereinafter described. The printing mechanism shown, comprises a pair of printing rolls 28 and 29 which are adapted, for example, to print in different colors, and a co-operating impression roll 30. The printing rolls are mounted in bearings 31 and 32 so that one of these rolls will be directly above the other, and the bearings for these rolls are slidable horizontally in the sides of the main frame 25 and rest against set screws 33 and 34 against which they are held yieldingly by compression springs 35 and 36, the set screws 33 and 34 sustaining the impression pressure exerted by the impression roll 30 upon the printing rolls. The impression roll 30 is mounted by its shaft in a bearing 37 at each end thereof, and each bearing 37 is slidable in a horizontal guide-way 38 formed in the respective side of the main frame 25 so that the center of the impression roll is shiftable in a plane which is perpendicular to a line connecting the centers of the printing rolls 28 and 29 and passes midway between the centers of the printing rolls. By so mounting the impression roll, it may be simultaneously brought into or removed from co-operative relation with both printing rolls which are of equal diameter, or it may be adjusted toward or from the pair of printing rolls and thus made to conform with pairs of printing rolls of smaller or larger diameters.

Adjusting means is provided for the impression roll whereby the impression roll may be readily withdrawn from the printing rolls to relieve the pressure between these rolls while the machine is idle, thereby avoiding the formation of flat spots on the rolls, and for accurately gaging the return movement of the impression roll so that it will apply the proper impression pressure after being once set, and such adjusting means also provides for the adjustment of the impression roll to conform with larger or smaller printing rolls. Such adjusting means, according to the present invention and shown most clearly in Figures 1^a and 8, comprises a spindle 39 on one end of which is threaded into the respective bearing 37 as at 40 and the other end of which is threaded along its length as at 41 and has a thread engagement within a worm wheel 42 which is rotatably mounted in the respective side of the main frame 25, and a pair of lock nuts 43 are mounted on the outer end of each spindle and at the outer side of a bracket 44 which is fixed to the respective side of the main frame. A transverse shaft 45 is rotatably mounted in bearing brackets 46 bolted or otherwise fixed to the respective sides of the main frame 25, this shaft having a pair of worms 47 fixed thereon and meshing with the worm wheels 42 which are rotatable on the respective spindles 41, the end of the shaft 45 at the front of the

machine having a crank 48 fixed thereon, this crank preferably having a weight 49 formed therewith or connected thereto so that the crank 48 will normally tend to hang in its lower position. Rotation of the shaft 45 by the crank 48 will cause the worms 47 thereon meshing with the worm wheels 42 to rotate said worm wheels and the latter, threaded on the spindles 41, will cause both of the spindles to be shifted simultaneously in a direction to move both ends of the impression roll 30 toward or from the printing rolls, and after the impression roll has been set to apply the proper degree of impression pressure to the printing rolls, the lock nuts 43 are adjusted against the outer ends of the brackets 44, and operation of the shaft 45 to withdraw the impression roll from the printing rolls, as when the machine is to be idle, will merely move the lock nuts 43 out of engagement with the brackets 44 but when the shaft 45 is rotated in a direction to restore the impression roll to printing relation with the printing rolls, the extent of rotation thereof and hence the extent of movement of the impression roll toward the printing rolls will be limited by the engagement of the lock nuts 43 with the brackets 44, the position of the impression roll with respect to the printing rolls being thus gaged so that the proper degree of impression pressure will be insured without requiring readjustment of the impression roll each time it is returned to operative position. The crank 48 is preferably mounted adjustably on the shaft 45, as by a screw operated clamp 50, so that after each adjustment of the impression roll relatively to the printing rolls and adjustment of the lock nuts 43 against the brackets 44, the crank 48 may be set in such position around the shaft 45 that the weight 49 will tend to swing downwardly and thereby maintain a turning force on the shaft 45 in a direction which will maintain the lock nuts 43 against the brackets 44. One of the worms 47, as for example, the right-hand worm in Figure 8, may be keyed or otherwise fixed to the shaft 45, but the other worm 47 is preferably mounted rotatably on the shaft 45 and is clamped or held non-rotatably on said shaft by a jamb nut 51 which may be threaded on the shaft 45. By this construction, rotation of the shaft 45 will move both ends of the impression roll equally toward and from the printing rolls, but in order to equalize the pressure at both ends of the impression roll when such pressure is uneven, the nut 51 will be turned to unclamp the adjacent worm 47 so that said worm will not turn with the shaft 45, and by then turning the shaft 45 in the proper direction, the opposite worm 47 will be turned to advance or retract the respective end of the impression roll, and after the latter has been adjusted to equalize the pressure at both ends thereof, the nut 51 is tightened to lock the adjacent worm 47 so that both worms will turn in unison.

