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(54) **TRANSFER APPARATUS AND PRINTING MACHINE FOR SHEETS.**

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Transfer apparatus and printing machine for sheets

Technical field

This invention relates to transfer apparatus for sheets, particularly but not exclusively in connection with printing machines for printing sheets of metal or other non-limp material. It is also concerned with such printing machines per se.

Background art

In a known system for printing metal sheets, which may for example be used in the manufacture of can bodies or other items, printing ink is applied to the sheets as they are being conveyed in a horizontal plane by a first horizontal conveyor. This first conveyor feeds each sheet between a respective pair of wickets or oven trays secured to and upstanding from a second horizontal conveyor, and each sheet is then continuously advanced by the wickets, first through a heating station in the form of an oven for curing the ink, and then a cooling station where the sheet is cooled before being discharged from the wickets at a downstream end of the second conveyor on to a stack of printed sheets.

The printing ink application station, the oven and the cooling station are arranged in line with each other, with the result that they occupy extensive floor space. The wickets comprise metal lattices which provide support for the sheets whilst allowing air to circulate freely around the sheets in the oven and the cooling station. By virtue of the conductivity of the wickets, heating of the sheets in the curing oven to the correct temperature for curing the ink is delayed until the wickets themselves reach this temperature. Thus, besides being inefficient in the use of space, such a system is also wasteful of energy. Furthermore, in order to achieve a desired throughput of sheets, the second conveyor may have to have as many as 4,000 wickets. The initial expense of providing such a conveyor is coupled with considerable maintenance costs, since the wickets are prone to wear and damage and must be regularly replaced. The wickets are also closely spaced, so that the timing of the two conveyors is critical if the successive sheets are to be fed accurately between the wickets.

The use of a magnetic field to hold metallic articles on a conveyor is known. In one known arrangement, steel can ends are conveyed flat along a first conveyor to a magnetic roll which rotates the ends through approximately 90°. A stationary chute extending from an upper region of the roll receives the ends and allows them to accumulate on the chute in nesting relationship with each other. This arrangement, however, would be undesirable for the purpose of conveying printed metallic sheets through the heating and cooling stations of a printing system, since, on the one hand, excessive space

would be required if the first conveyor were to extend through both stations, whilst on the other hand the chute (being stationary) would not serve to advance the sheets in the spaced relation which is required, by contrast with the can end stacker just mentioned, until the end of the cooling station is reached so as to facilitate cooling and to avoid scuffing or scratching of the printing ink.

One object of the present invention is to provide sheet transfer apparatus, having means providing a magnetic field to cause sheets of magnetisable material to follow a conveyor path, conveyor means arranged downstream of the path for advancing the sheets on edge and in face-to-face spaced relation, for example through a cooling station of a printing machine according to the invention.

A further object of the invention is to provide a printing system occupying less floor space than the system just described. Another object is to provide a compact transfer arrangement for use in such a system, for transferring sheets from the curing oven to the cooling station.

Another object is to provide sheet transfer apparatus which is suitable for use in a printing system in place of the abovementioned wicket-carrying further conveyor and which eliminates or reduces at least some of the disadvantages mentioned above.

A further object of the invention is to provide sheet transfer apparatus wherein magnetic fields or equivalent means are provided to support the sheets during a portion of their travel so that the number of moving parts in the apparatus may be reduced by comparison with the earlier apparatus (including the wicket-carrying type of conveyor).

Yet another object is to reduce the size and complexity of curing ovens by eliminating the use of wickets.

Disclosure of the invention

According to the invention in one aspect, the invention provides transfer apparatus for sheets, said apparatus comprising sheet-advancing means arranged continuously to advance the sheets in succession in edge-to-edge relationship along a predetermined path; conveyor means which are so spaced from an upwardly-inclined downstream end portion of the sheet-advancing means at the downstream end of said path that sheets arriving at said end of the path are carried therefrom by their own momentum towards the conveyor means, the conveyor means having means for locating the leading edges of the sheets thereon and support means for receiving the trailing edges of the sheets falling thereon, the conveyor means being arranged to advance the sheets on

edge, away from said end portion in spaced, face-to-face relationship.

In another aspect the invention provides a printing machine for sheets, comprising a printer; horizontally-extending ink-curing means for curing ink on the sheets by application of heat; cooling means below the ink-curing means; and transfer apparatus for transferring a succession of the printed sheets from the curing means to the cooling means, the curing means being arranged to operate with the sheets moving therethrough in a first direction in edge-to-edge relationship in substantially the same plane, and the transfer apparatus being adapted to turn the direction of motion of said sheets through an angle such that, upon transfer to the cooling means, one face of each sheet is facing in a second direction substantially opposite to said first direction, the cooling means having conveyor means for advancing the sheets in said second direction on edge, in spaced, face-to-face relationship.

This arrangement, wherein the cooling station is disposed under the heating station, permits considerable space savings to be effected; it may be achieved in a simple manner if the transfer apparatus of the invention is incorporated in the machine.

Advantageously, the curing oven can have a conveyor for carrying sheets through the oven substantially flat thereon, thus permitting direct flame curing, the sheets then being transferred to the cooling station by the transfer apparatus which preferably has magnetic means for holding the sheets as they are advanced to the cooling station. The conveyor of the cooling station may conveniently have magnetic means for locating the edges of sheets thereon.

Such apparatus has the advantage when used in a printing machine that less space and energy may be used for heating the sheets for curing the printing ink in the absence of wickets. Additionally, it is expected that elimination of the wickets will reduce both the initial and maintenance costs of the machine, the latter because the reduction in moving parts tends to cut down wear. A further advantage is that relative timing of the conveyors is less critical than when a feed conveyor has to feed the sheets between the closely spaced wickets of the oven conveyor.

It is also advantageous to arrange an elongate support below the sheet-locating conveyor surface of the cooling station conveyor, such that lower edges of sheets held by the latter are supported in compression with a slightly bowed configuration as the sheets are advanced through the cooling station. The sheets are thus prevented from swinging freely into, and so scuffing or scratching, one another, and can be held with a gap between each sheet and the next.

Embodiments of the invention are described in the Specific Description, by way of example only, with reference to the drawings.

Brief description of the drawings

All the drawings are diagrammatic, with parts not essential to an understanding of the invention omitted for clarity. Like parts are given like reference numerals.

Figure 1 is a side elevation of a printing machine according to the invention.

Figure 2 is an enlarged elevation showing part of the machine.

Figure 3 is an elevation showing a transfer apparatus of the machine.

Figure 4 is an elevation showing the discharge end of the machine.

Figure 5 is an elevation showing an alternative form of transfer apparatus which may be used in place of that shown in Figure 3.

Specific description

The machine shown in Figure 1, and to be described in greater detail with reference to the other Figures, is intended primarily for industrial application in the printing of small sheets of thin magnetisable metal (for example sheets of 60 cm. square) such as tinplate for use in the packaging industry.

The primary industrial application of the transfer apparatus shown in Figure 3 or 5 is in a printing machine for small sheets as shown in the drawings. However it will be realised that such transfer apparatus may have many other applications where it is desired to translate the edge-to-edge relationship of a succession of sheets to a face-to-face relationship, particularly where the direction of motion of the sheets requires to be changed at the same time.

