Nov. 26, 1968 L. V. DUTRO 3,412,994

UNFOLDING DEVICE FOR SIGNATURE GATHERER

Filed Jan. 5, 1966 2 Sheets-Sheet 1

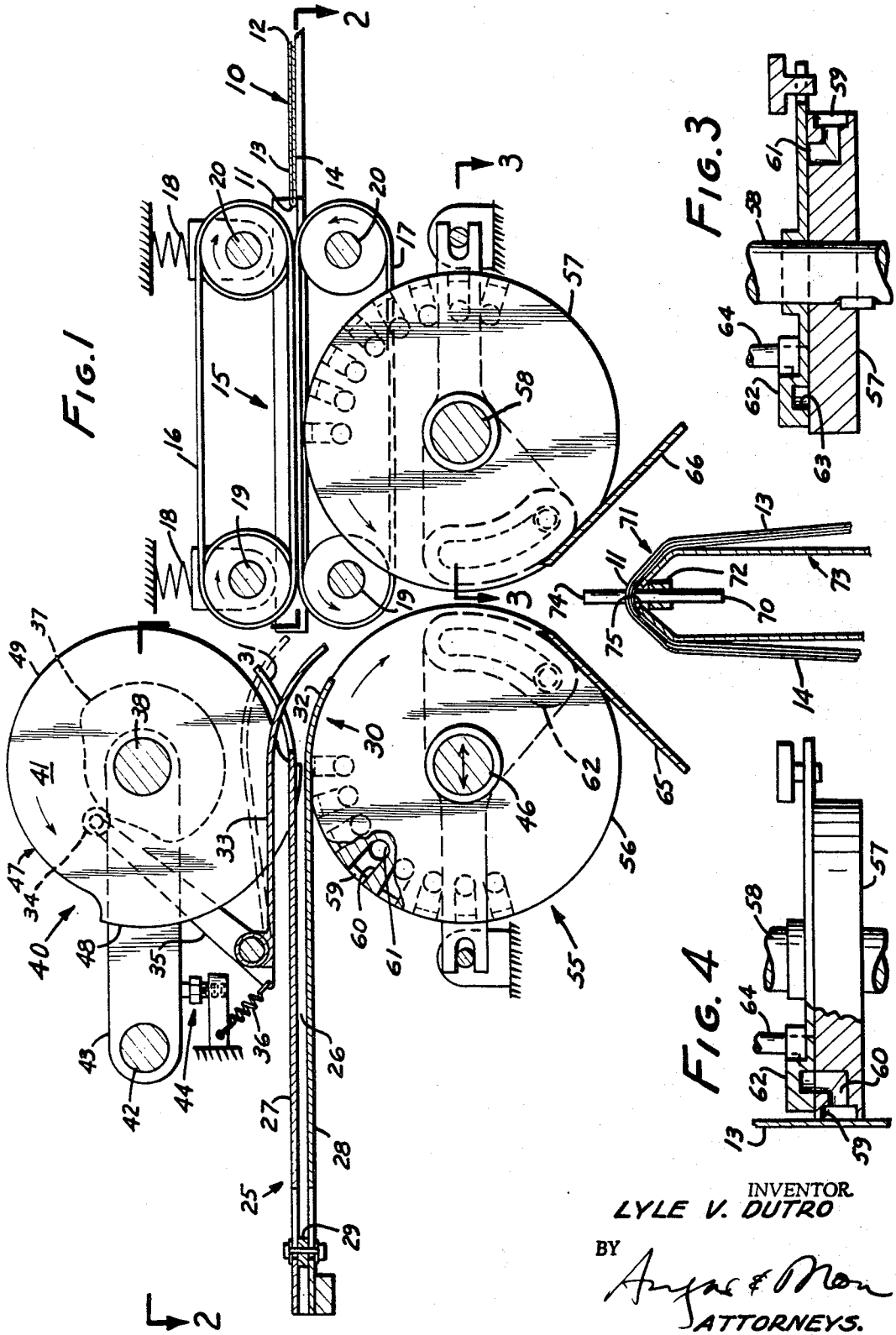


FIG. 1

FIG. 3

FIG. 4

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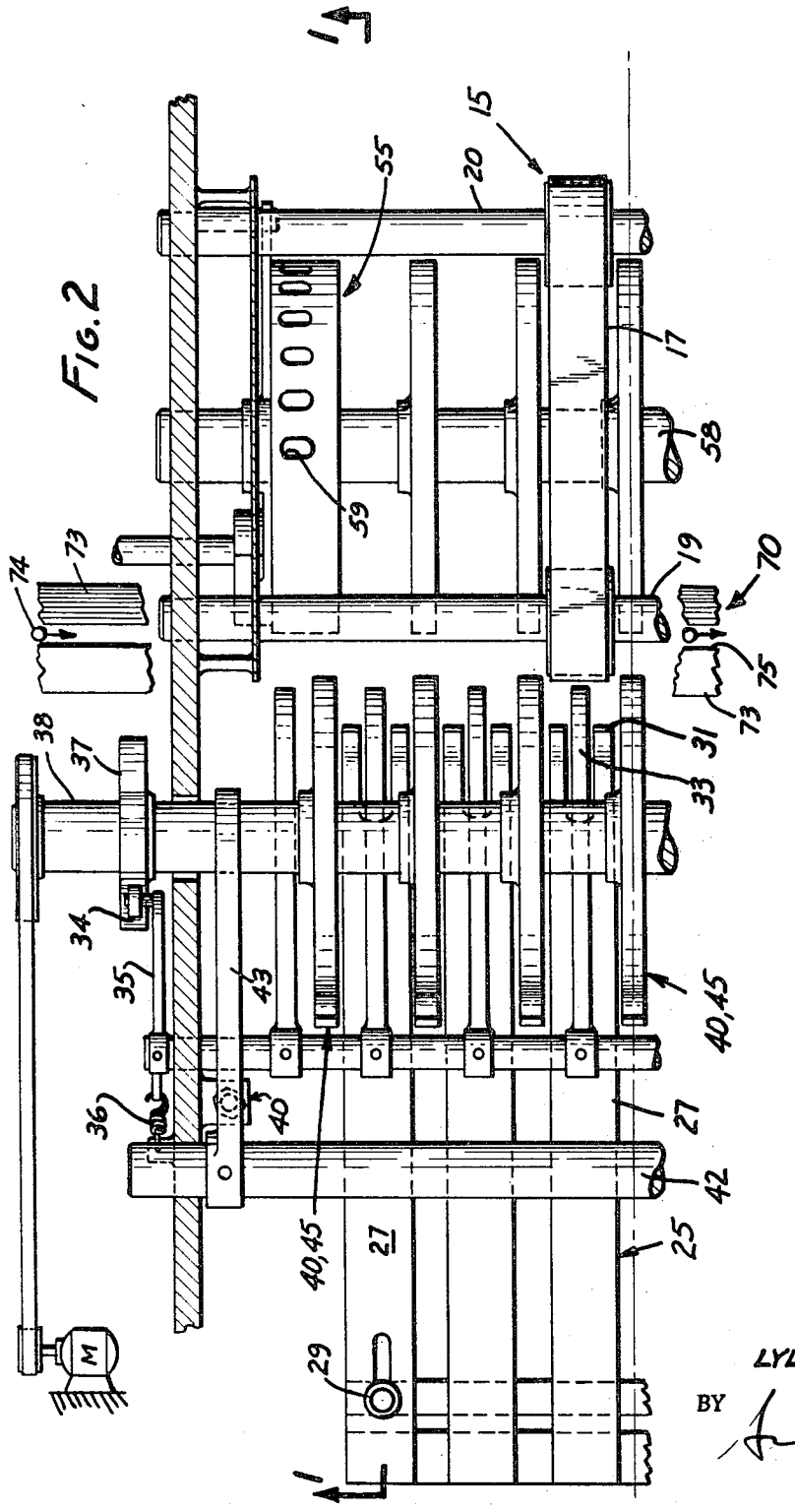
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FIG. 2



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UNFOLDING DEVICE FOR SIGNATURE GATHERER

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2 Claims. (Cl. 270—54)

ABSTRACT OF THE DISCLOSURE

A signature is delivered with its folded edge leading into a reception means, later ejected from the reception means with its open edge leading by a wheel having a raised arcuate portion which engages the face of the signature, then guided between a pair of cooperating suction cylinders which open the signature and drop it on a conveyor below.