The printing rolls 28 and 29 and the impression roll 30 are geared together so that they will rotate at equal surface speed, the shaft 52 of the impression roll being provided for this purpose with a gear 53 which is fixed thereon to turn therewith, the pitch circle of this gear being of a diameter which equals the diameter of the impression roll, and the shafts 54 and 55 of the printing rolls have gears 56 and 57 which are fixed thereon to turn therewith, the gears 56 and 57 having pitch circles the diameter of which is equal to the diameter of the printing rolls, and these gears mesh with the gear 53 on the shaft of the impression roll. The printing rolls and the impression roll are driven through a gear 58 which is fixed on the shaft 54 of the upper printing roll, the gear 58 meshing with and being driven by an idler gear 59, said idler gear meshing with and being driven from a gear 60.

The present invention enables printing rolls of different diameters to be accommodated in the printing mechanism in place of the printing rolls 28 and 29. By providing printing rolls of different diameters having gears 56 and 57 of appropriately corresponding diameters to mesh with the gear 53 on the impression roll shaft, such printing rolls of different diameters may be substituted and they will be caused to rotate at the same surface speed as that of the impression roll and to receive the same impression pressure from the impression roll through the adjustment of the impression roll toward or from the printing rolls in a plane passing midway between the centers of the printing rolls, as hereinbefore described.

The printing rolls are so driven from the bag-making machine that they each make one revolution to each revolution of the striker or severing device 5. In the present instance, the shaft 21 (Figures 5 and 6) which is connected to the shaft 18 and makes one revolution to each revolution of the striker or cut-off device 5, is connected through a gear 61 or 62 fixed thereon and a cooperating bevel gear 63 of equal size fixed on a shaft 64 to a gear 65 which meshes with and is of the same size as the gear 60 so that the latter will always make one revolution to each revolution of the striker or cut-off device 5 of the bag-making machine, and by using a gear 58 of the same diameter as that of the gear 60, the printing rolls will always be driven so that they will each make one revolution to each revolution of the striker or cut-off device 5. The smaller or larger diameter of the printing rolls used will conform with the diameter of the change speed gear 13 used in the bag machine to drive the draw rolls 3 at a slower or higher speed to produce relatively shorter or longer bag lengths, and the use of change gears 56 and 57 which conform with the smaller or larger diameter of the printing rolls will provide proper meshing of these gears with the gear 53 on the impression roll shaft when the surfaces of these rolls are in contact and will insure the driving of the printing and impression rolls at uniform surface speed to conform with the speed of the draw rolls 3 in the bag machine, it being understood that the diameter of the printing rolls and their gears should conform with the speed at which the draw rolls are driven so that the paper strip will pass between the impression roll and the printing rolls at the same speed at which it passes between the draw rolls.

The inking mechanism for the printing rolls 28 and 29 (Figures 1[a], 2 and 7), is carried by an auxiliary frame 27 so that the inking mechanism may be shifted bodily out of cooperative relation with the printing rolls either to relieve pressure between the inking rolls and the printing rolls while the machine is idle or to provide convenient access to the printing rolls for the changing or other manipulation thereof, as well as to enable the inking mechanism to be adjusted to conform with printing rolls of different diameters. In the construction shown, the auxiliary frame 27 carrying the inking mechanism is formed at its lower end with slides 66 which are movable horizontally on rails 67 on the base 26 so that the frame 27 may move horizontally in a direction