Referring first to Figures 1 to 3, the machine includes a destacker 10 having a frame 12 which supports a vertically-movable table 14. In use, the table 14 carries a pallet 16 bearing a stack of metallic sheets 18. At an upper end of the frame 12, a pair of discharge rollers 20 are arranged for supplying the uppermost sheet 18 to a printer 22.

The printer 22 has an inlet conveyor arranged to receive each sheet 18 from the rollers 20, and a rotary printing drum 26 mounted in a frame 28 to accept sheets from the inlet conveyor. The drum 26 is arranged to carry the sheets past ink applicators 30 and discharge them on to a feed conveyor 32 which extends between the printer 22 and a long, horizontally-extending curing oven 34.

A horizontal oven conveyor 36 has an upper stringer 38 passing through the oven 34 on a support plate 40. This conveyor comprises a pair of endless steel belts extending around an idle pulley 42 and a driven pulley 44. In the curing oven 34, for curing the ink on and removing solvent from the printed sheets, heat from a flame burner unit indicated diagrammatically at 35 is directed straight on to sheets 18 carried on the upper stringer 38 of the conveyor 36, whilst downstream of the burner unit, there is provided a heated air zone for blowing away solvent evaporated from the hot sheets by

directing heated air at the sheets under pressure.

As shown in Figure 3, the downstream end 46 of the oven conveyor 36 is arranged to discharge the sheets on to a transfer conveyor 48 of the transfer apparatus 47, by way of an intermediate conveyor 50 comprising steel belts 51 mounted on rotatable idle pulleys 52 and further pulleys 54 carried by a driven shaft 55. The transfer conveyor 48 follows a path 56 which is partly curved and partly straight in a vertical plane, and which turns through approximately 260°. The conveyor path 56 is at least partially defined by an elongate steel plate 58. Endless conveyor belts 60 are moved along the plate 58 by further pulleys 54 carried by the driven shaft 55, and extend around idle pulleys 62 and adjustable tensioning pulley 64. The belts 60 are driven by the pulleys on shaft 55 along the outside of the plate 58. Behind the plate 58, in relation to the belts 60, there is fixed a series of permanent magnets 66. These are mounted between a pair of fixed side supports 68 which also carry the plate 58 and which in turn are carried by a fixed frame 70 of the transfer apparatus. A magnetic field is thus created along the conveyor path 56 to hold the sheets 18 against the belts 60, thus causing the sheets to be carried around the path 56 by the latter. The magnets 66 are arranged along substantially the whole of the path 56. However, those in the upwardly-inclined final part 72 of the curved path 56, i.e. approaching the pulleys 62, are arranged to provide a magnetic field of diminished strength for reasons to be mentioned below. In the present instance, this is achieved by selecting appropriate permanent magnets 66A weaker than the magnets 66. However, an alternative possibility is to guide the belts 60 away from the plate 58 in the final or downstream end part of the conveyor path, i.e. in the end portion 72 of the conveyor 48, in which case the path 56 is defined initially by the plate 58 and finally by the belts 60 in the region where the latter depart from the plate 58.

The upwardly-inclined final part of the conveyor path 56 is directed towards the lower stringer of a horizontal cooling station conveyor or cooler conveyor 74 which is arranged below the oven conveyor 36. The cooler conveyor 74 comprises a pair of endless steel belts 76 extending around driven pulleys 78, a pair of freely rotatable idle pulleys 80, 82 and adjustable tensioning pulleys 84 (Figure 4). The pulleys 78, 80 are adjustable in a vertical direction (by means not shown), to alter the height of the lower stringer 75 as desired.

Also vertically movable so that the lower stringer runs at all times along its lower surface, is a horizontal magnetic rail 85, typically comprising a flat steel plate 86 above which a series of permanent magnets 88 are fixed between a pair of fixed side supports 90 carrying the plate 86. The magnets 88 provide a magnetic field for holding the upper edges 19 of

the sheets 18 leaving the transfer conveyor 48 against the lower stringer of conveyor 74, so that the sheets are thereafter suspended from the cooler conveyor 74. A horizontal drag rail 92 spaced below the magnetic rail 85, serves to hold the sheets in compression, in slightly bowed form as seen in Figures 3 and 4, against the rail 85 so that they cannot swing into and scratch or scuff one another and to preserve a gap 91 (typically of 2.5 cm) between each sheet and the next.

The cooler conveyor 74 passes through a cooling station 93. In the station 93, and mounted at a level intermediate between the magnetic rail 85 and the drag rail 92, is a blower (diagrammatically indicated at 94) or other suitable means for directing cooling air at the sheets 18 as they travel along the cooler conveyor 74. The air-directing means 94 are not, however, an essential part of the printing system since the sheets may sometimes be cooled in the station 93 merely by contact with the atmosphere during their advance by the conveyor 74.

Downstream of the conveyor 74, a stacking device 96 (Figures 1 and 4) is arranged to receive the sheets 18. This device 96 comprises a table 98 mounted on a stand 100 and forwardly inclined to the horizontal, so that the rear, higher edge of the table is located adjacent to a downstream end of the rail 92. The latter terminates in advance of the magnetic rail 85 as seen in Figure 4. The downstream end of the rail 85 thus lies above the table 98. As the sheets are advanced by the conveyor belts 76 beyond the magnetic rail 85, i.e. beyond the reach of the magnets 88, they fall forward on to the table 98. Upwardly-extending fingers 102 at a lower edge and sides of the table 98 serve to position the sheets on the table in a stack.

Operation of the machine illustrated in Figures 1 to 4 is as follows:—

Plain tinplate sheets 18 are fed in succession from the top of the stack on the table 14 to the printing ink application station 22. Each sheet has ink applied by the applicators 30 to one of its faces at the station 22. The sheet is then passed at a comparatively high speed, printed face uppermost, through the curing oven 34 by the oven conveyor 36. Here the ink is cured, solvent being removed from the ink by the flame burners (which heat the sheets) and by the heated air blown on to the sheet. The still hot sheet is next carried by the transfer conveyor 48 at the same speed towards the cooler conveyor 74 and the blower 94. As shown in Figure 2, the sheet 18 is conveyed by the belts 60, with its unprinted face against the plate 58, along the path 56 and assumes a tangential relationship with the path where the latter is curved. The magnetic field provided by the magnets 66 holds the sheet 18 against the belts 60 as the sheet is carried thereby from the horizontal intermediate conveyor 50, around the path 56, until the sheet is upwardly in-

clined at the downstream end 72 of the path 56 with its upper edge 19 facing toward the cooler conveyor 74.

At this point, the sheet 18 continues to advance towards the conveyor 74 under its own momentum, the diminishing local magnetic field of the transfer conveyor 48, due to the weak magnets 66A, no longer determining the direction of motion of the sheet 18, which instead comes under the influence of the magnets 88. In other words, the sheet 18 is flung from the transfer conveyor 48 in the direction of the cooler conveyor 74. The relative positioning of the conveyors 48, 74, and the speed of the belts 60, is selected to be such that the kinetic energy of the sheet leaving the transfer conveyor is mostly, but not quite entirely, converted into potential energy. Thus the leading edge 19 of the sheet just reaches the underside of the cooler conveyor 74 and is held against the belts 76 of the latter by the magnets 88. The reduced magnetic field provided by the magnets 66A and the downstream end of the path 56 allows the trailing edge of the sheet 18 to leave the path 56; and as the belts 76 of the cooler conveyor 74 advance the uppermost edge 19 of the sheet, its lowermost edge slides along the drag rail 92. The sheet is thus prevented from swinging into the sheet in front, the gap 91 being in this way maintained.

