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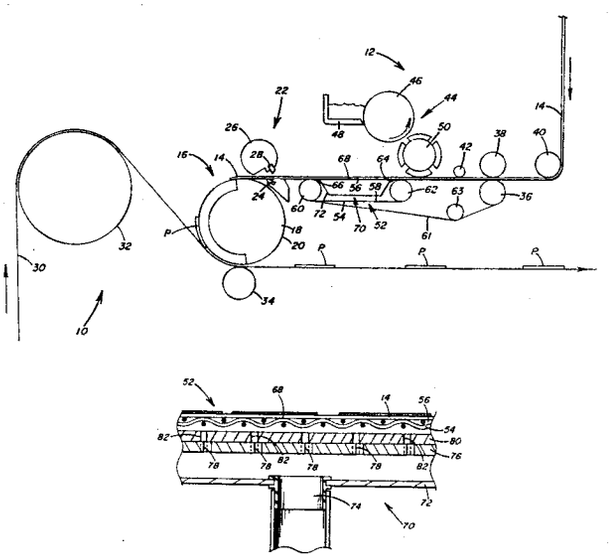
(54) Apparatus for making window patches.

(57) A web (14) of patch material is unwound from a reel and conveyed to apparatus (44) for applying adhesive to preselected portions of one surface of the web. Positioned downstream of the adhesive applicator (44) is patch severing apparatus (22) associated with a vacuum roll (18). Positioned between the patch severing apparatus (22) and the adhesive applicator (44) is a vacuum conveyor (52). The vacuum conveyor (52) includes a porous conveying surface (68) having a web receiving end portion (64) and a web discharging end portion (66). A vacuum housing (72) having a passageway (74) connected to a source of reduced pressure is positioned below the porous conveying surface (68). A ported stationary plate (76) is secured to the housing (72) above the vacuum passageway (74). A ported movable plate (80) is adjustably positioned in overlying relation with the stationary plate (76). Each plate has a plurality of suction ports (78) therethrough. The conveyor (54) pulls the web (14) from the adhesive applicator (44) and pushes the web (14) to the patch severing apparatus (22) where window patches (P) are cut from the web. The window patches (P) are transferred onto the surface (20) of the vacuum roll (18) and therefrom onto the cut windows of envelope blanks.



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APPARATUS FOR MAKING WINDOW PATCHES

This invention relates to apparatus for making window patches from a web of patch material and more particularly to vacuum conveying apparatus for advancing a web of patch material with adhesive on one surface thereof along a linear path a preselected distance to apparatus for severing successive window patches for application around the periphery of the windows formed in envelope blanks or an envelope web.

The severing of patch material from a web and positioning patch material in overlying relation with the window portion of an envelope blank or a web of envelope material is disclosed in United States Patents 3,869,965; 3,745,893; 3,618,483; 3,431,830; and 3,410,162. The adhesive material can be applied to the periphery of the window portion of the envelope blank and then the severed window patches applied to the envelope blank with the adhesive thereon, such as disclosed in United States Patent 3,869,965. In the alternative, as disclosed in United States Patent 3,618,483, a patch severing apparatus is arranged to sever window patches of selected length. The window patch web is transferred to the periphery of a vacuum roll. A knife blade positioned on the periphery of a vacuum roll cooperates with an adjacent backing knife blade to sever a window patch from the web after the web has been transferred to the vacuum roll. Adhesive is then applied to the severed patch after it is released from the vacuum roll. In United States Patents 3,410,162 and 3,745,893 adhesive is applied to the web of window patch material before the web is severed. The web with adhesive applied thereto is transferred to a vacuum roll. The web is then cut on the vacuum roll by the knife of a rotating cutter roll to form individual patches that adhere to the periphery of the vacuum roll. The pregummed patches are then applied to the envelope blanks or envelope web. In United States Patent 3,410,162, the vacuum roll is covered with a porous screen or fabric to distribute the partial vacuum from the ports of the roll over a large portion of the surface of the vacuum roll.