toward or from the printing rolls, and the frame 27 has a cross shaft 68 extending across its width and rotatably mounted therein, this cross shaft having pinions 69 fixed thereon near its ends and meshing with rack bars 70 which are fixed to the inner sides of the rails 67, so that rotation of the shaft 68 will cause the pinions 69 in engagement with the rack bars 70 to shift the frame 27 horizontally along the base in a direction toward or from the printing rolls. The shaft 68, according to the present invention, is rotated by a ratchet lever 71, the hub 72 of which is rotatably mounted on the forward end of the shaft 68, and a ratchet wheel 73 is fixed to the forward end of the shaft 68 in front of the lever 71. The lever 71 carries a double acting pawl 74 having teeth 75 and 76, the pawl being mounted rotatably on a pivot 77 which is bolted or otherwise fixed in the lever 71, and the pawl is provided with a handle 78 by means of which it may be rotated to throw either the tooth 75 or the tooth 76 into engagement with the ratchet wheel. A spring-pressed plunger 79, guided by a pivot pin 80 mounted rotatably in the lever 71 is arranged to bear in a transverse recess 81 formed in the upper edge of the pawl 74, the plunger 79 so acting that when the pawl 74 is rocked in one or the other direction to engage the tooth 75 or the tooth 76 with the ratchet wheel 73, the spring plunger will slide into the appropriate end of the recess 81 to yieldingly hold the pawl 74 in such position, although yielding to permit retrograde movement of the active tooth with respect to the ratchet wheel. Reversal of the position of the pawl will cause a corresponding reversal of the position of the spring plunger. Such ratchet lever and ratchet wheel enable the frame 27 to be shifted readily in either direction to bring the inking mechanism into cooperation with the printing rolls or to remove it therefrom. Means is also provided for properly gaging the movement of the inking mechanism toward the printing rolls, such means comprising a rod 82 fixed to each side of the frame 27 at the bottom thereof, each of these rods being threaded and extending through the outer end of the respective rail 67 and provided with lock nuts 83 which are adjustable along the respective rod and are adapted to be set against the outer end of the respective rail after the inking mechanism has been properly set with respect to the printing rolls, the lock nuts acting as automatic limit stops to arrest the movement of the inking mechanism toward the printing rolls while being returned to cooperative relation therewith. Means is also preferably provided for normally retaining the inking mechanism in cooperative relation with the printing rolls and for holding the lock nuts 83 against the ends of the rails 67, such means as herein shown comprising a weight 84 having a split hub 85 which is adapted to be clamped on the hub 72 of the ratchet lever 71, this weight being set in such a position that it will tend to descend and thereby turn the shaft 68 in a direction to move the inking mechanism carrying frame 27 toward the printing rolls and to thereby hold the lock nuts 83 against the ends of the respective rails. Preferably, the weight 84 is set at the side of the ratchet lever 71 which is toward the printing rolls so that while the ratchet lever is in substantially upright position, the weight will act thereon to swing it in a direction tending to move the inking mechanism toward the printing rolls.

The inking mechanism, in the present instance, comprises two inking rolls to cooperate with the respective printing rolls, and ink fountains and rolls for supplying ink to the respective inking rolls. The employment of two printing rolls enables printing to be done in different colors, and in that case, the different inking rolls and their cooperative fountains and feeding rolls will supply ink of different colors to the printing rolls. As shown in Figures 1a, 2 and 7, a pair of ink fountains 86 and 87 are employed which carry the inking and ink supply rolls, these fountains and the rolls cooperative therewith being preferably substantially duplicates. The ink fountains are mounted on base plates 88 and 89 which extend transversely across the auxiliary frame 27 and rest slidably on guideways 90 and 91 on the respective side members of the frame 27 so that each ink fountain is shiftable relatively to the frame 27 in a direction toward and from the respective printing roll. Springs 92 and 93 are interposed between the forward edges of the respective base plates 88 and 89 and the frame 27, these springs acting normally or yieldingly to withdraw the respective ink fountains relatively to the printing rolls, and screws 94 and 95 are threaded in the frame 27 and bear on the edges of the base plates 88 and 89 respectively opposite to the edges thereof engaged by the springs 92 and 93, these screws serving to provide relatively fine or accurate adjustments of the inking devices relatively to the respective printing rolls. Preferably, a pair of screws 94 and 95 are provided to cooperate with the ends of the respective base plates 88 and 89, the screws for each base plate being independently adjustable so that the inking roll carried by the base plate may be brought evenly at both ends into engagement with the respective printing roll. The ink fountains 86 and 87 are preferably adjustable on the respective base plates 88 and 89, they being mounted for this purpose on angle plates 96 and 97 which are slidable transversely on the respective base plates 88 and 89 and carry pairs of set screws 98 and 99 which bear against the adjacent edges of the respective base plates 88 and 89, each pair of these set screws being adjustable either in unison or independently to gage the distance of the respective ink fountain from the respective printing roll or to adjust it angularly relatively thereto.

The ink fountains may be supplied with ink in different ways, the ink supply means shown in the present instance being similar to that shown in my prior application, Serial No. 455,919, filed May 26, 1930, it being believed sufficient for the purposes of the present invention to describe the ink supply means shown as comprising a bracket 100 for each ink fountain, the bracket having a well 101 therein which communicates with the bottom of the respective ink fountain through a passageway 102, a swivel pin 103 which is rotatable on a vertical axis in the bracket 100 and is provided with a clamp-like socket 104 at its upper end, and an ink bottle carrier 105 which is swiveled in the socket 104 to rotate on a horizontal axis, this carrier being adapted to receive a bottle of ink while the latter is in upright position and to secure the bottle thereto by a clamp 106, after which the ink bottle may be inverted by swiveling the carrier 105 in the socket 104. The carrier 105 contains a duct 107 which leads from the bottle mouth-receiving portion of the carrier to a tube 108, the latter being arranged to project downwardly into the ink well 101 when the carrier 105 is in a position to support the ink bottle in upright or ink-feeding position. The ink flowing from the bottle through the duct 107 and tube

108 will fill the well 101 and the ink fountain to a predetermined level which is determined by the height of the lower end of the tube 108, this tube automatically maintaining the ink at a predetermined level in the ink fountain by controlling the admission of air to the bottle to relieve the vacuum therein.

