

Jan. 31, 1939.

H. P. ELLIOTT

2,145,299

APPARATUS FOR EXTRACTING THE SUCCESSIVE ENDMOST  
ARTICLES FROM A STACK OF SUCH ARTICLES

Filed July 3, 1937

3 Sheets-Sheet 1

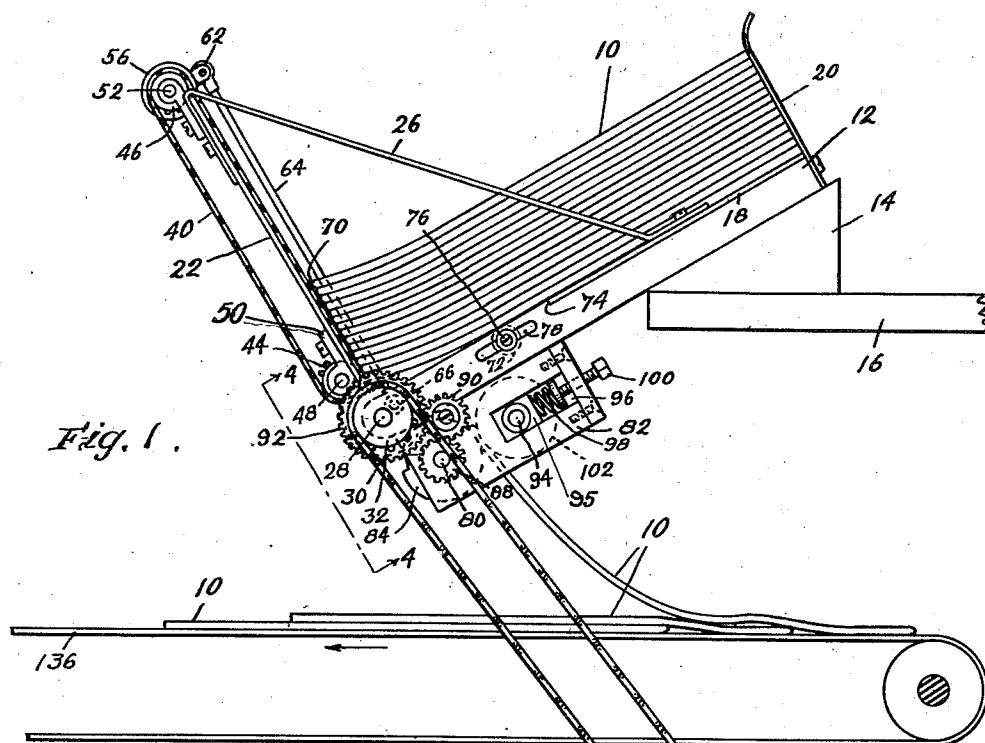


Fig. 1.

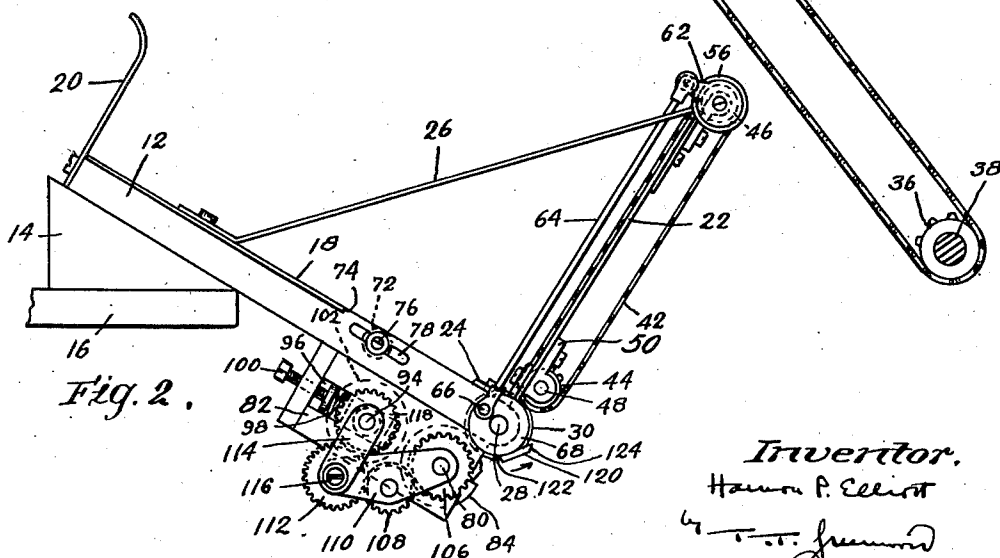


Fig. 2.

