Sept. 6, 1966 A. H. WELCH 3,270,629

ENVELOPE ATTACHING MACHINES

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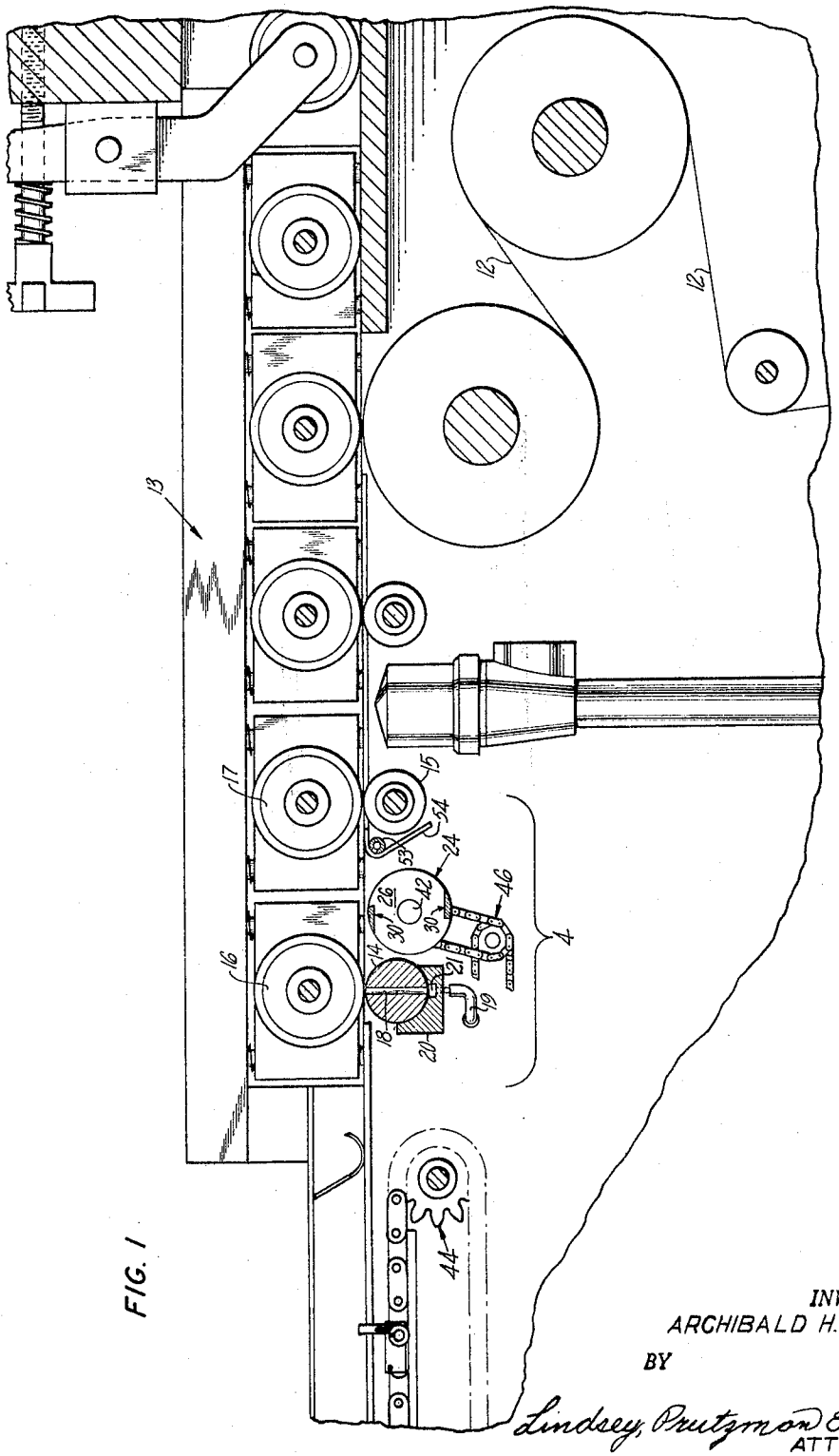