This invention relates to apparatus for unfolding folded articles such as newspaper sections and the like.

Especially in the printing industry, but also in many other industries where folded articles are produced from a press or other source, it is frequently desired to unfold the article in order to assemble it into a larger stack such as the familiar assembly of a large Sunday newspaper. There does not exist at the present time any suitable and economical method for accomplishing this operation mechanically, and it is common practice for this to be done by hand which entails considerable time and expense. The object of this invention is to provide apparatus and a novel method for unfolding a folded article, which apparatus can be used either in a steady flow association with a press or some other source of articles or separately therefrom operating from an entirely independent and, perhaps, static supply.

Apparatus according to this invention receives folded articles from a supply means. The type of supply means is immaterial, so long as articles are provided in such a manner as to meet the demand of this apparatus. The article is received by reception means. Guide means is placed between the supply means and the reception means which has a first position that directs the folded article into the reception means and a second position that directs the article away from the supply means.

Ejection means is placed adjacent to the reception means for the purpose of ejecting the folded article from the reception means. A pair of engagement means is provided, each one of which is opposed to each other, and this pair of means receives the folded article between them after it leaves the reception means. Both of these engagement means have a first condition in which a respective side of the folded article is engaged, and a second condition in which the respective side is released. After the supply means has fed the folded article into the reception means under the guidance of the guide means in its first position, the ejection means removes the folded article therefrom, and feeds it to the engagement means in its first condition under the guidance of the guide means in its second condition. The engagement means then separates the folds while in its first condition, and releases the opened article while in its second condition.

According to a preferred but optional feature of the invention, the engagement means is placed in its first and second conditions by valving which is operable periodically to apply vacuum to the periphery of the engagement means. The engagement means is then provided in the form of a rotatable wheel.

The above and other features of the invention will be fully understood from the following detailed description and the accompanying drawings in which:

FIG. 1 is an elevation in cross section taken at line 1—1 of FIG. 2;

FIG. 2 is a plan view taken at line 2—2 of FIG. 1 with certain portions deleted for clarity of illustration;

FIGS. 3 and 4 are fragmentary cross-sections of portions of the invention.

FIG. 1 illustrates the general scheme of the invention. Folded articles are provided one by one from a supply means. The type of supply means is immaterial. This device can even be hand fed. The source provides the folded article **10** with its fold **11** first, open edge **12** trailing, and with its sides **13** and **14** lying at the top and bottom.

A portion of a supply means **15** is shown which comprises a pair of opposed endless belts **16** and **17**. The upper belt is resiliently biased downwardly by springs **18** to accommodate articles of varying thickness. Shafts **19, 20** support and drive the belts in the direction indicated by the arrows. This is a convenient out feed from a supply means, and forms part of another machine. This apparatus begins where the article is received from belts **16** and **17**.

A folded, periodically supplied article will be sent by the supply means to reception means **25**. Reception means preferably comprises a slot **26** having a top and bottom member, **27, 28** respectively, and an adjustable stop **29**, which stop can be adjusted to stop articles of varying width at the proper place in the stop. Actually, the stop and lower member are sufficient. A stop with an upper member will be used only when the ultimate in guidance of the article is desired. Usually it will not be needed. The folded article is received from the supply means by the reception means and is fed into the latter means until it strikes the stop. Now an article is in a known position in the system, at a predetermined time in the machine's cycle.

Guide means **30** is provided for directing the folded article. The guide means includes a tongue **31** on top member **27** when member **27** is used and a tongue **32** on bottom member **28** facing the supply means. The guide means also includes a pivoted finger **33** operating between adjacent sets of top and bottom members. This finger has a first position shown in dotted line and a second position shown in solid line. In the dotted first position, the finger stands out of the way of the folded article. In the second position it depends downwardly in the path of it to deflect the folded article away from the supply means, toward other means yet to be described.

The position of the finger is determined by a cam follower **34** mounted to a pivot arm **35**. A spring **36** biases the follower against a cam **37** which is pinned to a drive shaft **38**. The cam has arcs of greater and lesser radius, the illustration showing the finger in its second position because the cam and cam follower are engaged at a position of least radius.