The base plates 88 and 89 support the inking rolls 109 and 110 which are supplied with ink by the respective fountain rolls 111 and 112 and doctor rolls 113 and 114 which remove surplus ink from the inking rolls and thereby insure the transfer of the proper amount of ink therefrom to the printing rolls. For this purpose, the base plates 88 and 89 have bearing brackets 115 and 116 bolted on otherwise fixed thereon, these bearing brackets having guides 117 and 118 in which are mounted bearings 119 and 120 and 121 and 122 for the shafts of the rolls 113 and 109 and 114 and 110 respectively, the bearings 119 and 121 being slidable in the respective guides in an inclined direction substantially radially of the axes of the respective printing rolls 28 and 29 so that the doctor rolls 113 and 114 carried by these bearings may move toward and from the respective inking rolls 109 and 110. Springs 123 and 124 normally act on the bearings 119 and 121 to yieldingly withdraw the rolls 113 and 114 from the respective inking rolls, and cam levers 125 and 126, pivoted on the respective bearing brackets act on plungers 127 and 128 to force the rolls 113 and 114 into operative relation with the respective inking rolls 109 and 110. By this arrangement, when the levers 125 and 126 are swung into positions which permit retraction of the plungers 127 and 128, the springs 123 and 124 will act to disengage the doctor rolls 113 and 114 from the respective inking rolls, thus avoiding the development of flat spots in the peripheries of these rolls while the machine is idle or not in operation.

The fountain rolls 111 and 112 are rotatably mounted in bearings 129 and 130 which are formed in the ends of the respective ink fountains 86 and 87, these rolls dipping into the ink in the respective fountains and transferring it to the respective inking rolls. Preferably, a very slight gap is left between each fountain roll 111 or 112 and the respective inking roll 109 or 110, so that the inking roll will contact with the film of ink lifted from the ink fountain by the fountain roll and will thus receive ink therefrom. The independent adjustment provided for the ink fountain as hereinbefore described and controlled by the set screws 98 and 99 enables each fountain roll to be adjusted very accurately in relation to the respective inking roll to effect the transfer of ink between these rolls without requiring actual contact thereof. The doctor rolls 113 and 114 bear upon the respective inking rolls 109 and 110 and serve to remove surplus ink picked up by the inking rolls and to return such ink to the respective ink fountains.

The inking mechanisms just described are driven from the gears 56 and 57 on the shafts of the respective printing rolls by gears 131 and 132 connected to the shafts of the inking rolls 109 and 110. The doctor rolls 113 and 114 are driven from the inking rolls 109 and 110 by gears 133 and 134 which are fixed on the shafts of these rolls, these gears being preferably of equal size so that the inking and doctor rolls will rotate at substantially equal speed but in reverse directions, and the fountain rolls 111 and 112 are driven at a relatively lower speed so that undue lifting or splashing of ink from the ink fountains will be avoided, the driving means for the fountain rolls comprising relatively small pinions 135 and 136 which are fixed on the shafts of the doctor rolls 113 and 114 and mesh with relatively larger gears 137 and 138 which are loosely mounted on the shafts of the respective inking rolls and are connected to relatively smaller pinions 139 and 140 which mesh with relatively large gears 141 and 142 fixed on the shafts of the respective fountain rolls, the reduction gear drive for each fountain roll thus insuring rotation thereof at a sufficiently low speed to avoid splashing or undue lifting of ink from the ink fountains. The contact between the doctor rolls 113 and 114 and the inking rolls 109 and 110 and the rotation of these rolls in opposite directions insures the squeezing of surplus ink from the inking rolls and the return of such ink to the ink fountains.

It is to be understood that the inking rolls 109 and 110 are adapted to contact with the type faces borne by the printing rolls 28 and 29 to supply such type faces with ink for transfer to the paper strip while the latter passes between the printing rolls and the impression roll, and it will be obvious from the diagrammatic illustration of printing rolls of different diameters in Figure 7 that the inking rolls may be brought into operative relationship with printing rolls of different diameters by shifting the auxiliary frame 27 on which the inking mechanisms are mounted, in a direction toward and from the printing rolls by the adjusting means hereinbefore described.