The sheet 18 is advanced by the belts 76 relatively slowly by comparison with the speed of the sheet on the oven and transfer conveyors 36, 48, this being possible since the distance between one sheet and the next can be very much smaller when they are suspended face to face, as in the conveyor 74, than when they lie flat in edge-to-edge relationship as on the transfer conveyor 48. Thus, the conveyor 74 can achieve a similar throughput to the conveyor 36 with a much slower rate of advance. The sheet 18, whilst being advanced by the cooler conveyor 74, is cooled down as already mentioned, and is finally stacked on the preceding sheets by delivery on to the device 96.

Figure 5 shows a large diameter wheel 103, in the form of a pair of identical discs 105 mounted on a rotatable shaft 106, which may be driven through suitable gearing by the main driver motor (not shown) of the machine. However, if as in the embodiment shown the belts 60 extend around the wheel 103, the wheel may freely rotate with the belts 60, the latter being driven as before by the pulleys 54 on the shaft 55.

The wheel 103 takes the place of the fixed plate 58 and its associated parts 68 shown in Figure 3. The magnets 66 are located in the periphery of the wheel and all are of the same field strength. A cylindrical plate 107 may be provided about the rim of the wheel 103, the belts 60 bearing on the plate 107. The conveyor path 56 extends between the two arrows 56 in Figure 5, and at the downstream end 108 of the path, the belts 60 are diverted by the

pulley 62 away from the wheel 103, thus weakening the magnetic field due to magnets 66 exerted on the sheets 18 and enabling the latter to be flung as already described into engagement with the cooler conveyor 74.

Alternatively the pulley 62 may be omitted, the belts 60 then following the rim of the wheel 103 well beyond the point 108 (as indicated by a phantom line in Figure 5). A fixed plough 104 may then be provided to divert each sheet 18 from contact with the wheel-type transfer conveyor 48 and towards the cooler conveyor 74.

In yet another alternative arrangement, the belt 60 may be omitted, the intermediate conveyor being extended so as to transfer the sheets direct on to the rim of the wheel 103, over a deadplate if necessary. The sheets will then be carried round in direct contact with the rim of the wheel until diverted therefrom by the plough 104 and flung by their own momentum towards the cooler conveyor 74.

It will be understood that in place of magnets, the transfer conveyor 48, in either of the embodiments described, may employ air suction in known manner. The magnets 88 of the cooler conveyor may be absent, the lower stringer of the belts 76 being provided with for example dogs against which the sheet edges 19 impinge as they are flung from the transfer conveyor. The lower edges of the sheets will then fall on to the rail 92 as before. In such an arrangement the sheets need not be of magnetisable material but may be of any non-limp material capable of being handled by the apparatus, for example relatively thick cardboard, non-magnetic metals, or certain plastics.

Claims

1. Transfer apparatus for sheets, comprising sheet-advancing means (48) arranged continuously to advance the sheets (18) in succession in edge-to-edge relationship along a predetermined path (56), characterised by conveyor means (74) which are so spaced from an upwardly-inclined downstream end portion (72) of the sheet-advancing means (48) at the downstream end of said path (56) that sheets arriving at said end of the path are carried therefrom by their own momentum towards the conveyor means (74), the conveyor means (74) having means (85) for locating the leading edges (19) of the sheets thereon and support means (92) for receiving the trailing edges of the sheets falling thereon, the conveyor means (74) being arranged to advance the sheets on edge, away from said end portion (72), in spaced, face-to-face relationship.

2. Apparatus according to claim 1, characterised in that said predetermined path (56) is at least partly curved, the sheet-advancing means (48) comprising a sheet-engaging member (60) arranged to move along said path and holding means (66, 66A) for drawing the

sheets (18) into continuous engagement with the sheet-engaging member.

3. Apparatus according to claim 2 for sheets of magnetisable material, characterised in that the holding means (66, 66A) comprises magnet means.

4. Apparatus according to claim 1, characterised in that the conveyor means (74) comprise an elongate sheet-engaging member (76) intercepting the path of a sheet carried by its own momentum from the sheet-advancing means (48) at the said end portion (72), the locating means (85) being associated with the said elongate sheet-engaging member (76) for holding the leading edge (19) against the latter.

5. Apparatus according to any one of claims 1, 2 or 4, characterised in that the sheet-advancing means (48) has, at its upwardly-inclined downstream end portion (72), means (66A) adapted to reduce the constraint on the sheets (18) to follow said path (56), whereby the sheets are free to continue towards the conveyor means (74) under their own momentum.

6. Apparatus according to claim 5, in which the sheet-advancing means (48) comprises a sheet-engaging member (60) arranged to move along said path (56) and holding means (66, 66A) for drawing the sheets (18) into continuous engagement with the sheet-engaging member, characterised in that the holding means (66A) at the said end portion (72) is arranged to exert a reduced force on the sheets as compared with the holding means (66) of the remainder of the sheet-advancing means (48) whereby to reduce said constraint at the end portion (72).

7. Apparatus according to claim 6 for sheets of magnetisable material, characterised in that the holding means (66, 66A) comprises magnet means.

8. Apparatus according to claim 7, characterised in that the magnet means (66, 66A) are fixed with respect to said path (56), the magnet means (66A) at the downstream end portion (72) being weaker than the magnet means (66) associated with the remainder of said path (56).

9. Apparatus according to claim 6, characterised in that the sheet-engaging member (60) is so disposed at the end portion (72) that the sheet-engaging member is diverted away from the holding means as it moves along the end portion, so as to reduce the force exertable on the sheets (18) by the holding means.

10. Apparatus according to claim 4 for sheets of magnetisable material, characterised in that the locating means (85) includes magnet means.

11. Apparatus according to claim 10 wherein the elongate sheet-engaging member (76) is endless, characterised in that the locating means (85) is a magnetic rail extending along and above a lower stringer of the endless member (76).

12. Apparatus according to any one of claims 4, 10 or 11, characterised in that the distance

between the elongate sheet-engaging member (76) and the support means (92) is less than the distance between the leading edge (19) and the trailing edge of a sheet (18), so that each sheet when engaging both the sheet-engaging member (76) and the support means (92) is held in compression and in slightly bowed configuration therebetween.

13. Apparatus according to claim 2, characterised in that said predetermined path (56) extends through an angle from the initial direction of motion of the sheets (18) such that the direction of advance of the sheets by the conveyor means (74) is substantially reversed with respect to said initial direction.

14. Apparatus according to claim 13, characterised in that the sheet-advancing means (48) has a substantially horizontal upstream end for receiving the sheets (18) in a substantially horizontal initial direction of motion, the conveyor means (74) extending substantially horizontally.

15. Apparatus according to claim 13 or claim 14, characterised in that the said angle is 260°.

16. Apparatus according to claim 13, characterised in that the sheet-advancing means is arranged at the delivery end of further conveyor means (36, 50) for delivering the sheets (18) in a generally-horizontal direction, the conveyor means (74) of the transfer apparatus being disposed below said further conveyor means.