Ejection means **40** is provided adjacent to the opening of the slot, and is adapted to extend downwardly into the region between the top and bottom members, these members themselves being formed as fingers. Ejection means includes ejection wheel **41** which is rotatably mounted to shaft **38**. This shaft is motor driven, and is mounted to the frame by a second shaft **42** through a rocker beam **43** that allows the ejection wheel to move up and down to accommodate folded articles of various thicknesses. A stop **44** limits the downward motion of shaft **38**.

The ejection wheel is opposed by an idler wheel **45** located below the ejection wheel on shaft **46**. The ejection wheel has a periphery **47** with an arcuate portion **48** of greater radius than a second arcuate portion **49** of lesser radius. It will now be seen that in the position shown, with the ejection wheel rotating counterclockwise in FIG.

1, portion **48** will encounter and press a folded article against the idler wheel (the idler wheel having a uniform radius) and will thereupon eject the folded article from the slot. Further rotation brings arcuate portion **49** to the slot. At this time the slot is unimpeded and a folded article may be placed in the slot, passing beneath the ejection wheel without hindrance by it. Obviously the supply means will be timed to send a folded article into the reception means when arc **49** is adjacent to the slot. At this time the pivoted finger will be in its first position and then, when the folded article is in the slot and is to be disengaged, the finger will be dropped to its second position. Arcuate portion **48** will then move the folded article out of the slot and direct it downward to engagement means **55**.

Engagement means **55** comprises a pair of engagement wheels **56**, **57** which are respectively mounted to shafts **46** and **58**. These wheels are spaced apart from each other and are mounted so as to be shiftable toward and away from each other to accommodate articles of various thicknesses. They are biased toward each other. Shafts **46** and **58** are driven, and as the folded article goes into the space between them it is preferably slightly compressed by these wheels, although such compression is not necessary to the function of the invention.

Wheels **56** and **57** have sucker ports **59** (see FIGS. 3 and 4) on their outer periphery and these are connected via vacuum passages **60** to valving ports **61** on the side surface of the engagement wheels. Here the valving ports periodically engage a valving plate **62** which has a vacuum groove **63** in sealing engagement with the side face of the engagement wheel. The groove extends for a substantial portion of the arc and is connected by a hose **64** to a vacuum pump (not shown).

It will now be seen that as the ejection wheels, for example wheel **56**, moves about another 90° from the position shown, the first of the valving ports will come into registration with the vacuum groove, the respective sucker port will then have vacuum exerted at its surface, and will grasp a respective side of the folded article which should arrive at the space between the wheels at this time. Then as additional ones of the valving ports come into registertion with the vacuum groove, respective additional ones of the sucker ports will be at lower pressures. As the ejection wheels continue to turn, they spread apart the free edges of the folded article. It will be observed that when the respective holes leave the lower edge of the vacuum groove, the suction ports are returned to atmospheric pressure and the article is released just about the time that blades **65**, **66**, acting as guides, make certain that the folded articles is disengaged from the engagement wheels.

FIGS. 3 and 4 show the two conditions of engagement means. The first condition is shown in FIG. 4 where a respective sucker port is placed under reduced pressure by the registration of its respective valving port and the vacuum groove. FIG. 3 illustrates a further rotation of the engagement means at which position there is no interconnection and the periphery adjacent to the folded article is at atmospheric pressure as is the periphery at the sucker hole. It will thereby be seen that periodically, portions of the peripheries of the engagement wheels are at lowered pressures which tends to cause the free sides of the article to cling to the wheel while the free edges are being pulled away from each other so as to straddle a conveyor **70** below.

When the fold passes beyond the engagement means, the opened articles **71** fall upon the conveyor which is conveniently made as a continuous chain moving in a plane normal to FIG. 1. FIG. 1 illustrates that by the use of this technique, an assembly of a large number of opened articles can be made on the stack by passing the conveyor under a plurality of these means. Thus, with this device, assemblies of any numbers of folded articles can be formed. The conveyor may include a chain **72** running inside a sheltering support **73**, with a push rod **74** mounted to the chain and running in a slot **75** in support **73** to move the stack along.