The printing rolls may be of different constructions although it is preferable to construct each of these rolls substantially in the manner shown in Figures 19 to 22 inclusive. As shown in these figures, the printing roll comprises a metal or other core 143 which is cylindrical in form but is flattened at one point in its circumference, as at 144, and the cylindrical core is surrounded by a strip 145 of canvas or other suitable flexible material on which rubber type 146 are vulcanized. The canvas strip bearing the type is drawn tightly around the cylindrical core with its ends terminating at the flattened side 144 thereof, and these ends of the strip are firmly secured with the strip under proper tension, by steel or other clamping strips 147 which are secured by screws or other means to the core so as to securely clamp the ends of the type bearing strip in position. The core 143 bearing the type is preferably splined on the printing roll shaft so that it will rotate therewith but is shiftable axially thereof, and collars 148 are preferably clamped or otherwise fixed to the printing roll shaft and carry set screws 149 arranged to bear against the respective ends of the printing roll, adjustment of these set screws serving to shift the printing roll axially of its shaft and thereby enabling the printing roll to be registered transversely of the strip which is to be printed. In using a plurality of printing rolls, as shown in the present instance and providing such rolls with the transverse registering means described, the impressions made on the paper strip by the different printing rolls may be readily and accurately registered transversely.

The strip of paper or the like which is printed by the printing rolls is designated x and it is supplied from a paper roll mounted on a reel shaft 150 (Figure 9), this reel shaft being rotatably supported in bearing brackets 151 provided on the main frame 25. Preferably, in order to properly position the paper strip transversely as it is fed into the machine, means is provided for adjusting the reel shaft in a direction to ac-

complish this result. As shown, the reel shaft is provided with a pair of conical roll centering members 152 and 153 which are movable toward and from one another to engage in the central opening in the paper roll, the member 152 being threaded on the reel shaft and the member 153 having a pawl 154 adapted to engage in ratchet teeth 155 spaced axially in one side of the reel shaft, rotation of the member 152 after the member 153 has been properly set, securing the paper roll against axial displacement on the reel shaft and centering the paper roll thereon. One end of the reel shaft is provided with a collar 156 which is pinned or otherwise fixed thereon and a screw 157 is rotatably mounted in one of the bearing brackets 151, the screw being threaded in a slide 158 which is guided by a pin 159 which is secured to and projects outwardly from the bracket 151 in parallelism with the screw 157, and the slide is provided with opposed bearing plates 160 which engage opposite sides of the collar 156. By this construction, rotation of the screw 157 will shift the slide 158 in one direction or the other longitudinally of the reel shaft and will cause one or the other of the bearing plates 160 to act on the collar 156 on the reel shaft to shift the latter axially in its bearings on the bearing brackets 151, a fine adjustment being thus provided for positioning the paper strip transversely as it enters the printing mechanism, and the confinement of the collar 156 between the bearing plates 160 will maintain axial adjustment of the reel shaft although permitting rotation thereof.

The paper strip x after passing successively between the printing rolls and the impression roll so as to receive the desired printed impressions, is conducted toward the bag-making machine, and when bags of the ordinary single thickness are to be made, the printed paper strip may be conducted to the bag-making machine without further treatment thereof except the application of paste for the usual longitudinal seam. The printing mechanism shown in the present instance however is adapted to the making of so-called duplex bags, that is, bags of double thickness formed from two paper strips, and the machine is, therefore, provided with means for applying paste to one of the bag strips to unite the inner and outer bags, and for feeding a second bag strip so that it will be united with the other bag strip so that the combined bag strips will be fed into the bag-making machine.