17. Apparatus according to any one of claims 2, 13 or 14, characterised in that the sheet-engaging member (60) of the sheet-advancing means (48) is an endless conveyor member, the sheet-carrying means comprising also fixed guide means (58, 68), means (54, 62, 64) for locating the conveyor member (60) so as to follow said path (56), and means (55) for driving the conveyor member around the fixed guide means, the holding means (66, 66A) being carried by the fixed guide means (58, 68) behind the conveyor member (60).

18. Apparatus according to any one of claims 2, 13 or 14, characterised in that the sheet-advancing means (48) comprises a rotatable wheel (103) whose circumference defines at least the greater part of said predetermined path (56), the holding means (66) being incorporated in said wheel and the apparatus further having diverting means (88; 104) at the downstream end of the path (56) adapted to reduce the constraint on the sheets (18) to follow said path (56), whereby the sheets are caused to continue towards the conveyor means (74) under their own momentum.

19. Apparatus according to claim 18, characterised in that said wheel (103) comprises a pair of substantially identical discs (105) whose peripheries together define the said path (56).

20. Apparatus according to claim 18, characterised in that the diverting means (104) comprise a fixed plough member.

21. Apparatus according to claim 18 for

sheets of magnetisable material, characterised in that the diverting means (88) comprise magnet means of the conveyor means (74), the said magnet means (88) being so disposed as to exert a greater attractive force on the sheets (18) at the downstream end of the said path (56) than the holding means (66) of the rotatable wheel (103).

22. Apparatus according to claim 18, characterised in that the sheet-engaging member (60) of the sheet-advancing means is an endless conveyor member which extends around and in contact with that part of the periphery of the wheel (103) which defines the said path (56).

23. Apparatus according to claim 22, characterised in that the conveyor member (60) is arranged to move away from the wheel (103) at the downstream end of said path (56) so as to divert the sheets (18) away from the influence of the holding means (66).

24. Apparatus according to any one of claims 1, 2 or 4, characterised in that the conveyor means (74) is arranged to move the sheets (18) substantially more slowly than the sheet-advancing means (48).

25. A printing machine for sheets, comprising a printer (22) and horizontally-extending ink-curing means (34) for curing ink on the sheets (18) by application of heat, characterised by cooling means (93) below the ink-curing means (34) and transfer apparatus (47) for transferring a succession of the printed sheets (18) from the curing means to the cooling means, the curing means (34) being arranged to operate with the sheets moving therethrough in a first direction in edge-to-edge relationship in substantially the same plane, and the transfer apparatus being adapted to turn the direction of motion of said sheets through an angle such that, upon transfer to the cooling means (93), one face of each sheet is facing in a second direction substantially opposite to said first direction, the cooling means having conveyor means (74) for advancing the sheets in said second direction on edge, in spaced, face-to-face relationship.

26. A machine according to claim 25, characterised in that the transfer apparatus comprises sheet-advancing means (48) arranged continuously to advance the sheets (18) in succession in edge-to-edge relationship along a predetermined path (56), the conveyor means (74) of the cooling means being so spaced from an upwardly-inclined downstream end portion (72) of the sheet-advancing means (48) at the downstream end of said path (56) that sheets arriving at said end of the path are carried therefrom by their own momentum towards the conveyor means (74), the conveyor means (74) having means (85) for locating the leading edges (19) of the sheets thereon and support means (92) for receiving the trailing edges of the sheets falling thereon, the conveyor means (74) being arranged to advance the sheets on

edge, away from said end portion (72), in spaced, face-to-face relationship.

27. A machine according to claim 25 or claim 26, characterised in that the conveyor means (74) of the cooling means is arranged to move the sheets (18) at a forward velocity substantially less than that of their movement when in said edge-to-edge relationship.

28. A machine according to claim 25 or claim 26, characterised in that the printer (22) comprises a printing drum (26) arranged to carry the sheets (18) in succession past a plurality of ink applicators (30) situated about the circumference of the drum (26).

29. A machine according to claim 25 or claim 26, characterised in that the curing means (34) has direct flame-impingement means (35) and hot air means (37) for removing solvents from ink on the sheets (18).

Patentansprüche

1. Transportvorrichtung für Abschnitte aus Flachmaterial, die mit durchgehend angeordneten Mitteln (48) zum Vorbewegen der Abschnitte versehen ist, um die Abschnitte (18) entlang einem bestimmten Weg (56) aufeinanderfolgend vorzubewegen, wobei die Kanten der Abschnitte einander gegenüberliegen, dadurch gekennzeichnet, dass Fördermittel (74) vorgesehen sind, die derart in einem Abstand von einem nach oben schräg verlaufenden, in Förderrichtung hinten liegenden Endbereich (72) der Mittel zum Vorbewegen (48) am in Förderrichtung hinterenden Ende des Weges (56) angeordnet sind, dass an diesem Ende des Weges ankommenden Abschnitte von diesem durch ihre eigene Bewegungsenergie in Richtung auf die Fördermittel (74) bewegt werden, welche mit Mitteln (85), um die Vorderkanten (19) der Abschnitte daran zu halten, und mit Stützmitteln (92) versehen sind, um die rückwärtigen Kanten der darauf fallenden Abschnitte aufzunehmen, wobei die Fördermittel (74) so ausgebildet sind, dass die Abschnitte hochkant und voneinander Abstände aufweisend mit den Seiten einander gegenüberliegend vom Endbereich (72) wegbewegt werden.

2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, dass der bestimmte Weg (56) wenigstens teilweise bogenförmig ausgeführt ist und die Mittel (48) zum Vorbewegen der Abschnitte ein an letzteren angreifendes Teil (60), welches entlang dem Weg bewegbar angeordnet, und Haltemittel (66, 66A) aufweisen, um die Abschnitte (18) in kontinuierliche Verbindung mit dem an den Abschnitten angreifenden Teil zu ziehen.

3. Vorrichtung nach Anspruch 2 für Abschnitte aus magnetisierbarem Material, dadurch gekennzeichnet, dass die Haltemittel (66, 66A) magnetisch Mittel aufweisen.

4. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, dass die Fördermittel (74) ein

langgestrecktes, an den Abschnitten angreifendes Teil (76) aufweisen, welches in den von einem durch seine eigene Bewegungsenergie in Mittel (48) zur Vorbewegung der Abschnitte am Endbereich (72) vorbewegten Abschnitt beschriebenen Weg hineinragt, wobei die Haltemittel (85) dem langgestreckten, an den Abschnitten angreifenden Teil (76) zugeordnet sind und die Vorderkante (19) gegen letzteres halten.

5. Vorrichtung nach einem der Ansprüche 1, 2 oder 4, dadurch gekennzeichnet, dass das Mittel (48) zum Vorbewegen der Abschnitte an seinem in Förderrichtung hinteren, schräg nach oben verlaufenden Endbereich (72) Mittel (66A) aufweist, die dazu dienen, die auf die Abschnitte (18) einwirkende und diese entlang dem Verlauf des Weges (56) haltende Führungskraft zu verringern, wodurch die Abschnitte frei werden, um unter der Einwirkung ihrer eigenen Bewegungsenergie ihre Bewegung in Richtung auf das Fördermittel (74) fortzusetzen.