It is evident from the foregoing that this device is simply timed through properly ratioed chains or gears and may be driven by conventional motors. The article is inserted fold first into the reception means while the ejection wheels are in such position as to pass the same. Then the guide means is dropped in the path of the folded article and the other portion of the ejection wheel engages the folded article and ejects it from the slot into the engagement means under guidance of the guide means. There the engagement means will grasp by suction the opposite sides of the folded article and open the same, thereafter dropping it upon the conveyor.

This device is elegant in its simplicity, made of rugged and long wearing devices, and is free of the complications which so abound the art of handling folded articles. It may be used to collate or assemble any class of stack, such as newspapers, book sections and many other stacks wherein one fold is placed inside another.

This invention is not to be limited by the embodiment shown in the drawings and described in the description which is given by way of example and not of limitation, but only in accordance with the scope of the appended claims.

I claim:

1. Apparatus for opening a folded article received from a supply means, comprising: reception means so disposed and arranged as to receive said folded article; guide means having a first position to direct the folded article into the reception means and a second position to direct the article away from the supply means; ejection means to eject the folded article from the reception means, the ejection means comprising a rotatable wheel having a periphery, said periphery including a pair of arcs, the folded article entering the reception means when the arc of lesser radius is adjacent thereto and thereafter being engaged by the arc of greater radius and being thereby ejected from the reception means; a pair of engagement means, each of said engagement means being opposed to the other to receive the folded article between them, and both having a first condition in which to engage a respective side of said folded article and a second condition in which to release said folded article, the supply means feeding the folded article into the reception means under guidance of the guide means in its first position, the ejection means removing the folded article from the reception means and feeding it to the engagement means in its first condition under guidance of the guide means in its second condition, the engagement means separating the folds while in its first condition, and releasing the opened article in its second condition; and means timing the supply means and guide means relative to each other and the guide means and engagement means relative to each other to produce the aforesaid sequence.

2. Apparatus for opening a folded article received from a supply means, comprising: reception means so disposed and arranged as to receive said folded article; guide means having a first position to direct the folded article into the reception means and a seocnd position to direct the article away from the supply means, the guide means comprising a pivoted finger and cam means for moving the finger periodically from one of its positions to the other; ejection means to eject the folded article from the reception means when the arc of lesser radius is adjacent thereto having a periphery, said periphery including a pair of arcs, the radius of one arc being greater than the radius of the other arc, the folded article entering the reception means when the arc of lesser radius is adjecent thereto and thereafter being engaged by the arc of greater radius and being thereby ejected from the reception means; a pair of engagement means, each of said engagement means being opposed to the other to receive the folded article between them, and both having a first condition in which to engage a respective side of said folded article and a

second condition in which to release said folded article, each said engagement means comprising a rotatable engagement wheel having a periphery including sucker ports around at least a portion thereof, and valving means adapted to connect said sucker ports to a vacuum pump during a portion of the engagement wheel's rotation, the valving means comprising a stationary valve plate extending around the center of the engagement wheel at the side thereof, a plurality of valving ports opening onto said side whereby periodically to register with the valve plate, and vacuum passages interconnecting respective valving ports and sucker ports; a conveyor means disposed below said engagement means to receive the unfolded article therefrom, the supply means feeding the folded article into the reception means under guidance of the guide means in its first position, the ejection means removing the folded article from the reception means and feeding it to the engagement means in its first condition under

guidance of the guide means in its second condition, the engagement means separating the folds while in its first condition and releasing the opened article in its second condition; and means timing the supply means and guide means relative to each other and the guide means and engagement means relative to each other to produce the aforesaid sequence.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,412,994 November 26, 1968

Lyle V. Dutro

It is certified that error appears in the above identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 12, "leading" should read -- leading, --. Column 3, line 42, "registertion" should read -- registration --; line 50, "articles" should read -- article --; line 60, "that" should read -- that, --. Column 4, line 60, "seocnd" should read -- second --; line 65, "when the arc of lesser radius is adjacent thereto" should read -- , the ejection means comprising a rotatable wheel --; line 69, "adjecent" should read -- adjacent --.

Signed and sealed this 14th day of April 1970.

(SEAL)
Attest:

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