In the present instance, the shaft 64 on which the gears 63 and 65 are fixed serves as a paster shaft, it being provided, as shown in Figures 10 to 14 inclusive, with two series of paste-applying members 161 each of which is in the form of an arm having a clamp-like hub 162 adapted to be bolted to the shaft 64 at an appropriate angle thereon. These paste-applying members in the present instance are arranged in two rows in angular relationship with one another, as shown in Figures 10 and 12, and they act on the paper strip x as it passes them in such positions as to apply spots of paste to the paper strip at opposite sides of the point at which the paper strip is to be severed in the bag-making machine in forming the bag sections, so that each revolution of the shaft 64 will apply paste to unite the outside bags to the inside bags at the bottom of one complete or duplex bag and the top of another or adjacent duplex bag. The shaft 64 carrying the paste-applying members 161 is driven to revolve continuously during the operation of the machine so that these pasters move with the paper strip as the latter passes a paster roll 163 which is mounted opposite to the shaft 64. The roll 163 is preferably an idler which is revolved by the pressure of the paper strip x against it, for which purpose the gear 60 on one end of the shaft of this roll is mounted loosely thereon. The paste-applying members 161 are supplied with paste from a paste-containing receptacle 164 which is supported on the main frame 25 and contains a paste roll 165 which is revoluble therein and dips into the paste, the periphery of the paste roll 165 being so located that the outer ends or tips of the paste-applying members 161 will touch the surface of this paste roll as they are carried around by the shaft 64, thus picking up paste which, upon further rotation of the shaft 64 in the direction of the arrow in Figure 10 will cause the paste-carrying end of the members 161 to apply two rows of paste spots to the passing paper strip x, the pressure of the paste-applying members against the strip x being sustained by the roll 163. The degree of pressure exerted by the paste-applying members 161 to the paper strip x may be varied as desired by mounting each bearing 166 for the shaft of the roll 163 in a guide 167 in the frame 25 so that the roll 163 may move toward and from the shaft 64, set screws 168 and 169 being provided at opposite sides of each bearing to adjust it transversely and maintain it in adjusted position. The paste roll 165 is preferably driven from the shaft 64 by gears 170 fixed on the shaft of the paste roll 165 and the shaft 64 respectively, these gears being of such ratio as to cause the paste roll 165 to revolve at the same peripheral or surface speed as that of the outer ends of the members 161. One or the other of the gears 61 and 62 is meshed with the gear 63 on the shaft 64 to drive the paster mechanism and also, through the gear 60, the various parts of the printing mechanism in the proper direction, according to the direction in which the longitudinal shaft 18 of the bag-making machine rotates, this shaft rotating in different directions in different machines and the provision of the two beveled gears 61 and 62 on the shaft 21 enabling one or the other of these gears to be meshed with the gear 63 to drive the pasting and printing mechanism in the proper direction.

After paste has been applied as described to the bag strips x, a second bag strip x' is fed into the machine so that it will unite with and become pasted to the strip x, the second strip x' being fed into the machine from a paper roll which may be mounted on a reel shaft 150^a which may be similar to the reel shaft 150 and centered and mounted and adjusted in the same way on brackets 151^a on the frame 25. The second strip x' is preferably brought into contact with the previously pasted strip x as these two strips pass around a tension roller 171 which forms a loop in the two strips as they pass around an idler roller 172. The tension roller 171, as shown in Figure 17, is freely revoluble, by means of antifriction bearings 173, in bearing members 174, and these bearing members are mounted in the upper ends of a pair of arms 175 which are fixed to and extend upwardly from a shaft 176 which extends across the width of the frame 25 and is journaled in suitable bearings 177 in the side members thereof, and an operating arm or lever 178 is fixed to the shaft 176 and extends downwardly therefrom and carries at its lower end a nut 179 which is engaged by a screw 180. One

end of this screw is rotatably mounted in a swivel pin 181 supported on the frame 25 and one end of the screw is provided with a knurled head 182 by means of which it may be rotated. By this construction, the paper strip x' is pressed into adhering relationship with the pasted side of the strip x as the two strips pass around the tension roller 171 and around the idler roller 172, and also, the screw adjustment provided for the tension roller 171 enables the position of this roller and hence the length of the strips x and x' contained in the loop between the pasting mechanism and the bag-making machine to be increased or decreased in order to bring the printed impressions and the transverse lines of paste on the strip x into proper registry with the severing device 5 and other operative parts of the bag machine into which the two strips x and x', united to form the strip X is fed. While the united strips are passing around the idler roller 172, longitudinal lines of paste are applied to the longitudinal edges of these strips to form the longitudinal seams of the inner and outer bags, a pair of narrow paste wheels 183 and 184 being provided for this purpose in the present instance, these paste wheels being immersed in a paste receptacle 185 which is held by a screw clamp 186 at an appropriate point in the length of a transverse supporting bar 187 so that the paste wheels 183 and 184 will travel along the longitudinal edges of the strips x' and x respectively to apply paste thereto for making the longitudinal seams in the bag tubes, it being understood that the strip x' to form the inner bag is narrower than the strip x which is to form the outer bag or is displaced laterally of the strip x so that the two adjacent longitudinal edges of these strips will be exposed to the respective paste wheels. The idler roller 172 is freely revoluble in the top of the frame 25, it being preferably provided, as shown in Figure 16, with roller or other anti-friction bearings 188 which support it for very free rotation on its supporting shaft 189, thus minimizing resistance to the feeding of the bag strip or strips from the printing mechanism to the bag-making machine.