6. Vorrichtung nach Anspruch 5, bei welcher das Mittel (48) zum Vorbewegen der Abschnitte ein an diesen angreifendes Teil (60), welches so angeordnet ist, dass es entlang dem Weg (56) bewegbar ist, und Haltemittel (66, 66A) aufweist, um die Abschnitte (18) in kontinuierlichem Eingriff mit dem an den Abschnitten angreifenden Teil zu ziehen, dadurch gekennzeichnet, dass das Haltemittel (66A) am Endbereich (72) so angeordnet ist, dass es im Vergleich mit dem Haltemittel (66) des übrigen Mittels (48) zum Vorbewegen der Abschnitte eine verringerte Kraft auf die Abschnitte ausübt, wodurch die Wirksamkeit der Führungskraft im Endbereich (72) verringert wird.

7. Vorrichtung nach Anspruch 6, für Abschnitte aus magnetisierbarem Material, dadurch gekennzeichnet, dass die Haltemittel (66, 66A) magnetische Mittel aufweisen.

8. Vorrichtung nach Anspruch 7, dadurch gekennzeichnet, dass die magnetischen Mittel (66, 66A) mit Bezug auf den Weg (56) befestigt sind und die magnetischen Mittel (66A) im in Förderrichtung hinteren Endbereich (72) schwächer als die magnetischen Mittel (66) sind, die dem übrigen Weg (56) zugeordnet sind.

9. Vorrichtung nach Anspruch 6, gekennzeichnet durch eine derartige Anordnung des an den Abschnitten angreifenden Teiles (60) am Endbereich (72), dass das an den Abschnitten angreifende Teil während seiner Bewegung entlang dem Endbereich vom Haltemittel abgelenkt wird, um so die durch die Haltemittel auf die Abschnitte (18) ausgeübte Kraft zu verringern.

10. Vorrichtung nach Anspruch 4, für Abschnitte aus magnetisierbarem Material, dadurch gekennzeichnet, dass die Haltemittel (85) magnetische Mittel aufweisen.

11. Vorrichtung nach Anspruch 10, bei welcher das langgestreckte an den Abschnitten angreifende Teil (76) endlos ist, dadurch gekennzeichnet, dass das Haltemittel (85) als

magnetische Schiene ausgebildet ist, die sich entlang und oberhalb eines Untertrums des endlosen Teiles (76) erstreckt.

12. Vorrichtung nach einem der Ansprüche 4, 10 oder 11, dadurch gekennzeichnet, dass der Abstand zwischen dem langgestreckten, an den Abschnitten angreifenden Teil (76) und dem Stützmittel (92) kleiner ist als der Abstand zwischen der Vorderkante (19) und der Hinterkante eines Abschnittes (18), so dass jeder Abschnitt, wenn er sowohl mit dem an den Abschnitten angreifenden Teil (76) und dem Stützmittel (29) in Berührung ist, zwischen diesem unter Druck und in einer etwas gebogenen Form gehalten wird.

13. Vorrichtung nach Anspruch 2, dadurch gekennzeichnet, dass sich der vorbestimmte Weg (56) über einen Winkel von der Anfangsrichtung der Bewegung der Abschnitte (18) derart erstreckt, dass die Richtung der Vorbewegung der Abschnitte durch das Fördermittel (74) in Bezug auf die Anfangsrichtung im wesentlichen entgegengesetzt ist.

14. Vorrichtung nach Anspruch 13, dadurch gekennzeichnet, dass das Mittel (48) zur Vorbewegung der Abschnitte ein im wesentlichen horizontales, in Förderrichtung vorderes Ende für die Aufnahme der Abschnitte (18) in einer im wesentlichen horizontalen Anfangsbewegungsrichtung aufweist und das Fördermittel (74) sich im wesentlichen horizontal erstreckt.

15. Vorrichtung nach Anspruch 13 oder 14, dadurch gekennzeichnet, dass der Winkel 260° beträgt.

16. Vorrichtung nach Anspruch 13, dadurch gekennzeichnet, dass das Mittel zur Vorbewegung der Abschnitte am Austragsende der weiteren Fördermittel (36, 50) so angeordnet ist, dass die Abschnitte (18) in einer im wesentlichen horizontalen Richtung zugeführt werden und das Fördermittel (74) der Transportvorrichtung unterhalb der weiteren Fördermittel angeordnet ist.

17. Vorrichtung nach einem der Ansprüche 2, 13 oder 14, dadurch gekennzeichnet, dass das an den Abschnitten angreifende Teil (60) des Mittels (48) zum Vorbewegen der Abschnitte ein endloses Förderelement ist und das die Abschnitte tragende Mittel auch feststehende Führungsmittel (58, 68), Mittel (54, 62, 64) zum Führen des Förderelementes (60) entlang dem Weg (56) und Mittel (55) zum Antreiben des Förderelementes um feststehende Führungsmittel aufweist und die Haltemittel (66, 66A) von den feststehenden Führungsmitteln (58, 68) hinter dem Förderelement (60) getragen sind.

18. Vorrichtung nach einem der Ansprüche 2, 13 oder 14, dadurch gekennzeichnet, dass das Mittel (48) zum Vorbewegen der Abschnitte ein rotierbares Rad (103) aufweist, dessen Umfang wenigstens den grösseren Teil des bestimmten Weges (56) definiert, und die Haltemittel (66) in diesem Rad eingesetzt sind und die Vorrichtung weiterhin Ablenkmittel

(88, 104) am in Förderrichtung hinteren Ende des Weges (56) aufweist, die die auf die Abschnitte (18) einwirkende Führungskraft, mittels welcher die Abschnitte auf dem Weg (56) gehalten werden, verringert, so dass die Abschnitte unter der Einwirkung ihrer eigenen Bewegungsenergie ihre Bewegung in Richtung auf das Fördermittel (74) fortsetzen.

19. Vorrichtung nach Anspruch 18, dadurch gekennzeichnet, dass das Rad (103) ein Paar von im wesentlichen gleichen Scheiben (105) aufweist, deren Umfänge zusammen den Weg (56) definieren.

20. Vorrichtung nach Anspruch 18, dadurch gekennzeichnet, dass das Ablenkmittel (104) ein feststehendes Abstreifteil aufweist.

21. Vorrichtung nach Anspruch 18 für Abschnitte aus magnetisierbarem Material, dadurch gekennzeichnet, dass das Ablenkmittel (88) magnetische Mittel des Fördermittels (74) aufweist und die magnetischen Mittel (88) derart angeordnet sind, dass sie auf die Abschnitte (18) am in Förderrichtung hinteren Ende des Weges (56) eine grössere Anziehungskraft ausüben als die Haltemittel (66) des rotierbaren Rades (103).

22. Vorrichtung nach Anspruch 18, dadurch gekennzeichnet, dass das an den Abschnitten angreifende Element (60) des Mittels zur Vorbewegung der Abschnitte als endloses Förderelement ausgebildet ist, welches sich in Berührung um jenen Teil des Umfanges des Rades (103) erstreckt, welcher den Weg (56) definiert.

23. Vorrichtung nach Anspruch 22, dadurch gekennzeichnet, dass das Förderelement (60) so angeordnet ist, dass es am in Förderrichtung hinteren Ende des Weges (26) sich von Rad (103) derart wegbewegt, dass es die Abschnitte (18) vom Einflussbereich der Haltemittel (66) wegbewegt.

24. Vorrichtung nach einem der Ansprüche 1, 2 oder 4, dadurch gekennzeichnet, dass das Fördermittel (74) so ausgebildet und angeordnet ist, dass es die Abschnitte (18) merklich langsamer bewegt als das Mittel (48) für den Vortransport der Abschnitte.