FIG. 1

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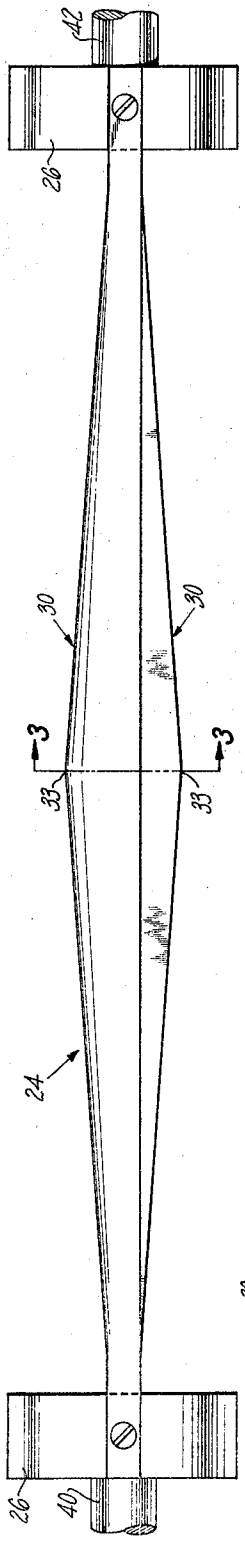