The general operation of printing mechanism constructed as hereinbefore described is as follows: The paper rolls for feeding the bag strips x and x' having been mounted in the machine as hereinbefore described and these strips being led into the bag-making machine past the former 2 and between the draw rolls 3, and the printing rolls 28 and 29 having been provided with the desired type or printing surfaces and the inking devices supplied with ink having been adjusted so that the inking rolls properly contact with the printing rolls, the strip x first passes between the printing roll 29 and the impression roll 30, producing an imprint from said printing roll onto the strip, following which said strip passes between the printing roll 28 and the impression roll 30, thereby receiving an imprint from the latter printing roll, the strip x with the printed impressions thereon then passing upwardly between the shaft 64 carrying the paste-applying members 161 and the paster roll 163, the strip then receiving longitudinally spaced transversely extending rows of paste spots, and as the printing and pasted strip x approaches the tension roller 171, it is met by the second strip x' which is fed to the pasted side of the strip x and becomes pasted thereto, following which the united strips pass around the idler roller 172, receiving longitudinal lines of paste from the paste wheels 183 and 184 for the making of the longitudinal seams of the inner and outer bag tubes which are to be formed from the combined strip X. This combined bag strip X is fed into the bag-making machine in the usual way, beneath the former 2, during which the longitudinal edges thereof are turned over the upper side of the former and their longitudinal edges are pasted together to form the inner and outer bag tubes, and the duplex bag tube thus formed is advanced by the draw rolls 3 in the usual way to the striker or cut-off device 5 which severs the duplex bag tube into bag lengths which pass between the pinch rolls 6 and thence to the usual mechanism of the machine for closing the bottoms thereof.

Since the longitudinal shaft 18 of the bag-making machine is geared to the striker or severing device 5 so that it makes one revolution to each revolution made by the striker, and the train of gearing connecting the shaft 21 driven in unison with the shaft 18 to the shaft 64 carrying the paste-applying members and to the printing rolls 28 and 29 is of a one to one ratio, the printing rolls and also the shaft 64 will always make one revolution to each revolution made by the striker or severing device 5 of the bag-making machine, so that these elements of the printing mechanism and the bag-making machine will be thus maintained in proper timed relation. However, when a change gear 13 is used in the bag-making machine which is of reduced or increased size to reduce or increase the speed of the draw rolls 3 for the production of shorter or longer bag lengths, the speed of the paper strip x through the printing mechanism will be correspondingly reduced or increased, and to compensate for such variation in the speed of the paper strip through the printing mechanism, printing rolls 28 and 29 and drive gears 56 and 57 of correspondingly reduced or increased size are placed in the printing mechanism so that their surface speed will conform with the speed of travel of the strip x.

The present invention enables printing rolls of different diameters to be placed in the printing mechanism and the impression roll and inking devices to be accommodated thereto, with facility. In order to change the printing rolls, the auxiliary frame 27 carrying the inking devices is retracted from the printing rolls along the rails 67 by manipulation of the ratchet lever 71 to rotate the pinion shaft 68 in the appropriate direction, such retraction of the inking devices rendering the printing rolls conveniently accessible, and the impression roll 30 is retracted from the opposite side of the printing rolls by rotation of the crank 48 in the appropriate direction. After the printing rolls in use have been removed and the substitute printing rolls of another size introduced into the machine, the auxiliary frame 27 is advanced by manipulation of the ratchet lever 71 to rotate the pinion shaft 68 in the appropriate direction, until the inking rolls 109 and 110 are brought into contact with the respective printing rolls, and the impression roll 30 is brought into contact with the printing rolls and the gear 53 on the impression roll shaft meshed with the change gears 56 and 57 on the printing roll shafts by rotation of the crank 48 in the opposite direction. After the inking rolls have been set with the proper pressure against the printing rolls, the lock nuts 83 are adjusted so that they abut against the outer ends of the rails 67, they thus forming limit stops for gaging the position of the inking rolls relative to the printing rolls, and the ratchet lever 71 is set in a position where

the weight 84 will act to hold the lock nuts 83 in position against the rails 67. After the impression roll 30 has been set for the proper impression pressure against the printing rolls, the lock nuts 43 are adjusted so that they abut against the outer ends of the brackets 44, they thereby forming limit stops for gaging the movement of the impression roll toward the printing rolls. In this way, printing rolls of different diameters may be readily interchanged in the machine to conform with bag sections of different lengths made in the bag machine, and the inking devices and the impression roll may be readily adjusted to conform with the printing rolls of different diameters.