25. Druckmaschine für Abschnitte aus Flachmaterial mit einer Druckvorrichtung (22) und horizontal sich erstreckenden Druckfarben-Trocknungsmitteln (34) zum Trocknen der Druckfarbe auf den Abschnitten (18) durch Wärmeanwendung, dadurch gekennzeichnet, dass Kühlmittel (93) unterhalb der Druckfarben-Trocknungsmittel (34) und eine Transportvorrichtung (47) zum Transportieren aufeinanderfolgender bedruckter Abschnitte (18) aus den Trocknungsmitteln zu den Kühlmitteln vorgesehen und die Trocknungsmittel (34) so angeordnet sind, dass die Abschnitte in einer ersten Richtung miteinander gegenüberliegenden Kanten in im wesentlichen derselben Ebene in einer ersten Richtung durch sie hindurchbewegt werden und die Transportvorrichtung so ausgebildet ist, dass sie die Bewegungsrichtung der Abschnitte um einen Winkel derart

ändert, dass beim Transport zum Kühlmittel (93) eine Seite jedes Abschnittes in eine zweite Richtung weist, die im wesentlichen entgegengesetzt zur ersten Richtung ist, und das Kühlmittel ein Fördermittel (74) aufweist, um die Abschnitte in der zweiten Richtung hochkant, mit einander gegenüberliegenden Seiten und in Abständen voneinander vorzubewegen.

26. Maschine nach Anspruch 25, dadurch gekennzeichnet, dass die Transportvorrichtung kontinuierlich ausgebildete Mittel (48) zum Vorbewegen der Abschnitte aufweist, um die Abschnitte (18) aufeinanderfolgend entlang einem vorbestimmten Weg vorzubewegen, wobei die Kanten der Abschnitte einander gegenüberliegen und das Fördermittel (74) des Kühlmittels derart in einem Abstand von einem in Förderrichtung hinten liegenden Endbereich (72) des Mittels (48) zum Vorbewegen der Abschnitte am hinteren Ende des Weges (56) angeordnet ist, dass an diesem Ende des Weges ankommende Abschnitte von diesem durch ihre eigene Bewegungsenergie in Richtung auf das Fördermittel (74) bewegt werden, welches Mittel (85), um die Vordekanten (19) der Abschnitte daran zu halten, und Stützmittel (92) zur Aufnahme der Hinterkanten der darauf fallenden Abschnitte aufweist, und das Fördermittel (74) so angeordnet und ausgebildet ist, dass die Abschnitte hochkant weg vom Endbereich (42) in Abständen voneinander vorbewegt werden und dabei mit ihren Seiten einander gegenüberliegen.

27. Maschine nach Anspruch 25 oder 26, dadurch gekennzeichnet, dass das Fördermittel (74) des Kühlmittels so ausgebildet ist, dass es die Abschnitte (18) mit einer Geschwindigkeit vorbewegt, die wesentlich geringer ist als die der Bewegung bei einer Lage der Abschnitte, in der ihre Kanten einander gegenüberliegen.

28. Maschine nach Anspruch 25 oder 26, dadurch gekennzeichnet, dass die Druckmaschine (22) eine Drucktrommel (26) aufweist, die so ausgebildet und angeordnet ist, dass sie die Abschnitte (18) aufeinanderfolgend an mehreren Auftragseinrichtungen (30) für Druckfarbe vorbeibewegt, die entlang dem Umfang der Trommel (26) angeordnet sind.

29. Maschine nach Anspruch 25 oder 26, dadurch gekennzeichnet, dass die Trocknungsmittel (34) mit einer direkten Beflammungseinrichtung (35) versehen sind und eine Heisslufteinrichtung (37) aufweisen, um Lösungsmittel aus der Druckfarbe auf den Abschnitten (18) zu entfernen.

Revendications

1. Appareil de transfert pour feuilles, comportant des moyens d'avancement de feuilles (48) agencés pour faire avancer en continu les feuilles (18) en secession en disposition bout à bout le long d'un trajet déterminé (56), caractérisé par des moyens transporteur (74)

espacés d'un tronçon terminal d'aval, incliné vers le haut (72), des moyens d'avancement de feuilles (48) situé à l'extrémité d'aval dudit trajet (56) en sorte que les feuilles arrivant à cette extrémité du trajet sont transportées de là par leur propre vitesse acquise vers les moyens transporteurs (74), les moyens transporteurs (74) comportant des moyens (85) pour maintenir en place sur eux les bords menants (19) des feuilles et des moyens de support (92) pour recevoir les bords arrière des feuilles tombant sur eux, les moyens transporteurs (74) étant agencés pour faire avancer les feuilles de champ, en les éloignant dudit tronçon terminal (72), en relation d'espacement, face à face.

2. Appareil selon la revendication 1, caractérisé en ce que ledit trajet déterminé (56) est au moins partiellement courbe, les moyens d'avancement de feuilles (48) comportant un organe de contact avec les feuilles (60) agencé pour se déplacer le long dudit trajet et des moyens de maintien (66, 66A) pour amener par attraction les feuilles (18) en contact continu avec l'organe de contact avec les feuilles.

3. Appareil selon la revendication 2 pour feuilles de matière aimantable, caractérisé en ce que les moyens de maintien (66, 66A) comportent des moyens du type aimant.

4. Appareil selon la revendication 1, caractérisé en ce que les moyens transporteurs (74) comportent un organe oblong de contact avec les feuilles (76) coupant le trajet d'une feuille entraînée par sa propre vitesse acquise à partir des moyens d'avancement de feuilles (48) audit tronçon terminal (72), les moyens de maintien en place (85) étant associés avec ledit organe oblong de contact avec les feuilles (76) pour maintenir le bord menant (19) contre ce dernier.

5. Appareil selon l'une quelconque des revendications 1, 2 ou 4, caractérisé en ce que les moyens d'avancement de feuilles (48) ont, à leur tronçon terminal d'aval incliné vers le haut (72), des moyens (66A) agencés pour réduire l'effet contraignant les feuilles (18) à suivre ledit trajet (56), de sorte que les feuilles sont libres de poursuivre leur mouvement vers les moyens transporteurs (74) sous l'effet de leur propre vitesse acquise.

6. Appareil selon la revendication 5, dans lequel les moyens d'avancement de feuilles (48) comportent un organe de contact avec les feuilles (60) agencé pour se déplacer le long dudit trajet (56) et des moyens de maintien (66, 66A) pour mettre par attraction les feuilles (18) en contact continu avec l'organe de contact avec les feuilles, caractérisé en ce que les moyens de maintien (66A) situés audit tronçon terminal (72) sont agencés pour exercer sur les feuilles une force réduite en comparaison avec les moyens de maintien (66) du reste des moyens d'avancement de feuilles (48) afin de réduire ledit effet contraignant au tronçon terminal (72).

7. Appareil selon la revendication 6 pour feuilles de matière aimantable, caractérisé en ce

que les moyens de maintien (66, 66A) comportent des moyens du type aimant.

8. Appareil selon la revendication 7, caractérisé en ce que les moyens du type aimant (66, 66A) sont fixes par rapport audit trajet (56), les moyens du type aimant (66A) situés au tronçon terminal d'aval (72) étant plus faibles que les moyens du type aimant (66) associés au reste dudit trajet (56).