Inventor.

Harmon P. Elliott

by *[Signature]* atty

Jan. 31, 1939.

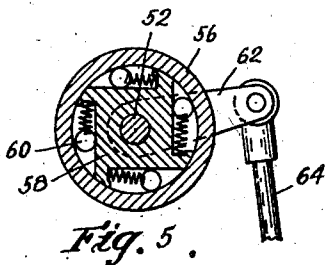
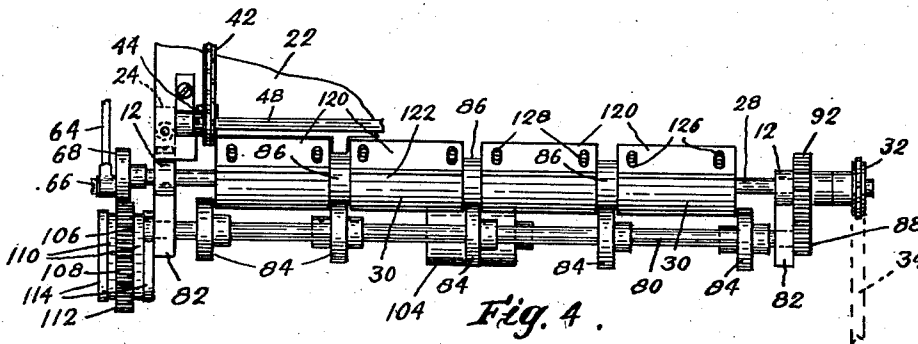
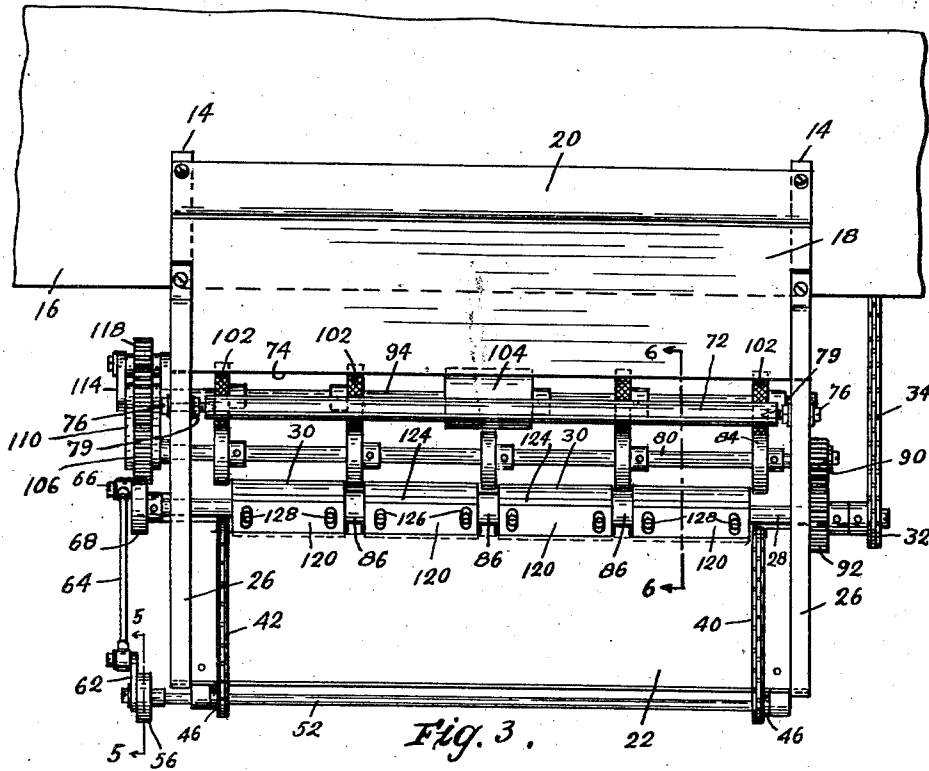
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3 Sheets-Sheet 2



Inventor.