After the adhesive material is applied to the web of window patch material or to the severed window patch, it is preferred that the adhesive be permitted to preset prior to application to the envelope blank or web of envelope material. Presetting of the adhesive assures positive bonding between the window patch and the envelope blank or web. If the vacuum roll is positioned closely adjacent to the adhesive applicator, there may be insufficient time for the adhesive to preset before the web is severed and the patch applied to the envelope blanks, particularly for a high-speed patching operation.

Therefore, there is need in high-speed window patch making operations for patch severing and applying apparatus that assures positive bonding of the window patch to the envelope blank to eliminate incomplete bonding of the patch to the envelope blank by permitting a desired presetting of the adhesive before the patch is applied.

In accordance with the present invention, there is provided apparatus for severing window patches from a web of patch material that includes means for applying adhesive to selected portions of the web of patch material. A pair of cooperating rolls feed the web to the means for applying adhesive. A vacuum roll engages successive window patches with adhesive on one surface thereof. Severing means cuts successive window patches of a preselected length from the web while the web is engaged to the surface of the vacuum roll. A vacuum conveyor is positioned between the means for applying adhesive and the severing means. The vacuum conveyor is operable to advance the web with adhesive applied to selected portions of the web along a linear path from the means for applying adhesive toward the severing means. The vacuum conveyor has a receiving end portion positioned closely adjacent the means for applying adhesive and a discharging end portion spaced from the severing means. The vacuum conveyor is arranged to push the web from the discharging end portion a preselected distance to the vacuum roll before the web is transferred to the vacuum roll and the window patches are cut.

Further in accordance with the present invention, there is provided web conveying apparatus that includes a housing having a vacuum passageway connected to a source of reduced pressure. A stationary plate is positioned on the housing and overlies the vacuum passageway. The

stationary plate has a plurality of suction ports open to the vacuum passageway. A movable plate is positioned in overlying relation with the stationary plate. The movable plate is supported for longitudinal movement relative to the stationary plate. The movable plate has a plurality of suction ports positioned in selected registry with the stationary plate suction ports. A driven conveyor having a web receiving end portion and a web discharging end portion is positioned adjacent opposite ends of the housing respectively. The driven conveyor includes a conveying surface extending between the receiving end portion and the discharging end portion for the web. The conveying surface is positioned above the housing and extends in overlying relation with the stationary and movable plates. The conveying surface is porous to communicate with the suction ports in the stationary and movable plates to apply a reduced pressure force to the conveying surface. The movable plate is adjustable relative to the stationary plate to control the size of the registered ports communicating with the vacuum passageway to adjust the magnitude of the reduced pressure force applied to the conveying surface.

Preferably, the web receiving end portion of the conveyor is positioned closely adjacent to apparatus for applying adhesive to selected portions of one surface of web patch material. A pull roll and an idler roll feed the web to the adhesive applicator. The conveyor advances or pulls the web from the adhesive applicator toward the vacuum roll. The web is maintained on the conveying surface formed by an upper run of the conveyor by the reduced pressure force applied through the porous conveying surface and the registered suction ports of the stationary and movable plates. By adjusting the position of the movable plate on the stationary plate, the size of the passageways formed by the registered ports through the plates in communication with the reduced pressure source is adjusted. In this manner, the magnitude of the reduced pressure force applied to the web to maintain the web in contact with the conveying surface can be increased or decreased as desired.

The discharging end portion of the vacuum conveyor is spaced a preselected distance from the vacuum roll and the window patch severing

apparatus associated with the vacuum roll. Thus between the conveyor discharging end portion and the point at which the web is engaged on the periphery of the vacuum roll, the web is pushed forwardly by the conveying action generated by the vacuum conveyor. Preferably the web of patch material is conveyed a preselected distance from the point of adhesive application to the point where the web is severed to assure a desired presetting of the adhesive on the surface of the web while maintaining a preselected feed rate of the web.