FIG. 2

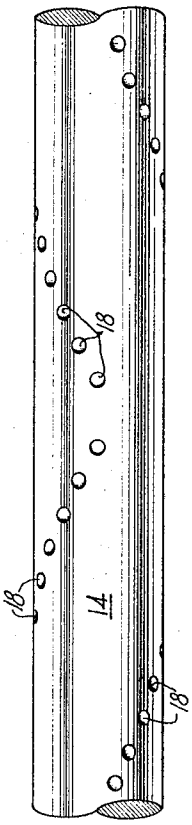


FIG. 4

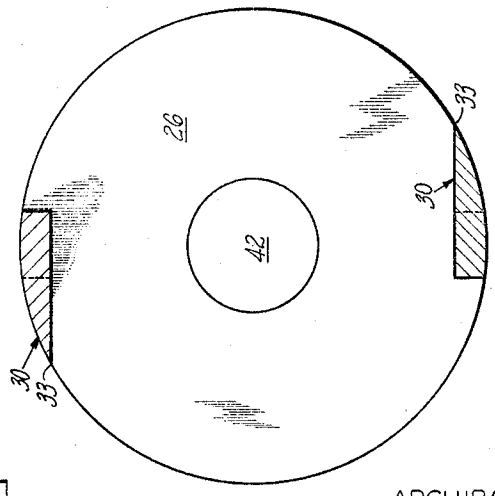


FIG. 3

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FIG. 5

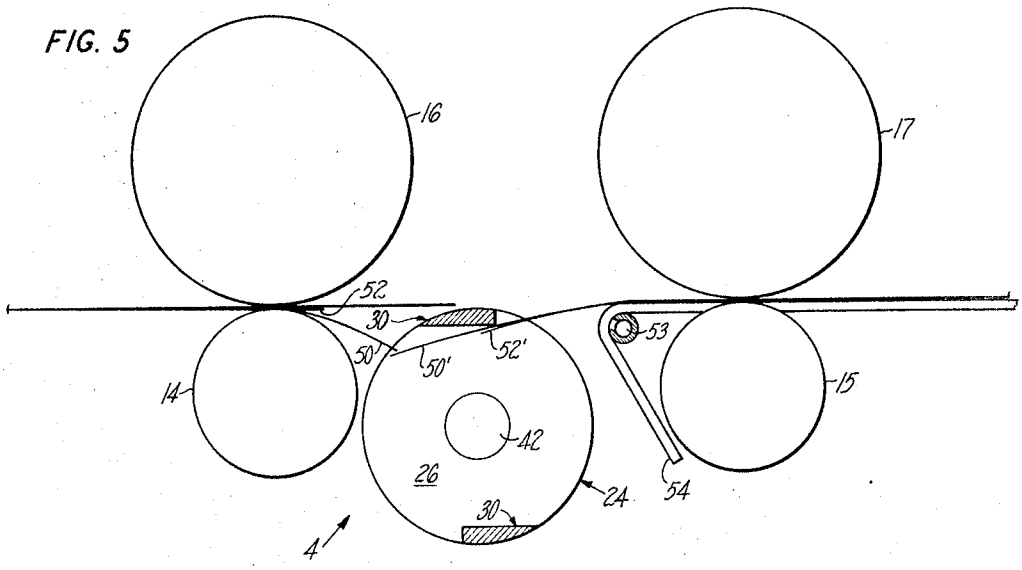


FIG. 6

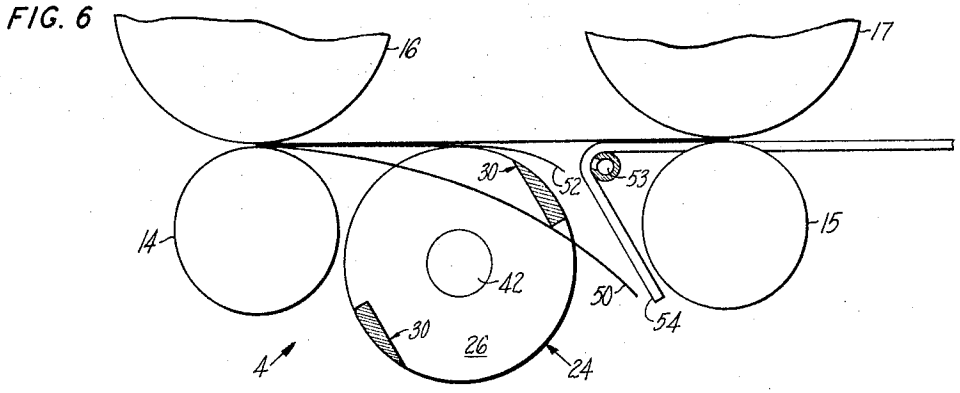
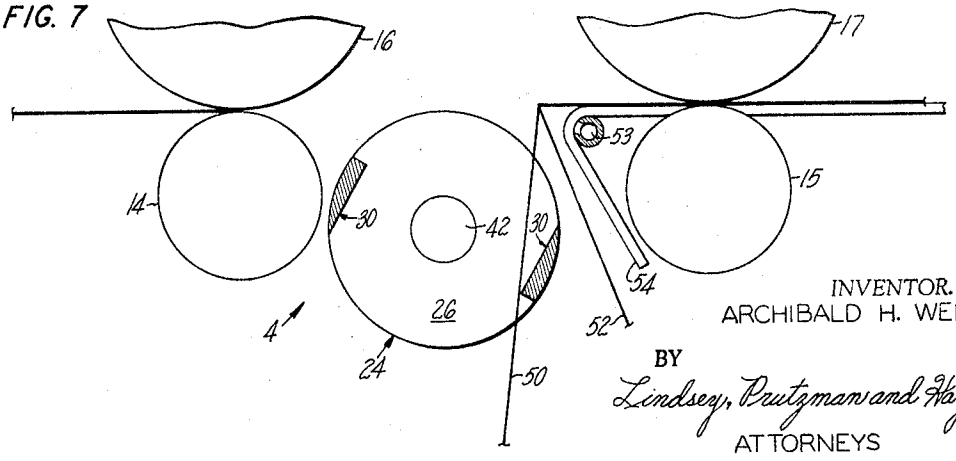


FIG. 7



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United States Patent Office 3,270,629 Patented Sept. 6, 1966

3,270,629

ENVELOPE ATTACHING MACHINES

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Filed Feb. 14, 1964, Ser. No. 345,024
10 Claims. (Cl. 93—61)

This invention generally relates to machines of the type disclosed in my copending United States application Serial No. 272,185, filed March 3, 1961, now Patent No. 3,200,719, issued on August 17, 1965, and entitled Envelope Attaching Machine, and utilized to attach envelopes individually and sequentially onto a carrier web so as to form a combined web and envelope product suitable for use, for example, with standard automatic envelope addressing equipment. More specifically, the present invention is directed to a new and improved apparatus useful in such envelope attaching machines for unfolding the envelope flaps in conjunction with the conveyance of the envelopes onto the carrier web.