Harmon P. Elliott

Wm. J. Freeman atty

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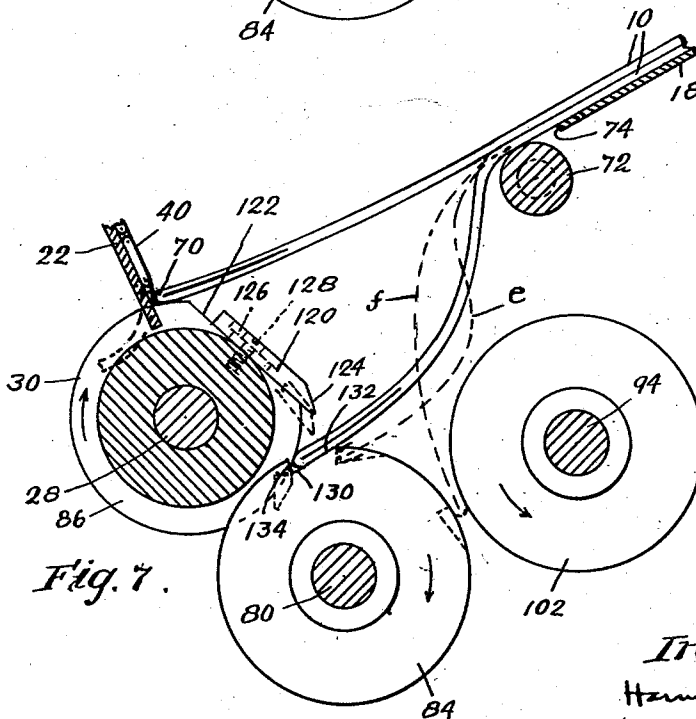
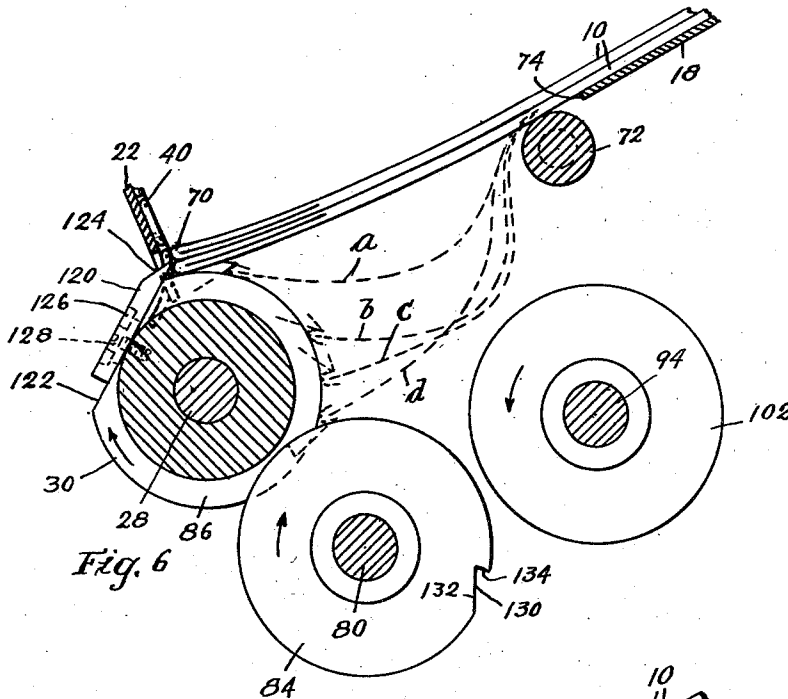
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3 Sheets-Sheet 3



Inventor.

Harmon P. Elliott

by *Freemond*  
att

## UNITED STATES PATENT OFFICE

2,145,299

## APPARATUS FOR EXTRACTING THE SUCCESSIVE ENDMOST ARTICLES FROM A STACK OF SUCH ARTICLES

Harmon P. Elliott, Watertown, Mass.

Application July 3, 1937, Serial No. 151,882

21 Claims. (Cl. 271-16)

This invention relates to sheet or article feeding apparatus and particularly to apparatus for removing the successive endmost articles or sheets from a stack thereof.

5 Considerable difficulty has been experienced heretofore in removing the successive endmost articles such as magazines, newspapers, folders and the like, from a stack thereof so that the single articles could be presented in proper position to have an address applied thereto.

10 The present invention has for one of its objects the provision of apparatus that is free from reciprocating or vibration producing elements and is adapted to operate at high speed relatively without noise or vibration to remove the successive endmost articles, such as newspapers, folders and the like, from a stack thereof and to deposit them preferably with at least parts of the individual articles exposed, either to subsequently receive addresses or to disclose previously applied addresses or to be in convenient position for subsequent treatment of the articles.