Some embodiments of the present invention will be described, by way of examples, with reference to the accompanying drawings, in which:-

Figure 1 is a schematic view of a portion of an envelope making machine, illustrating the apparatus for forming window patches that are adhesively applied to envelope blanks or a web of envelope material from which blanks are cut.

Figure 2 is a schematic top plan view of the web conveying apparatus for conveying the web of patch material from an adhesive applicator to patch severing apparatus, illustrating a pair of ported plates positioned between the upper surface of a porous conveyor and a source of reduced pressure.

Figure 3 is a fragmentary schematic sectional view of the ported plates and the porous conveying surface, illustrating the alignment of the ports in the plates to control the magnitude of the reduced pressure force applied to the porous conveying surface on which the web material is conveyed.

Referring to the drawings and particularly to Figure 1, there is schematically illustrated a portion of an envelope making machine generally designated by the numeral 10 that includes a window patch severing apparatus generally designated by the numeral 12. The window patch severing apparatus 12 includes a reel (not shown) for a web 14 of window patch material. Patch transfer apparatus generally designated by the numeral 16 includes a vacuum roll 18 mounted on a shaft (not shown) conventionally supported in an envelope machine frame. The vacuum roll 18 is conventional in design and includes a series of rows of suction or vacuum ports that open onto a roll periphery 20. As is well known in the

art, the rows of vacuum ports are connected to longitudinally extending passageways which are connected through suitable valve means to a vacuum pump or similar device to provide a partial vacuum or a reduced pressure at the suction ports when the suction ports are in preselected angular positions relative to the other components of the envelope machine.

Window patch severing apparatus generally designated by the numeral 22 is associated with the vacuum roll 18 and includes a knife blade 24 suitably mounted on the roll periphery 20. Positioned adjacent the vacuum roll 18 is a roll 26 with a backing knife blade 28 mounted thereon. The roll 26 is arranged to rotate at a preselected ratio with the vacuum roll 18 to sever successive selected lengths of window patch material from the web 14. Preferably the roll 26 rotates at the speed of the envelope machine drive shaft. With this arrangement the knife blades 24 and 28 are arranged to sever a window patch of a preselected length from the web 14 of patch material. The patch severing apparatus 12 is arranged to sever window patches of variable length while the envelope machine is running.

The web 14 of patch material is engaged on the surface of the vacuum roll 18, and a window patch P is severed therefrom. The free window patch P with adhesive secured to the outer surface, in a manner to be explained later in greater detail, remains engaged on the roll periphery 20. A web 30 of envelope blank material having windows cut out from the web 30 at spaced intervals along the length thereof is fed at a preselected rate around an idler roll 32 between the vacuum roll 18 and a back-up roll 34. With the window patch engaged to the vacuum roll 18, rotation of the vacuum roll transfers the patch P into overlying relation with the respective cut out window in the web 30 of envelope blank material.

As the envelope web 30 moves between the vacuum roll 18 and the back-up roll 34, window patch P adhesively engages the web 30 and is compressed by the rolls 18 and 34 onto one surface of the web 30. The rolls 18 and 34 are in abutting relation with each other so as to adhesively secure the patch to the web 30 surrounding the periphery of a cut out window in the web 30. It should also be understood that the patch P

can be applied to an envelope blank severed from the web 30 where the blank is conveyed between the vacuum roll 18 and the back-up roll 34.

The web 14 of window patch material is engaged by a pull roll 36 and an idler roll 38 and is fed by the rolls 36 and 38 around an idler roll 40. The web 14 is threaded around the periphery of the idler roll 40 and between the rolls 36 and 38. Preferably, the pull roll 36 has a sprocket (not shown) secured thereto for rotation with an output shaft of a variable speed drive, such as a P.I.V. gear type variable speed drive well known in the art. The output shaft of the web pull roll 36 is drivingly connected to the envelope machine drive shaft and is driven at a fixed ratio to the speed of the envelope machine drive shaft. The speed of the pull roll 36 can be increased or decreased as desired to feed the web 14 at a preselected patch web speed.