When the machine is to become idle, the ratchet lever 71 may be operated in a direction to retract the inking rolls 109 and 110 from the printing rolls and the crank 48 may be turned in a direction to retract the impression roll from the printing rolls, the pressure between these sets of rolls being thereby relieved so that the development of flat spots in the peripheries of the rolls under prolonged pressure while motionless is avoided, and before starting up the machine after an idle period, it is only necessary to operate the ratchet lever 71 to bring the lock nuts 83 into engagement with the outer ends of the rails 67 and to rotate the crank 48 to bring the lock nuts 43 into engagement with the outer ends of the brackets 44, the lock nuts in the two instances providing gaging or limit stops which enable the inking devices and the impression roll to be restored to proper working relationship with the printing rolls without requiring resetting thereof.

The idler roller 171 and its adjusting screw 180 provide simple and effective means for producing registration between the printed impressions on the bag strip and the striker or severing device in the bag-making machine, the adjustment of the screw 180 moving the idler roller 171 in one or the other direction to increase or diminish the size of the loop in the bag strip between the printing rolls and the bag-making machine so that the striker or severing device 5 of the bag-making machine will sever the bag lengths at the proper points in relation to the printed impressions thereon.

While the invention is herein shown and described as applied to apparatus for making duplex bags, it will be understood that the invention is equally applicable to apparatus for making the ordinary single thickness bags, in which event a single bag strip will be fed to the printing mechanism and bag machine and the pasting means for uniting the bag strips will be omitted.

I claim as my invention:

1. Printing mechanism for a bag-making machine having means for feeding a traveling bag strip therein, a cut-off device for severing the bag strip into bag sections, and means for varying the speed of operation of said feeding means relatively to that of the cut-off device to produce bag sections of different lengths, comprising a printing machine having means for supplying the bag strip thereto, means for mounting therein printing rolls of different diameters to conform with variations in the speed of operation of the feeding means of the bag-making machine for producing impressions on the bag strip at intervals in its length, an impression roll to cooperate with the printing roll and provided with a driving gear, a change gear connected to and conforming with the diameter of the printing roll and meshing with the driving gear for the impression roll, and means connecting a printing roll mounted in the printing machine to said cut-off device to synchronize the operations thereof.

2. A printing machine comprising means for mounting printing rolls of different diameters for transverse adjustment in parallel planes, inking means mounted to move toward and from the printing roll mounting to cooperate with printing rolls of different diameters, and an impression roll mounted to move toward and from the printing roll mounting in parallelism to the planes of adjustment of the printing rolls to cooperate with printing rolls of different diameters.

3. A printing machine comprising a pair of printing rolls having means for mounting them in adjacent relation for transverse adjustment in parallel planes, and an impression roll having means for mounting it to move in a plane between the centers of the printing rolls and parallel to the planes of adjustment thereof and transverse to a plane connecting said centers to bring the surface of the impression roll into cooperation with the surfaces of both of said printing rolls.

4. A printing machine comprising a pair of printing rolls having means for mounting them in adjacent relation for transverse adjustment in parallel planes, an impression roll having means for mounting it to move in a plane between the centers of the printing rolls and parallel to the planes of adjustment thereof and transverse to a plane connecting said centers to bring the surface of the impression roll into cooperation with the surfaces of said printing rolls, and gears connected to the printing and impression rolls arranged to be brought into mesh by said movement of the impression roll and operative to cause rotation of the printing rolls and the impression roll at the same surface speed.

5. A printing machine comprising a pair of printing rolls having means for mounting them in adjacent relation for transverse adjustment in parallel planes, an impression roll having means for mounting it to move in a plane between the centers of the printing rolls and parallel to the planes of adjustment thereof and transverse to a plane connecting said centers to bring the surface of the impression roll into cooperation with the surfaces of said printing rolls, and inking devices having means for mounting them to move into cooperation with the surfaces of the respective printing rolls.

6. A printing machine comprising a pair of printing rolls having means for mounting them in adjacent relation for transverse adjustment in parallel planes, an impression roll having means for mounting it to move in a plane between the centers of the printing rolls and parallel to the planes of adjustment thereof and transverse to a plane connecting said centers to bring the surface of the impression roll into cooperation with the surfaces of said printing rolls, gears connected to the printing and impression rolls arranged to be brought into mesh by said movement of the impression roll and operative to cause rotation of the printing rolls and the impression roll at the same surface speed, and inking rolls having means for mounting them to move into cooperation with the surfaces of the respective printing rolls and having driving gears arranged to be brought into mesh with said gears connected to the printing rolls and operative to cause rotation of the inking rolls and the printing rolls at the same surface speed.

7. In a printing machine having a printing roll and an impression roll having means supporting it to move to and from cooperative relation therewith, limit means capable of being set to accord with the operative relation of the impression roll with the printing roll and operative to limit the movement of the impression roll toward the printing roll, and means for moving the impression roll toward and from operative relation with the printing roll including means for holding the impression roll against said limit means while it is in operative relation with the printing roll.

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