Another object of the invention is the provision of rotary apparatus adapted to move an end portion of an endmost article of a stack of such articles away from the stack and into the bite of feed rolls which act to withdraw the endmost article from the stack.

30 A yet further object of the invention is the provision of a rotary member having a blade which engages the ends of the successive endmost articles of the stack and moves the end portion of the article away from the stack into position to be acted upon by a second rotary member which further moves the end of the article and cooperates with one or more feed rolls to withdraw the article from the stack.

A yet further object is generally to improve the construction and operation of apparatus for removing successive endmost articles from a stack of such articles.

Fig. 1 is a side elevation of the apparatus of the present invention.

45 Fig. 2 is a side view of the side elevation of the other side of the apparatus of Fig. 1.

Fig. 3 is a plan view of the apparatus of Fig. 1.

Fig. 4 is a front view of the sheet extracting and feeding mechanism of Fig. 1, taken along line 4-4 of Fig. 1.

50 Fig. 5 is a sectional detail of the clutch mechanism for the stack lowering mechanism taken along line 5-5 of Fig. 3.

Fig. 6 is an enlarged sectional elevation through the operative elements of the mechanism taken generally along line 6-6 of Fig. 3,

and illustrating the various positions assumed by the end portion of the lowermost article of the stack between its normal position in the stack and the position where it is in readiness to be moved into the extracting rolls.

Fig. 7 is a view similar to Fig. 6 illustrating the various positions of the sheet in its movement into the extracting rolls.

The mechanism of the present invention includes a holder for a stack of articles 10 that are adapted to be successively withdrawn from the stack. The holder comprises a pair of inclined bars 12 supported at one end by inclined blocks 14 from a table 16, which can be the table of an addressing machine. A bottom plate 18 is secured to and extended between the side bars 12 and is adapted to receive and support the main portion of the weight of the stack of articles 10. An end plate 20 is secured to the bars 12 and upstands thereabove and forms the end wall of the holder. A front plate 22 is secured by angle members 24, see especially Fig. 2, to the forward and lower edges of the bars 12 and upstands thereabove and at its upper end is braced by the braces 26 which are secured to the top face of the bars.

The articles 10 to be fed are placed in a stack upon the plate 18 and between the front and back plates 20 and 22. It is preferred that the holder be inclined so that the forward ends of the articles will be surely positioned in a straight line or against or close to the front plate 22. A retracting shaft 28 is extended between and is journaled in the front lower ends of the bars 12 and is provided with a series of rolls 30 which underlie the front edge of the stack. Preferably the front edge of the stack is approximately in line with the axis of the rolls 30. The forward edge of the stack is supported by its engagement with the rolls 30. The roll supporting shaft 28 has a sprocket 32 fixed thereon which is in engagement with a chain 34 driven by a sprocket 36 fixed to a suitable drive shaft 38, the drive shaft rotating in a continuous uniform manner so that the roll shaft 28 correspondingly rotates continuously and uniformly.

While the weight of the stack is ordinarily sufficient to insure that the lowermost article in the stack be against the rolls 30 positive means are provided to move the articles downwardly to position the lowermost article upon the rolls. Said means includes a pair of chains 40 and 42 which are passed about sprockets 44 and 46. The sprockets 44 are fixed to a shaft 48 located close to the lower end of the stack above the rolls 30

and journalled brackets 50 secured to the outer face of the front plate 22. The sprockets 46 are fixed to a shaft 52 located at the top part of the front plate and journalled in brackets 54 secured to said front plate. One pass of each of the chains traverses over the inner face of the front plate and between it and the front ends of the articles in the stack and is in sufficient driving engagement therewith to cause the front edges of the articles to move downwardly, when they are free to move, as the back passes of the chain are moved downwardly. If the end of the stack is bearing upon the rolls 30 the chain can move independently of the articles without damaging them.

The chains are advanced in an intermittent or step by step manner by a clutch mechanism, see especially Fig. 5, comprising a drum 56 fixed to the upper shaft 52. A cam member 58 is loosely mounted on the shaft and cooperates with spring pressed clutch balls 60 to effect driving engagement with the drum 56 upon successive oscillations of the cam member. The cam member is oscillated by means including an arm 62 pivoted to the upper end of a connecting rod 64 which at its lower end is pivoted on a pin 66 carried by a disc 68 fixed to the roll shaft 28. With this arrangement the rotary movement of the disc 68 causes the arm 62 to oscillate and thereby causes the chains to be advanced. Preferably the advance of the chains occurs between extracting operations of the roll shaft 28, as will presently appear.