The rolls 36 and 38 unwind the web 14 of window patch material from a roll and feed the web 14 beneath a deflector roll 42 to an adhesive applicator generally designated by the numeral 44. The adhesive applicator 44 includes a roll 46 positioned adjacent to a reservoir of adhesive material or gum box 48. The adhesive material is transferred from the reservoir 48 by roll 46 to an applicator roll 50 that applies the adhesive material to selected portions of the web 14 of window patch material in a well known manner. Preferably, the roll 46 is also driven by the P.I.V. variable speed gear drive at the patch web speed. The applicator roll 50 is driven at a fraction of the speed of the envelope machine drive shaft, depending on the diameter of roll 50.

The web 14 of window patch material with adhesive applied to selected portions on one surface of the web, is conveyed, in accordance with the present invention, by a vacuum conveyor generally designated by the numeral 52 from the adhesive applicator 44 to the vacuum roll 18 and the window patch severing apparatus 22. The vacuum conveyor 52 is operable to advance the web 14 with adhesive applied thereto along a linear path, for example, a horizontal linear path as illustrated in Figure 1, for a preselected distance from the adhesive applicator 44 to the severing apparatus 22. This arrangement permits the desired degree of presetting of the adhesive applied to the web 14 before the window patches are severed. This is particularly adaptable in high speed

patch making operations and eliminates the problems normally encountered with vacuum roll transfer of the gummed web to the patch severing apparatus. With vacuum roll transfer, the web is fed along an arcuate path and does not follow a linear path. Thus, for example, the distance between the applicator roll and the severing apparatus is insufficient to obtain the desired degree of presetting of the adhesive on the web 14 for high speed window patch making operations.

As illustrated in greater detail in Figure 2, the vacuum conveyor 52 includes a continuous belt-type conveyor 54 having an upper run 56 and a lower run 58. The upper and lower runs 56 and 58 are reeved at opposite ends around a driven roll 60 and an idler roll 62. The driven roll 60 is preferably driven at the speed of the pull roll 36 and the adhesive transfer roll 46 by the P.I.V. variable speed drive. The conveyor 54 may include, in one embodiment, a single porous conveyor belt or, as illustrated in Figure 2, a plurality of individual porous conveyor belts 54 reeved about the rolls 60 and 62 and positioned in spaced parallel relation below the web 14. Preferably, each conveyor 54 is fabricated of a suitable material having passages or apertures through which air is drawn downwardly through the upper conveyor run 56 immediately below the web 14. A timing belt 61 extends around rolls 36 and 60 and idler roll 63.

As further illustrated in Figure 1, the conveyor 54 has a web receiving end portion 64 and a web discharging end portion 66. The web receiving end portion 64 is supported by the idler roll 62 closely adjacent to the adhesive applicator roll 50 so that the web 14, after being applied with adhesive material, is immediately transferred to the receiving end portion 64. The web discharging end portion 66, however, is spaced a substantial distance from the vacuum roll 18 and is not positioned closely adjacent thereto. By substantially spacing the web discharging end portion 66 from the vacuum roll 18 and the severing apparatus 22, the web 14 is pushed by the conveying action of the vacuum conveyer 54 from the discharging end portion 66 to the severing apparatus 22. This provides an increase in the web patch conveying distance from the point of applying adhesive on the web 14 to the point of severing window patches from the web 14.

The web 14 of window patch material is maintained in contact with a porous conveying surface 68 on the upper conveyor run 56 by the application of a reduced pressure force on the conveying surface 68. The source of the reduced pressure force is a vacuum box generally designated by the numeral 70. The vacuum box 70 includes a housing 72 having a preselected length whereby the drive roll 60 and the idler roll 62 are positioned adjacent the opposite ends of the housing 72. With this arrangement, the housing 72 is positioned between the conveyor upper and lower runs 56 and 58. The housing 72 has a vacuum passageway 74 which is connected through suitable valve means (not shown) to a vacuum pump or similar device as utilized with the vacuum roll 18, to provide a partial vacuum at the upper conveying surface 68.