In the attachment of the envelopes onto a carrier web, it is often desirable to have the envelope panels positioned transversely of the carrier web and relatively close together and with the flap of each envelope extended beneath the panel of the succeeding envelope. In the envelope attaching machine of the aforementioned United States Patent No. 3,200,719, this overlapping of the flaps with the envelope panels is effected by apparatus which successively unfolds the flaps into overlapping relationship with the succeeding envelope panels as they proceed along the conveyor. However, in cases where the flaps of the envelopes are extra wide, as in commercial envelopes having double flaps, successive unfolding of the flaps is often impaired if not prevented by the unfolding of the flap of a preceding envelope, particularly where the flap is sufficiently wide to be unfolded into overlying relationship with the flap of the succeeding envelope.

Accordingly, a principal object of the present invention is to provide in an envelope attaching machine of the type described an improved apparatus for unfolding the closure flaps which is useful with the forming of a combined web and envelope product having the envelopes in closely spaced relationship, with the flaps extending into overlapping relationship with the succeeding envelope panels, and wherein the flap is sufficiently wide to be unfolded into overlying relationship with the flap of the succeeding envelope.

A more specific object of the present invention is to provide a novel flap unfolding apparatus that will effectively unfold the flaps of the envelopes proceeding along a conveyor and which will preclude periodic malfunctioning resulting from interference between the flaps of adjacent envelopes.

A further object of the present invention is to provide a novel and improved apparatus for automatically unfolding the flaps of envelopes, which may be readily and economically incorporated into conventional envelope handling machines and which will provide dependable operation over long periods of continued use.

Other objects will be in part obvious and in part pointed out more in detail hereinafter.

The invention accordingly consists in the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereafter set forth, and the scope of the application of which will be indicated in the appended claims.

In the drawings:

FIG. 1 is a fragmentary side elevation view, partly in section and partly broken away, of an envelope attaching machine incorporating the unfolding apparatus of the present invention;

FIG. 2 is an enlarged longitudinal view, partly broken away, of a rotor forming a part of the unfolding apparatus of the present invention;

FIG. 3 is an enlarged section view taken along line 3—3 of FIG. 2;

FIG. 4 is an enlarged longitudinal view, partly broken away, of a roller forming a part of the unfolding apparatus of the present invention; and

FIGS. 5, 6 and 7 are diagrammatic views illustrating successive steps in the unfolding of the envelope flaps with the unfolding apparatus of the present invention.

Referring to FIG. 1 of the drawings, an envelope attaching machine, of the type described in the aforementioned Patent No. 3,200,719, is shown incorporating an embodiment of the unfolding apparatus of the present invention, generally designated by the numeral **4**, utilized to unfold the envelope flaps as the envelopes are conveyed along the elongated horizontal path of the conveyor into contact with a carrier web **12** to which they are suitably attached. For a detailed description of the over-all machine as well as the combined envelope and web product that is formed thereby reference should be made to my copending application. Generally, however, the machine includes a conveyor, denoted by the numeral **13**, for conveying the envelopes individually and in succession onto the carrier web **12** with the envelope panels arranged in alignment transversely of their direction of movement and with the envelope flaps at the trailing edges of the envelopes folded forwardly beneath the envelopes into contiguous relationship with the envelope panels prior to their being unfolded by the apparatus of the present invention. In the illustrated installation of the apparatus of the present invention the unfolding is accomplished between a pair of adjacent conveyor drive rollers **14**, **15** and their corresponding spring-urged pressure or backup wheels **16**, **17**, respectively.