The articles 10 of the stack can be newspapers, magazines, folders, cards, and the like, which are flexible and somewhat resilient, at least with respect to their action in the present apparatus. The articles 10 herein illustrated are daily newspapers. The present apparatus, however, is by no means limited to operation on newspapers as it operates successfully on different articles.

If the article comprises more than one sheet and the sheets are folded or bound together the folded or bound edge 70 is positioned at the front of the stack so that the successive lowermost folded or bound edges ultimately rest upon the rolls 30. The bottom plate 18 of the holder is terminated a substantial distance behind the rolls 30 so that the forward part of the lowermost article is unsupported and hence is free to be flexed downwardly away from the stack. A supporting roller 72 is disposed between the front edge 74 of the plate 18 and the rolls 30 and is adapted to provide support for the overhanging part of the stack. Said roll 72 is rotatably supported on the ends of and between screws 76, see especially Figs. 1 and 3, which are located in slots 78 in the bars 12, which slots are elongated in the direction of the bars. The screws are adapted to be clamped by nuts 79 in any adjusted position of the slots and thus permit the roll 72 to be shifted toward and away from the rolls 30 a substantial amount. For best results it is found desirable to locate the spacing between the roll 72 and the roll 30 by an amount which depends upon the nature of the articles 10 in the holder. If the apparatus is intended to be used with but one kind of article the roll can be permanently located in a predetermined position, or the roll may be omitted and the end 74 of the bottom plate 18 may be suitably positioned and perform the functions of the roll. Where the apparatus is intended to operate upon different articles such as different weights of newspapers or magazines of different thicknesses then it is preferable to

have the roll or equivalent support adjustable as to the spacing between it and the rolls 30 to accord with the flexibility and resiliency of the articles. The top of the roll 72 is approximately in line with or slightly above the top face of the bottom plate 18. The top of the rolls 30 also is preferably slightly above the straight line projection of the top face of the bottom plate 18 so that the overhanging parts of the articles are bent, or sag, downwardly as illustrated in Fig. 6, thereby to ensure the downward buckling of the lowermost article, as will presently appear.

Cooperating with the shaft 28 is a second shaft 80 disposed below and somewhat behind the shaft 28 and journalled in blocks 82 secured to the under face of and depending below the bars 12 of the holder. The shaft 80 is provided with a plurality of feed rolls 84 which are located at the ends of the line of rows 30 and in the spaces 86 between the rolls 30. The shaft 80 is driven from the shaft 28 by means of a gear 88 fixed to the shaft 80 at one end and meshing with an idler gear 90 carried by one of the blocks 82 which idler gear meshes with a gear 92 fixed to one end of the shaft 28. The gear 92 is twice the pitch diameter of the gear 88 so that the shaft 90 rotates at twice the speed of the shaft 28.

A feed roll shaft 94 is carried by the blocks 82 behind the shaft 88. Said feed roll shaft is journalled in slide blocks 95 operating in slots 96 of the blocks 82 and is urged toward the shaft 80 by compression springs 98, the tension of which can be adjusted by screws 100. With this arrangement the roll shaft 94 can move away from the shaft 88 to accommodate varying thicknesses of the articles fed thereby. When no articles are being fed forward the slide blocks 95 are preferably in the bottoms of the slots 96.

The shaft 94 has a plurality of feed rolls 102, see especially Fig. 3, fixed thereto, which confront and cooperate with the feed rolls 84 of the shaft 80. Preferably certain of the rolls 102 are provided with knurled faces, as shown in Fig. 3, for the purpose of maintaining a good driving engagement with the articles. For some purposes one of the rolls on the shaft 94, as, for instance, the roll 104, can have a smooth face so that while it cooperates with the associated roll 84 in maintaining the edge of the sheet straight between the rolls it does not have sufficient driving engagement with the article to displace a label or the like that at the time is not permanently affixed to the article. For some purposes, however, the smooth faced roll 104 is not necessary and it can then be a driving roll like the roll 102.