A stationary plate 76 is positioned at the top of the housing 72 above the vacuum passageway 74 and below the conveyor upper run 56. The stationary plate 76 has a plurality of suction ports 78 therethrough. The suction ports 78 are open to the vacuum passageway 74 of the vacuum box 70. A movable plate 80 is positioned in overlying relation with the stationary plate 76. The movable plate 80 is suitably supported for movement relative to the stationary plate 76. The movable plate 80 also includes a plurality of suction ports 82. The movable plate 80 is maneuvered in a horizontal plane to a position relative to the stationary plate 76 where the suction ports 78 and 82 are arranged in preselected registry to provide a plurality of continuous passageways extending from the vacuum passageway 74 through the plates 76 and 80 to the porous conveying surface 68.

Further in accordance with the present invention, by placing the ports 78 and 82 in selected registry, the dimension of the passageways through the plates 76 and 80 for the application of reduced pressure on the conveying surface 68 is controlled. This, in turn, controls the magnitude of the reduced pressure force on conveyor surface 68. The movable plate 80 is advanced to a preselected position where, for example, the ports 82 of the movable plate 80 are in complete alignment with the ports 78 of the stationary plate 76. This provides the maximum openings through the passageways of the overlying plates 76 and 80 and the maximum degree of reduced pressure applied to the conveying surface

68. Accordingly, by moving the plate 80 relative to the plate 76 to a position where a portion of the ports 78 are partially obstructed or blocked by the movable plate 80, passageways of reduced dimension are provided through the plates 76 and 80. In this manner, the magnitude of the reduced pressure force applied to the conveying surface 68 is reduced. Accordingly, the ports 78 in plate 76 can be completely blocked by the movable plate 80, and the reduced pressure force is completely removed from the conveying surface 68. Consequently by selectively moving the plate 80 relative to the plate 76, the magnitude of the reduced pressure force applied to the conveying surface 68 is controlled.

Adjusting the partial vacuum applied to the conveying surface 68 is selected as determined by the operating conditions of the envelope machine, for example, the envelope machine speed and the patch web speed. This permits lower vacuum pressures to be applied to the conveying surface 68 to maintain the web 14 in positive contact with the conveyor upper run 56 for all patch web speeds utilized.

After the web 14 passes beneath the adhesive applicator roll 50, the vacuum conveyor 54 pulls the web 14 from beneath the roll 50 onto the web receiving end portion 64 and over the surface 68 to the web discharging end portion 66. From the web discharging end portion 66, the web 14 is pushed by the conveying action generated by the conveyor 54 to the vacuum roll 18 and the severing apparatus 22. Thus, by utilizing the vacuum conveyor 52 to push the web 14 to the severing apparatus 22, an increase in the conveying distance from the point of adhesive application on the web 14 to the point of severing the web 14 is obtained. This permits the adhesive applied to the web 14 to preset before the web 14 is severed and the window patches P are applied to the envelope blank between the vacuum roll 18 and the back-up roll 34.

CLAIMS

1. Apparatus for severing window patches from a web of patch material comprising, means for applying adhesive to selected portions of one surface of the web of patch material, a pair of cooperating rolls for feeding the web to said means for applying adhesive, a vacuum roll engaging successive window patches with adhesive on one surface thereof, severing means for cutting successive window patches of a preselected length from the web while the web is engaged to the surface of the vacuum roll, a vacuum conveyor positioned between said means for applying adhesive and said severing means, said vacuum conveyor being operable to advance the web with adhesive applied to selected portions of the web along a linear path from the means for applying adhesive toward said severing means, said vacuum conveyor having a receiving end portion positioned closely adjacent said means for applying adhesive and a discharging end portion spaced from said severing means, and said vacuum conveyor arranged to push the web from said discharging end portion a preselected distance to said vacuum roll before the web is transferred to the vacuum roll and the window patches are cut.