The improved unfolding apparatus of the present invention is illustrated with the drive roller **14** bored to provide a plurality of axially and angularly spaced transverse passages **18** (FIG. 4) adapted for connection to a suitable vacuum pump (not shown) by means of a conduit **19** and a manifold **20**. The manifold **20** has an axially extending conduit **21** in periodic registry with the passages **18** upon the rotation of the roller whereby with the movement of the envelopes along the conveyor and the passage of each envelope flap between the roller **14** and its pressure wheel **16**, the partial vacuum in the passages **18** in registry with the manifold conduit **21** will operate to hold the envelope flap in contact with the roller **14** an interval sufficient to effect initial unfolding of the flap, as shown diagrammatically in FIG. 5.

Unfolding of the flap is continued by the provision of a rotor, generally designated **24**, which is positioned forwardly of the drive roller **14** and which extends transversely of the path of the envelopes in close proximity thereto. As shown in FIGS. 2 and 3, the rotor **24** has two axially spaced end hubs **26** interconnected by two blades **30** that are suitably attached to the hubs **26** on diametrically opposed sides thereof. The blades **30** are of generally triangular shape with V-shaped trailing edges and have outer arcuate cylindrical surface portions which upon rotation of the rotor alternately move through an arc immediately adjacent to but preferably spaced from the envelope panels passing over the rotor. The apexes **33** of the trailing edges of the blades are transversely positioned centrally between the ends of the envelope panels whereby the blades will initially overlap the envelope flaps centrally thereof to ensure the continued unfolding of the flaps as hereinafter described in greater detail.

The rotor 24 is mounted for rotation about its longitudinal axis by a pair of stub shafts 40, 42 which are respectively secured to the hubs 26. One of the shafts 40, 42 is driven for rotating the rotor simultaneously with the chain conveyor portion 44 of the conveyor 13, as by a chain and sprocket drive 46, with the rotor 24 being rotated in a clockwise direction, as viewed in FIG. 1, and with the tangential speed of the trailing edges of the blades 30 less than the speed of the envelopes on the conveyor. Additionally, the rotation of the rotor 24 is synchronized with the conveyance of the envelopes such that as an envelope passes over the rotor 24 one of the blades 30 moves through an arc adjacent the envelope to enable it to be received between the flap and panel of the envelope, as shown in FIG. 5.

Referring to FIGS. 5, 6 and 7, a typical unfolding sequence will now be described in connection with envelopes of the illustrated type having a first large flap 50 and an additional smaller flap 52 which is located between the flap 50 and the envelope panel. With this type of envelope the smaller flap 52 is usually employed as the closure or sealing flap while the larger flap 50 is employed, for example as a detachable form for insertion into the envelope prior to sealing. It will be understood, however, that the present invention is equally useful in connection with envelopes having only a single flap.

With the machine conveyor operating to convey the envelopes in succession with their flaps 50, 52 folded forwardly into contiguous relationship with the envelope panels, as an envelope passes over the drive roller 14 the partial vacuum in the passages 18 in registry with the manifold slot 21 draws the larger flap 50 downwardly to initially unfold it away from the envelope panel with the smaller flap 52 usually remaining folded, as shown in FIG. 5. At this point in the illustrated sequence, the flap 50′ of the preceding envelope is nearly completely unfolded, with the leading edge of the uppermost blade 30 maintaining the trailing edge of the flap 50′ out of the envelope path.