The roll shaft 94 is positively driven from the shaft 80 by the mechanism illustrated in Figs. 2 and 3. The shaft 80 has a gear 106 fixed thereto which is in mesh with an idler gear 108 journalled between a pair of arms 110 loosely mounted and capable of swinging on the shaft 80. The idler gear 108 is in mesh with another idler gear 112 journalled between the free ends of the arms. A second pair of arms 114 is pivotally mounted on the shaft 116 for the gear 112 and is loosely journalled on the roll shaft 94. A gear 118 is fixed to said roll shaft between said arms 114 and meshes with the gear 112. This arrangement permits the roll shaft 94 to move toward and away from the cooperating roll shaft 80 without changing the relation between the gears and while maintaining the positive driving connection between the shafts.

The roll shaft 28 is provided with means en-

engageable with the front edges of the successive lowermost articles 10 of the stack and operative to bend the edges downwardly away from the stack. Said means includes a plurality of blades 120 which are approximately coextensive in width with the width of the rolls 30 and are secured on the flattened faces 122 of said rolls. Said blades are provided with beveled blunt forward edges 124 that are adapted to engage the forward edges of the successive lowermost articles. The blades are provided with slots 126 which are elongated in the direction of width of the blades and through which clamping screws 128 are passed and are screw-threaded into the rolls. With this arrangement the distance that the blades project beyond the periphery of the rolls can be adjusted and hence the blades can be set for any thickness of article operated upon.

The setting of the blades is such that the blades project from the rolls a distance approximately equal to the thickness of an article in the stack. As the rolls rotate to bring the blades into engagement with the front edge of the lowermost article continued rotation pushes the edge rearwardly and causes the front portion of the lowermost article between the blade and the supporting roll 72 to buckle downwardly into some position indicated by the dotted line *a*. Further rotation of the rolls causes the sheet to assume some positions as indicated by the dotted lines *b* and *c*. During such movement of the sheet the resiliency of the sheet causes the front edge portion of the sheet to be pressed against the periphery of the rolls. At some point in the downward movement of the sheet, as at *c*, where the end thrust of the sheet against the downwardly sloping face of the rolls is sufficiently great, the sheet moves downwardly and forwardly ahead of the blades 50 and against the upper surface of the rolls 84.

The peripheral portions of the rolls 84 are provided with notches 130 having an approximately tangential bottom wall 132 and an approximately radial back wall 134. When the rolls 84 have rotated sufficiently to bring the notches 130 under the front edge of the sheet in the position indicated at *d* the front edge drops into the notches and is engaged by the back walls 134, as is especially indicated in Fig. 7. The rotation of the rolls 84 carries the front edge of the article rearwardly and further flexes the sheet, as is illustrated by the dotted line *e*. Preferably the front edge of the article is moved away from the path swept by the blades 120 before the blades move downwardly sufficiently to come in contact with the article. Since the rolls 84 rotate at twice the angular speed of the rolls 30 this is easily accomplished without the necessity for any accurate timing of the rolls. For withdrawing some articles it is not necessary to have any particular relation between the blades 120 and the notches 130 since the article will assume such a position that the blades can wipe thereover without tearing the article.

Continued rotation of the rolls 84 carries the end of the sheet into the bite between the rolls 84 and the knurled rolls 102 or into the position indicated by the dotted line *f*. At some point between the positions *e* and *f* the sheet snaps from the S curve shown at *e* into the arcuate curve shown at *f*. When the end of the sheet is in the bite of the rolls 84 and 102 the sheet is rapidly drawn from the stack. The successive withdrawn sheets can be deposited upon the upper pass of a conveyor belt 136, as illustrated in Fig. 1, the

conveyor belt being either continuously movable or being advanced in a step by step direction. The speed at which the belt is advanced determines whether the successive articles will lie upon the belt in a partially superimposed relation, as illustrated with a part of the end portion exposed, or lie on the belt in successive order without being overlapped. The belt can convey the articles to a position where operation is performed upon the articles or the articles can be gathered from the belt for packing or shipment.

The mechanism herein disclosed has been found to be entirely satisfactory for removing the successive lowermost newspapers, folders and other articles, from a stack of such articles and operates noiselessly and free from vibration at high speed without damage to the articles.

In my copending application Serial No. 141,981, filed May 11, 1937, an addressing machine is disclosed having means for extracting successive lowermost articles from a stack of such articles, which means in part utilizes a principle embodied in the present invention. That is to say, the forward end portions of the successive lowermost articles of the stack are bent downwardly away from the stack into a position to be operatively engaged by extracting rolls. The said application is restricted to extracting means in combination with addressing means whereas the present application is directed more broadly to extracting means disassociated from addressing mechanism.