9. Appareil selon la revendication 6, caractérisé en ce que l'organe de contact avec les feuilles (60) est disposé au tronçon terminal (72) en sorte que l'organe de contact avec les feuilles se trouve écarté des moyens de maintien lorsqu'il longe le tronçon terminal, de manière à réduire la force que les moyens de maintien (18) peuvent exercer sur les feuilles (18).

10. Appareil selon la revendication 4 pour feuilles de matière aimantable, caractérisé en ce que les moyens de maintien en place (85) comportent des moyens du type aimant.

11. Appareil selon la revendication 10 dans lequel l'organe oblong de contact avec les feuilles (76) est sans fin, caractérisé en ce que les moyens de maintien en place (85) sont un rail magnétique s'étendant le long et au-dessus d'un brin inférieur de l'organe sans fin (76).

12. Appareil selon l'une quelconque des revendications 4, 10 ou 11, caractérisé en ce que la distance entre l'organe oblong de contact avec les feuilles (76) et les moyens de support (92) est inférieure à la distance entre le bord menant (19) et le bord arrière d'une feuille (18), de sorte que chaque feuille lorsqu'elle rencontre tant l'organe de contact avec les feuilles (76) auq les moyens de support (92) est maintenue entre eux en compression et avec une configuration légèrement cintrée.

13. Appareil selon la revendication 2, caractérisé en ce que ledit trajet déterminé (56) décrit à partir de la direction initiale de mouvement des feuilles (18) un angle tel que la direction d'entraînement des feuilles par les moyens transporteurs (74) est sensiblement inversée par rapport à ladite direction initiale.

14. Appareil selon la revendication 13, caractérisé en ce que les moyens d'avancement de feuilles (48) ont une extrémité d'amont sensiblement horizontale pour recevoir les feuilles (18) dans une direction de mouvement initiale sensiblement horizontale, les moyens transporteurs (74) s'étendant sensiblement horizontalement.

15. Appareil selon la revendication 13 ou 14, caractérisé en ce que ledit angle est de 260°.

16. Appareil selon la revendication 13, caractérisé en ce que les moyens d'avancement de feuilles sont agencés à l'extrémité de délivrance des moyens transporteurs supplémentaires (36, 50) pour délivrer les feuilles (18) dans une direction générale horizontale, les moyens transporteurs (74) de l'appareil de

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transfert étant disposés dessous lesdits moyens transporteurs supplémentaires.

17. Appareil selon l'une quelconque des revendications 2, 13 ou 14, caractérisé en ce que l'organe de contact avec les feuilles (60) des moyens d'avancement de feuilles (48) est un organe transporteur sans fin, les moyens porteurs de feuilles comportant aussi des moyens de guidage fixes (58, 68), des moyens (54, 62, 64) pour maintenir en place l'organe transporteur (60) de façon qu'il suive ledit trajet (56), et des moyens (55) pour entraîner l'organe transporteur autour des moyens de guidages fixes, les moyens de maintien (66, 66A) étant portés par les moyens de guidage fixes (58, 68) derrière l'organe transporteur (60).

18. Appareil selon l'une quelconque des revendications 2, 13 ou 14, caractérisé en ce que les moyens d'avancement de feuilles (48) comportent une roue rotative (103) dont la circonférence définit au moins la plus grande partie dudit trajet déterminé (56), les moyens de maintien (66) étant incorporés à ladite roue et l'appareil ayant encore à l'extrémité d'aval du trajet (56) des moyens de déviation (88; 104) agencés pour réduire l'effet contraignant les feuilles (18) à suivre ledit trajet (56), de sorte que les feuilles sont amenées à poursuivre leur mouvement vers les moyens transporteurs (74) sous l'effet de leur propre vitesse acquise.

19. Appareil selon la revendication 18, caractérisé en ce que ladite roue (103) comporte une paire de disques sensiblement identiques (105) dont les pourtours définissent ensemble ledit trajet (56).

20. Appareil selon la revendication 18, caractérisé en ce que les moyens de déviation (104) comportent un soc fixe.

21. Appareil selon la revendication 18 pour feuilles de matière aimantable, caractérisé en ce que les moyens de déviation (88) comportent des moyens du type aimant des moyens transporteurs (74), lesdits moyens du type aimant (88) étant disposés de manière à exercer sur les feuilles (18) à l'extrémité d'aval dudit trajet (56) une plus grande force d'attraction que les moyens de maintien (66) de la roue rotative (103).

22. Appareil selon la revendication 18, caractérisé en ce que l'organe de contact avec les feuilles (60) des moyens d'avancement de feuilles est un organe transporteur sans fin qui contourne en contact avec elle la partie de la périphérie de la roue (103) qui définit ledit trajet (56).

23. Appareil selon la revendication 22, caractérisé en ce que l'organe transporteur (60) est agencé pour s'écarter de la roue (103) l'extrémité d'aval dudit trajet (56) de façon à dévier les feuilles en les écartant de l'influence des moyens de maintien (66).

24. Appareil selon l'une quelconque des revendications 1, 2 ou 4, caractérisé en ce que les moyens transporteurs (74) sont agencés

pour déplacer les feuilles (18) sensiblement plus lentement que les moyens d'avancement de feuilles (48).

25. Machine à imprimer des feuilles, comportant une imprimeuse (22) et des moyens de durcissement d'encre s'étendant horizontalement (34) pour durcir l'encre portée par les feuilles (18) par application de chaleur, caractérisée par des moyens de refroidissement (93) situés sous les moyens de durcissement d'encre (34) et un appareil de transfert (47) pour transférer une succession des feuilles imprimées (18) des moyens de durcissement aux moyens de refroidissement, les moyens de durcissement (34) étant agencés pour fonctionner avec déplacement des feuilles qui les traversent dans une première direction en une disposition bord à bord sensiblement dans le même plan et l'appareil de transfert étant agencé pour faire décrire à la direction de mouvement des feuilles un angle tel que, après transfert aux moyens de refroidissement (93), une face de chaque feuille regarde dans une seconde direction sensiblement opposée à ladite première direction, les moyens de refroidissement comportant des moyens transporteurs (74) pour faire avancer les feuilles dans ladite seconde direction de champ en relation d'espacement, face à face.

26. Machine selon la revendication 25, caractérisée en ce que l'appareil de transfert comporte des moyens d'avancement de feuilles (48) agencés pour faire avancer en continu les feuilles (18) en relation de succession bord à bord le long d'un trajet déterminé (56), les moyens transporteurs (74) des moyens de refroidissement étant espacés d'un tronçon terminal d'aval incliné vers le haut (72) des moyens d'avancement de feuilles (48) situé à l'extrémité d'aval dudit trajet (56) en sorte que des feuilles arrivant à ladite extrémité du trajet soient entraînées à partir de là par leur propre vitesse acquise vers les moyens transporteurs (74), les moyens transporteurs (74) comportant des moyens (85) pour maintenir en place sur eux les bords menants (19) des feuilles et des moyens de support (92) pour recevoir les bords arrière des feuilles tombant sur eux, les moyens transporteurs (94) étant agencés pour faire avancer les feuilles de champ, en les éloignant dudit tronçon terminal (72), en relation d'espacement, en disposition face à face.