Continuing in the sequence, as shown in FIG. 6 the flap 50 will then initially pass under the blade 30 of the rotor 24 and the flap 50 will overtake the blade because of the greater forward speed of the envelopes as compared to the speed of the rotor blade. At this point in the sequence, flap 50′ of the preceding envelope will have proceeded forwardly of the rotor blade into a fully extended position overlapping the panel of the succeeding envelope, and the smaller flap 52′ of the preceding envelope will have been unfolded against the larger flap 50′ by a rearwardly flowing jet of air emitted from nozzle openings in an air manifold 53 connected to a suitable air pressure source. And a transverse cam plate 54, described in my Patent No. 3,200,719, will have engaged the flaps 50′, 52′ to fully extend them into the horizontal path of the envelopes. Upon continued operation of the machine, the above sequence will be repeated with the blades 30 being alternately engaged by the large flaps of succeeding envelopes. As the speed of the rotor blades is desirably less than the speed of the envelopes it can be seen that the diameter of the rotor 24 must be such that the circumferential distance between the trailing edges of the blades is proportionally less than the distance between the leading edges of adjacent envelopes.

From the above it will be seen that the apparatus of the present invention provides a highly efficient and reliable method of successively unfolding the envelope flaps while the envelopes are conveyed at relatively high speeds into contact with the carrier web. Additionally, this unfolding apparatus ensures sequential unfolding without intermittent malfunctioning even when the longitudinal spacing of the envelopes is such that the envelope flap of a preceding envelope when fully extended would overlap with the folded flap of a succeeding envelope.

As will be apparent to persons skilled in the art, various modifications and adaptations of the structure above described will become readily apparent without departure from the spirit and scope of the invention, the scope of which is defined in the appended claims.

I claim:

1. In a machine for conveying envelopes forwardly in succession along an elongated path with the envelope panels extending transversely of the path and the envelope flaps folded forwardly from adjacent the trailing edges of the envelopes into contiguous relationship with the envelope panels, an apparatus for successively unfolding the flaps as the envelopes are conveyed along the path comprising; a rotor mounted adjacent the envelope path with its axis extending transversely thereof and having at least one transversely extending blade radially spaced from its axis; and drive means for rotating the rotor so that the tangential velocity of the blade as it rotates through a position adjacent the path will have the same direction as but less magnitude than the velocity of the envelopes, said drive means being synchronized with the movement of the envelopes such that as the blade rotates through said position an envelope closure flap will overtake the blade for insertion of the blade between the envelope panel and flap and upon continued movement of said envelope and rotor the flap will be unfolded by the blade from the envelope panel.

2. The apparatus as defined in claim 1 further comprising suction means engageable with the envelope flaps for sequentially initiating unfolding of the flaps just prior to their overtaking the blade.

3. In a machine adapted for conveying envelopes forwardly in succession along an elongated path with the envelope panels extending transversely of the path and the envelope flaps folded forwardly from adjacent the trailing edges of the envelopes into contiguous relationship with the envelope panels, an apparatus for successively opening the envelope flaps as the envelopes are conveyed along the path comprising a rotor mounted adjacent the envelope path with its axis extending transversely thereof, said rotor having a pair of diametrically spaced blades extending transversely of the path alternately moving upon rotation of the rotor through an arc adjacent the path, and means for rotating the rotor so that the blades will be successively overtaken by the flaps of successive envelopes for disposing the blades between the envelope flaps and panels and thereby result in unfolding the flaps upon the continued movement of the envelopes and rotor.

4. The apparatus as defined in claim 3 wherein each blade has a generally V-shaped trailing edge with its apex transversely positioned centrally of the envelope panels.

5. The apparatus as defined in claim 3 further comprising suction means engageable with the envelope flaps for successively initiating unfolding thereof just prior to their overtaking the blades of the rotor.

6. In a machine for conveying envelopes forwardly in succession along a generally horizontal path with the envelope panels extending transversely of the path and the envelope flaps folded forwardly from adjacent the trailing edges of the envelopes into contiguous relationship with the lower surface of the envelope panels, an apparatus for unfolding the flaps as the envelopes are conveyed along the path comprising a rotor disposed below the path with its axis extending transversely thereof, said rotor including a pair of diametrically spaced outwardly convex blades extending transversely of the path and projecting generally circumferentially with respect to the rotor axis, and means for rotating the rotor in synchronism with the movement of the envelopes along the path so that as the envelopes pass the rotor a flap of a preceding envelope will overtake and receive one of the blades and the flap of a succeeding envelope will overtake and receive the other of the blades and so that the flap of the preceding envelope

is unfolded by said one blade and becomes disengaged from the rotor while the flap of the succeeding envelope is unfolded by said other blade.