I claim:

1. The method of removing the successive endmost articles from a stack of such articles, which comprises supporting the stack so that the edge portions of the successive endmost articles are free to be deflected away from the stack, deflecting the edge portions of the successive endmost articles away from the stack in two separate steps and withdrawing the successive lowermost articles from the stack by engagement with the deflected edge portions thereof in their final deflected positions.

2. Apparatus for removing the successive endmost articles from a stack of such articles comprising a stack holder, unidirectionally rotatable, edge abutting means engageable with the ends of the edge portions of successive endmost articles and operative to deflect the edge portion away from the stack, and extracting means engageable with the deflected edge portion for withdrawing the article from the stack.

3. Apparatus for withdrawing the successive endmost articles from a stack of such articles comprising a stack holder having a bottom support which is terminated short of the edge of the stack whereby said edge overhangs said support, continuously rotatable means engageable with the overhanging ends of the successive lowermost articles and operative to deflect the end portions thereof downwardly, and cooperating feed rolls additional to said rotatable means disposed in position to engage the successive deflected end portions and withdrawing the successive articles from the stack.

4. Apparatus for withdrawing successive endmost articles from a stack of such articles comprising a holder for the stack, and entirely rotary and continuously and uniformly rotating mechanism engageable with and acting on the successive endmost articles for initially deflecting them from and finally withdrawing them from the stack.

5. Apparatus for withdrawing successive endmost articles from a stack of such articles comprising a stack holder, a bottom support for the

stack terminated short of an edge thereof thereby providing the stack with an overhanging edge portion, unidirectionally rotatable means abuttable against the edges of the successive lowermost articles of the stack and operative to apply positive endwise and downwardly directed pressure on the successive overhanging edge portions to cause the overhanging edge portion to buckle downwardly away from the stack, and extracting means disposed in position to engage the displaced edge portion and withdraw the article from the stack.

6. Apparatus for withdrawing the successive lowermost articles from a stack of such articles comprising a stack holder having a bottom support which the stack overhangs, rotatable means engageable with the overhanging portion of the lowermost articles of the stack and operative to deflect said portion downwardly away from the stack, an extracting roll, and means engageable with the deflected portion of the article to move it into driving engagement with said roll.

7. Apparatus for withdrawing successive endmost articles from a stack of such articles comprising a stack holder having a bottom support which the stack overhangs, means engageable with an edge of the overhanging portion of the lowermost articles in the stack for applying endwise and downward pressure thereon to buckle said overhanging portion and to move it downwardly away from the stack, extracting means, and means engageable with the buckled end portion of the article to move it away from said first means and into the engagement of said extracting means.

8. Apparatus for withdrawing the successive end articles from a stack of such articles comprising a stack holder, means for buckling an edge portion of the end article of the stack away from the stack, and article extracting means independent of said first means engageable with said end portion of the article and operative to withdraw it from the stack.

9. Apparatus for withdrawing successive lowermost articles from a stack of such articles comprising a stack holder, a rotary member having means engageable with the successive edge portions of successive endmost articles of the stack for deflecting the edge portions away from the stack, and article extracting means engageable with the successive deflected edge portions and operative to move the deflected edge portions away from said rotary member and to extract the successive articles from the stack.

10. Apparatus for withdrawing successive lowermost articles from a stack of such articles comprising a stack holder having a bottom support which the stack overhangs, a unidirectionally rotatable member having means providing a ledge abuttable against the ends of the overhanging portions of the successive lowermost articles of the stack and operative to deflect the overhanging ends downwardly, and article extracting means engageable with the deflected end portions independently of said rotary member and arranged to extract the successive articles from the stack.

11. Apparatus for withdrawing successive endmost articles from a stack of such articles comprising a stack holder having a bottom support which the stack overhangs, a unidirectionally and uniformly rotatable member having a projecting blade which is engageable with the ends of the overhanging portions of the successive lowermost articles of the stack and is arranged

to deflect said end portions away from the stack, means for adjusting the amount of projection of said blade, and article extracting mechanism engageable with the deflected end portion and arranged to extract the articles from the stack.