2. Apparatus as set forth in claim 1 in which, said vacuum conveyor has a porous conveying surface for receiving the web of patch material, a source of reduced pressure for applying a reduced pressure force to said porous conveying surface to maintain the web of patch material in contact with said conveying surface and advance the web from said receiving end portion to said discharging end portion, and means for controlling the magnitude of the reduced pressure force applied to said porous conveying surface.

3. Apparatus as set forth in claim 2 in which said means for controlling the magnitude of the reduced pressure force includes, a stationary plate positioned below said porous conveying surface and above said source of reduced pressure, said stationary plate having a plurality of suction ports therethrough, a movable plate positioned in overlying relation with said stationary plate and below said porous conveying surface,

said movable plate having a plurality of suction ports therethrough, said movable plate being positioned for movement relative to said stationary plate to place said suction ports of said movable plate in selected registry with said suction ports of said stationary plate to control the magnitude of the reduced pressure force applied to said porous conveying surface.

4. Apparatus as set forth in claim 1 in which, said vacuum conveyor includes a conveyor belt having an upper run and a lower run, said upper run forming a conveying surface for receiving the web of patch material, means for driving said conveyor belt to advance the web of patch material at a preselected feed rate on said conveying surface from said receiving end portion to said discharging end portion, and a source of a reduced pressure force applied to said conveying surface and having means for controlling the magnitude of the reduced pressure force applied to said conveying surface to maintain the web of patch material thereon.

5. Apparatus as set forth in claim 1 in which, said conveyor discharging end portion is spaced a preselected linear distance from said severing means to provide an increased distance for the transport of the web of patch material from the point of applying adhesive thereto to the point of severing window patches from the web and thereby allow selected presetting of the adhesive on the web before the web is cut.

6. Apparatus as set forth in claim 1 which includes, means for applying a reduced pressure force of a preselected magnitude to the surface of said vacuum conveyor to maintain the web of patch material in contact with the surface for feeding the web of patch material from said means for applying adhesive to said severing means at a preselected feed rate.

7. Web conveying apparatus comprising, a housing having a vacuum passageway connected to a source of reduced pressure, a stationary plate positioned on said housing and overlying said vacuum passageway, said stationary plate having a plurality of suction ports open to said vacuum

passageway, a movable plate positioned in overlying relation with said stationary plate, said movable plate having a plurality of suction ports therethrough, said movable plate being supported for longitudinal movement relative to said stationary plate to place said suction ports of said movable plate in selected registry with said suction ports of said stationary plate, a driven conveyor having a web receiving end portion and a web discharging end portion positioned adjacent the opposite ends of said housing respectively, said driven conveyor including a conveying surface extending between said receiving and discharging end portions for receiving a web of material, said conveying surface being positioned above said housing and extending in overlying relation with said stationary and movable plates, said conveying surface being exposed to said suction ports in said stationary and movable plates to apply a reduced pressure force to said conveying surface, and said movable plate being adjustable relative to said stationary plate to control the size of said registered suction ports communicating with said vacuum passageway to adjust the magnitude of the reduced pressure force applied to said conveying surface.

8. Web conveying apparatus as set forth in claim 7 in which, said suction ports of said movable and stationary plates are selectively aligned to form a continuous passageway connecting said vacuum passageway with said conveying surface, and said movable plate being adjustable relative to said stationary plate to regulate the size of said continuous passageway and control the magnitude of the reduced pressure force applied to said conveying surface.

9. Web conveying apparatus as set forth in claim 7 in which, said movable plate is adjustable relative to said stationary plate to move said suction ports of said movable plate in selected registry with said suction ports of said stationary plate between a first position where said movable plate obstructs said stationary plate ports and a second position where said movable plate ports are aligned with said stationary plate ports to provide an unobstructed passage through said movable plate ports and said stationary plate ports.