7. In a machine for conveying envelopes forwardly in succession along an elongated path with the envelope panels extending transversely of the path, with the envelope flaps folded forwardly from adjacent the trailing edges of the envelopes into contiguous relationship with the envelope panels, and with the envelopes spaced in relatively close relationship with the longitudinal spacing between the fold of the flap of a preceding envelope and the leading edge of the folded flap of a succeeding envelope less than the longitudinal width of the flaps, an apparatus for successively unfolding the envelope flaps including in combination, suction means successively engageable with the flaps for partially unfolding the flaps, a rotor forward of the suction means having its axis and at least one blade extending transversely of the envelope path, means for rotating the rotor so that the blade will be overtaken and engaged by the partially unfolded flap to further unfold the flap, and cam means forward of said rotor engageable by the flap for fully unfolding the flap to its extended position partially overlapping with the panel of the succeeding envelope.

8. In a machine for conveying envelopes forwardly in succession along an elongated path with the envelope panels extending transversely of the path, with the envelopes having comparatively large and small flaps folded forwardly into contiguous relationship with the envelope panels with the large flap overlying the small flap, and with the longitudinal spacing between envelopes less than the longitudinal width of the large flap, an apparatus for unfolding the envelope flaps comprising in combination, suction means engageable with the large flap for partially unfolding it from the envelope panel, a rotor forward of the suction means having its axis transversely of the path and at least one blade moving adjacent the path, means for rotating the rotor so that the blade will be overtaken and engaged by the partially unfolded flap to continue to unfold the same, means including an air nozzle positioned forward of said rotor providing a generally rearwardly flowing air jet for partially unfolding the small flap, and cam means positioned forward of said rotor for unfolding the large and small flaps into fully extended positions with the large flap partially overlapping with the panel of the succeeding envelope.

9. In a machine adapted for conveying envelopes forwardly in succession along an elongated path with the envelope panels extending transversely of the path and the envelope flaps folded forwardly from adjacent the trailing edges of the envelopes into contiguous relationship with the envelope panels, an apparatus for successively opening the envelope flaps as the envelopes are conveyed along the path comprising a rotor mounted adjacent the envelope path with its axis extending transversely thereof, said rotor having a pair of axially spaced end hubs and a pair of diametrically spaced blades extending therebetween and alternately moving upon rotation of the rotor through an arc adjacent the envelope path, and means for rotating the rotor so that the blades will be alternately overtaken by the flaps of successive envelopes for disposing the blades between the envelope flaps and panels and thereby result in unfolding the flaps upon the continued movement of the envelopes and rotor.

10. In a machine for conveying envelopes forwardly in succession along an elongated path with the envelope panels extending transversely of the path, with the envelope flaps folded forwardly from adjacent the trailing edges of the envelopes into contiguous relationship with the envelope panels, and with the envelopes spaced in relatively close relationship with the longitudinal spacing between the fold of the flap of a preceding envelope and the leading edge of the folded flap of a succeeding envelope less than the longitudinal width of the flaps, an apparatus for successively unfolding the envelope flaps as the envelopes are conveyed along the path comprising a rotor disposed adjacent the path with its axis extending transversely thereof, said rotor having a pair of diametrically spaced blades extending transversely of the path, said blades having trailing edges with the circumferential distance between the trailing edges less than the longitudinal spacing between the leading edges of the folded flaps of adjacent envelopes, and means for rotating the rotor in synchronism with the movement of the envelopes along the path so that as the envelopes pass the rotor a flap of a preceding envelope will overtake and receive one of the blades and the flap of a succeeding envelope will overtake and receive the other of the blades.

No references cited.

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