12. Apparatus for withdrawing the successive endmost articles of a stack of such articles comprising a stack holder having a bottom support which the stack overhangs, a rotary roll disposed beneath the overhanging edge of said stack and constituting a support therefor, said roll carrying a peripherally projecting ledge which rotates with said roll and is engageable with the ends of the overhanging portions of the successive lowermost articles of the stack and is arranged to deflect said end portions downwardly away from the stack, and a pair of article extracting rolls separate from said rotary roll disposed in position to engage the successive deflected end portions and extract the articles from the stack.

13. Apparatus for withdrawing the successive endmost articles from a stack of such articles comprising a stack holder having a bottom support which the stack overhangs, a rotary roll disposed beneath the overhanging edge of the stack and constituting a support therefor, said roll having a deflecting blade on its periphery which outstands beyond the periphery and rotates with said roll and is arranged to be moved against the ends of the overhanging portions of the successive lowermost articles of the stack and hold the ends between the projecting portion of the blade and the roll and deflect the overhanging end portions downwardly away from and inwardly of the stack, and extracting means disposed in position to engage the deflected end portions and extract the articles from the stack.

14. Apparatus for withdrawing the successive endmost articles from a stack of such articles comprising a stack holder, an extracting roll, a conveyor roll having a peripherally disposed abutment arranged to engage the edge portion of the lowermost article of the stack and move the edge portion into the action of said extracting roll, and rotatable means to deflect the edge portion away from the stack and into the engagement of said conveyor roll.

15. Apparatus for withdrawing successive articles from a stack of such articles comprising a stack holder, a pair of cooperating extracting rolls one of which has a peripherally disposed abutment adapted to engage the edge portion of an article and transport it into the bite between said rolls, and rotatable means for deflecting the edge portion of the article in said stack into the engagement of said abutment.

16. Apparatus for withdrawing successive endmost articles from a stack of such articles comprising a stack holder, cooperating extractor rolls one of which has a notch in its periphery arranged to receive the edge portion of an article and transport it into the bite of said rolls, and a rotary deflecting roll having means operative to deflect the edge portion of the lowermost article of the stack onto the periphery of said notched extracting roll.

17. Apparatus for withdrawing successive endmost articles from a stack of such articles comprising a stack holder, cooperating extractor rolls one of which has an article engaging notch in its periphery, and a reflecting roll overlapping said notched roll and having means to deflect the edge portion of the lowermost article of the stack away from the stack and onto the periphery of said notched roll, and means for

driving said notched roll in a direction to move the deflected edge away from said deflecting roll and into the bite of said extractor rolls.

18. Apparatus for withdrawing successive endmost articles from a stack of such articles comprising a stack holder, a plurality of axially spaced concentric conjointly rotatable rolls at least some of which have peripherally projecting blades engageable with the edge of the lowermost article of the stack and operative to deflect the edge portion of said article downwardly, a plurality of axially spaced concentric conjointly rotatable conveyor rolls at least one of which has a notched periphery disposed in overlapping relation with and between said deflector rolls in position to be engaged by the deflected edge portion of the article and to receive the edge portion in the notch and move it away from said deflector rolls, and extractor rolls cooperating with said conveyor rolls and disposed in position to pinch the edge portion of the article between them and said deflector rolls.

19. Apparatus for withdrawing successive articles from a stack of such articles comprising a stack holder having a bottom support which an edge portion of the stack overhangs, a deflector roll disposed beneath the edge having means for exerting an endwise thrust on the edge of the lowermost article for buckling it away from the stack and for deflecting the edge away from the

stack, other means engageable with the deflected edge of the article for moving the edge crosswise of the stack to the action of extracting means, and extracting means operative on the edge portion for drawing the article from the stack.

20. Apparatus for withdrawing successive articles from a stack of such articles comprising a stack holder having a bottom support which an edge portion of the stack overhangs, a deflector roll disposed beneath the edge having a projecting blade for exerting an endwise thrust on the edge of the lowermost article for buckling it away from the stack and for deflecting the edge downwardly into a position where the deflected edge portion is approximately tangential to the path of movement of said blade, means engageable with the deflected edge portion for moving it crosswise of the stack into the action of extracting means, and extracting means exerting tension on the article for withdrawing it from the stack.

21. Apparatus for removing the endmost flexible article from a stack of such articles comprising means to buckle a part of the endmost article away from the stack, and extracting means separate from said first means engageable with the buckled part of the article and operative to exert tension lengthwise of the article to withdraw it from the stack.

HARMON P. ELLIOTT.