10. Web conveying apparatus as set forth in claim 7 in which, said driven conveyor pulls web material onto said web receiving end portion at a preselected speed, said conveying surface linearly transports the web material to said web discharing end portion at a preselected speed, and said web discharging end portion pushes the web material from said conveying surface along a linear path at a preselected speed.

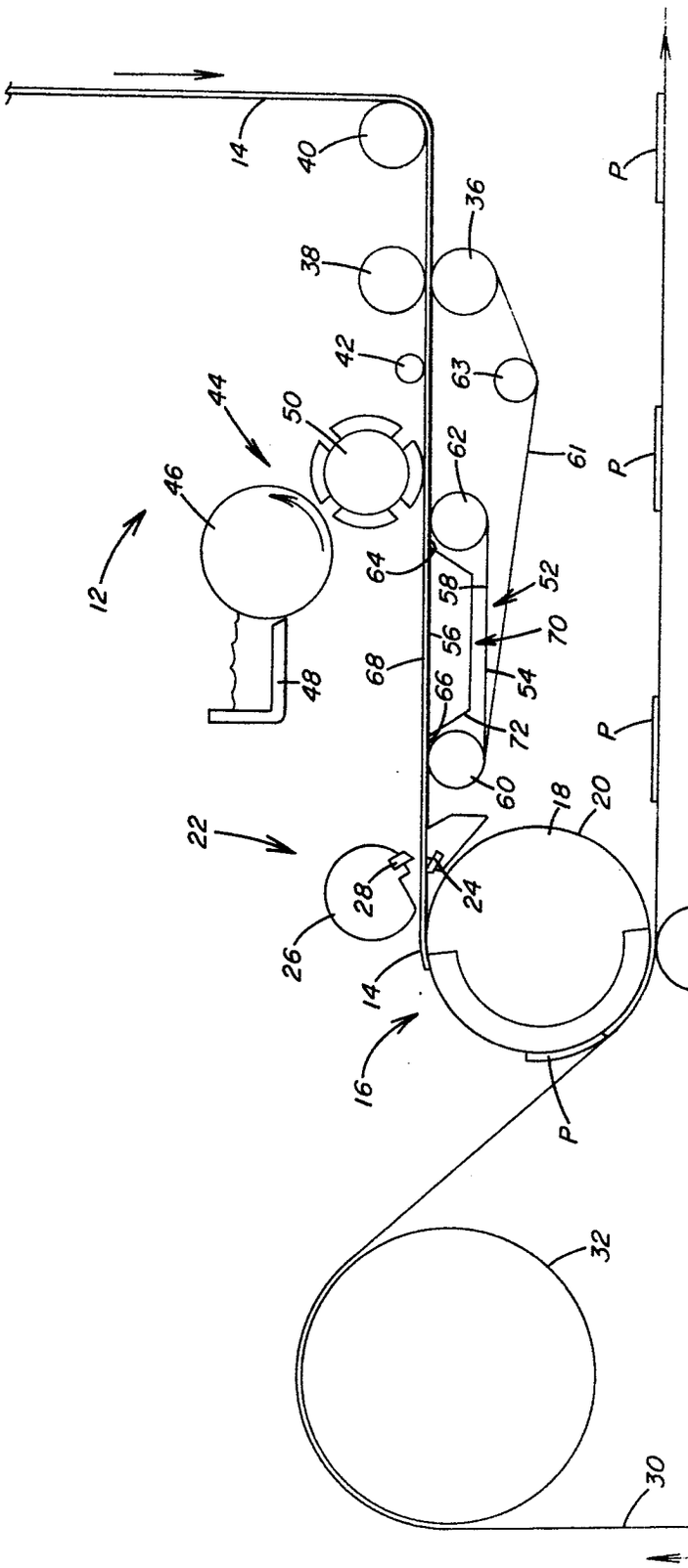
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FIG. 1

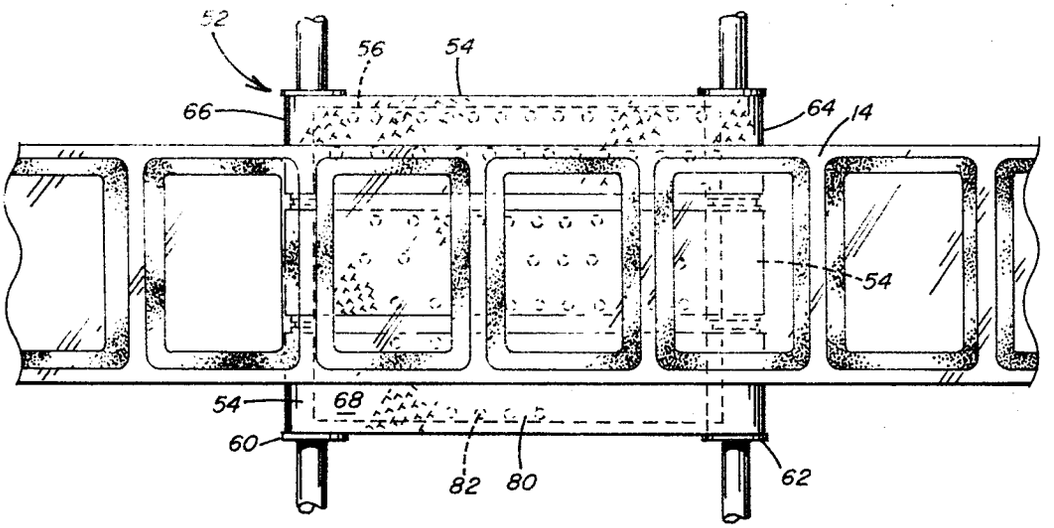
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FIG. 2

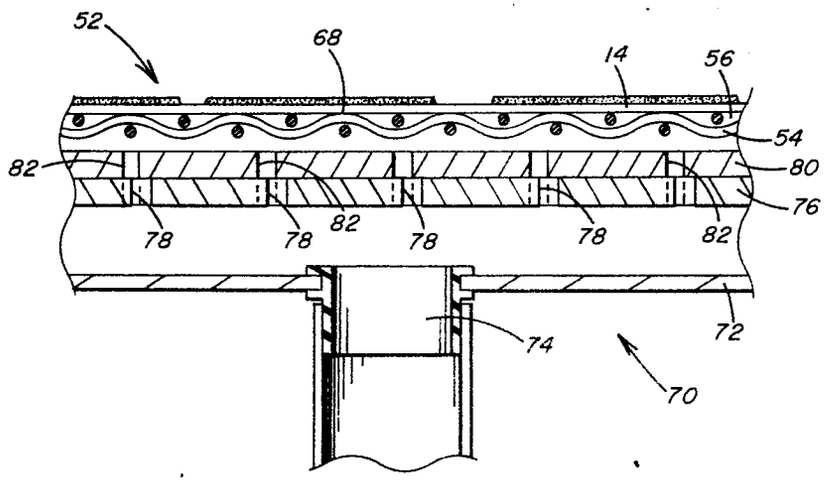
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FIG. 3

European Patent Office

EUROPEAN SEARCH REPORT

Application number

DOCUMENTS CONSIDERED TO BE RELEVANT

EP 83303017.4

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
A	US - A - 4 273 324 (HELMUT PHILIPP) * Fig. 1-6 *	1,7-9	B 31 B 1/82 B 65 H 5/22
D,A	US - A - 3 431 830 (M.A. STOUALL) * Fig. 1 *	1	
D,A	US - A - 3 745 893 (H.W. HELM) * Fig. 1 *	1	
A	US - A - 4 061 527 (J.E. TRAISE) * Fig. 1 *	1	
A	CH - A - 576 344 (CHAMPION INTERN. CORP.)		

TECHNICAL FIELDS SEARCHED (Int. Cl. ³)

B 31 B
B 65 H 5/00
B 65 H 29/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	30-08-1983	HABART

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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