27. Machine selon la revendication 25 ou 26, caractérisée en ce que les moyens transporteurs (74) des moyens de refroidissement sont agencés pour déplacer les feuilles (18) à une vitesse vers l'avant sensiblement inférieure à celle à laquelle elles se déplacent lorsqu'elles ont ladite disposition face à face.

28. Machine selon la revendication 25 ou 26, caractérisée en ce que l'imprimeuse (22) comporte un tambour imprimeur (26) agencé pour faire défiler les feuilles en succession devant une pluralité d'applicateurs d'encre (30)

situés autour de la circonférence du tambour (26).

29. Machine selon la revendication 25 ou 26, caractérisée en ce que les moyens de

durcissement (34) ont des moyens à impact de flamme direct (35) et des moyens à air chaud (37) pour éliminer les solvants de l'encre portée par les feuilles (18).

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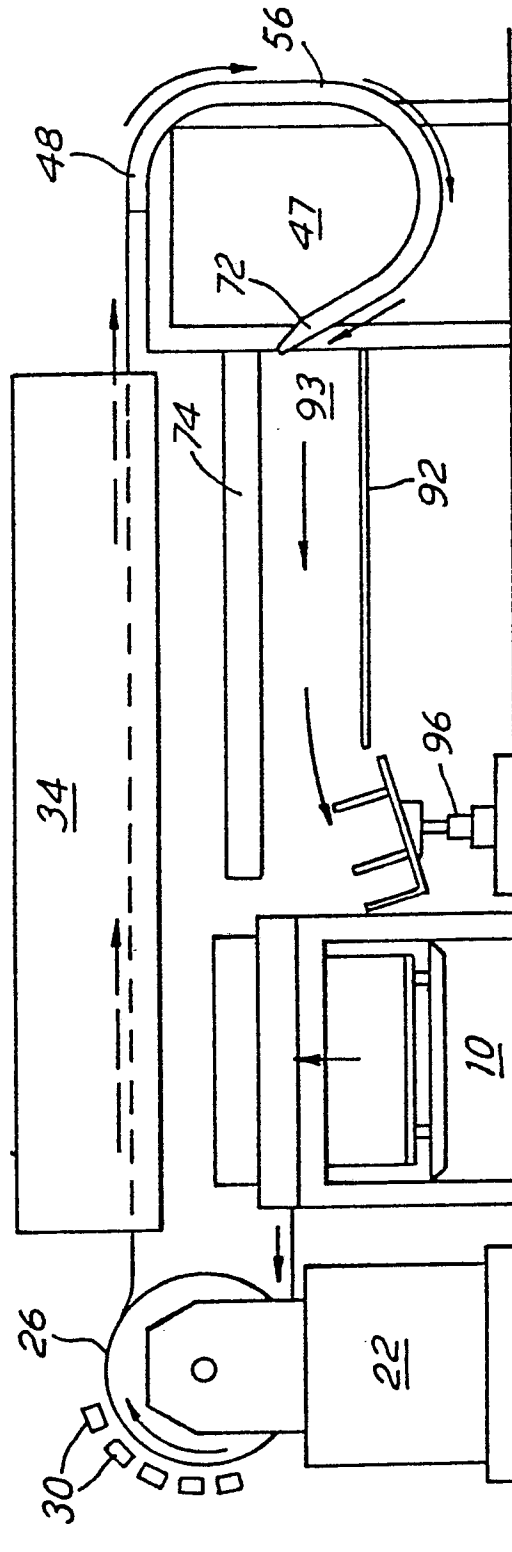
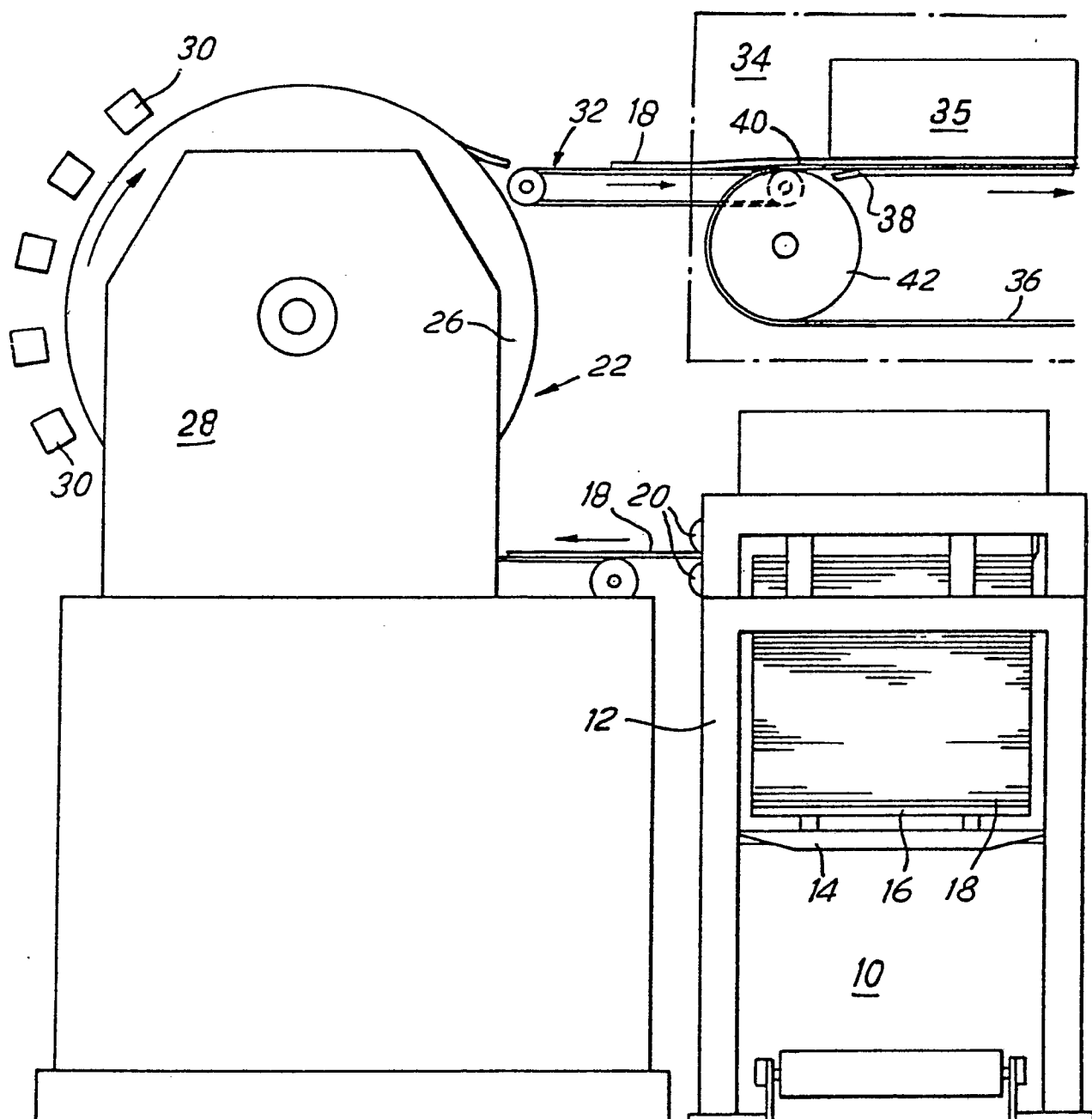


FIG.1



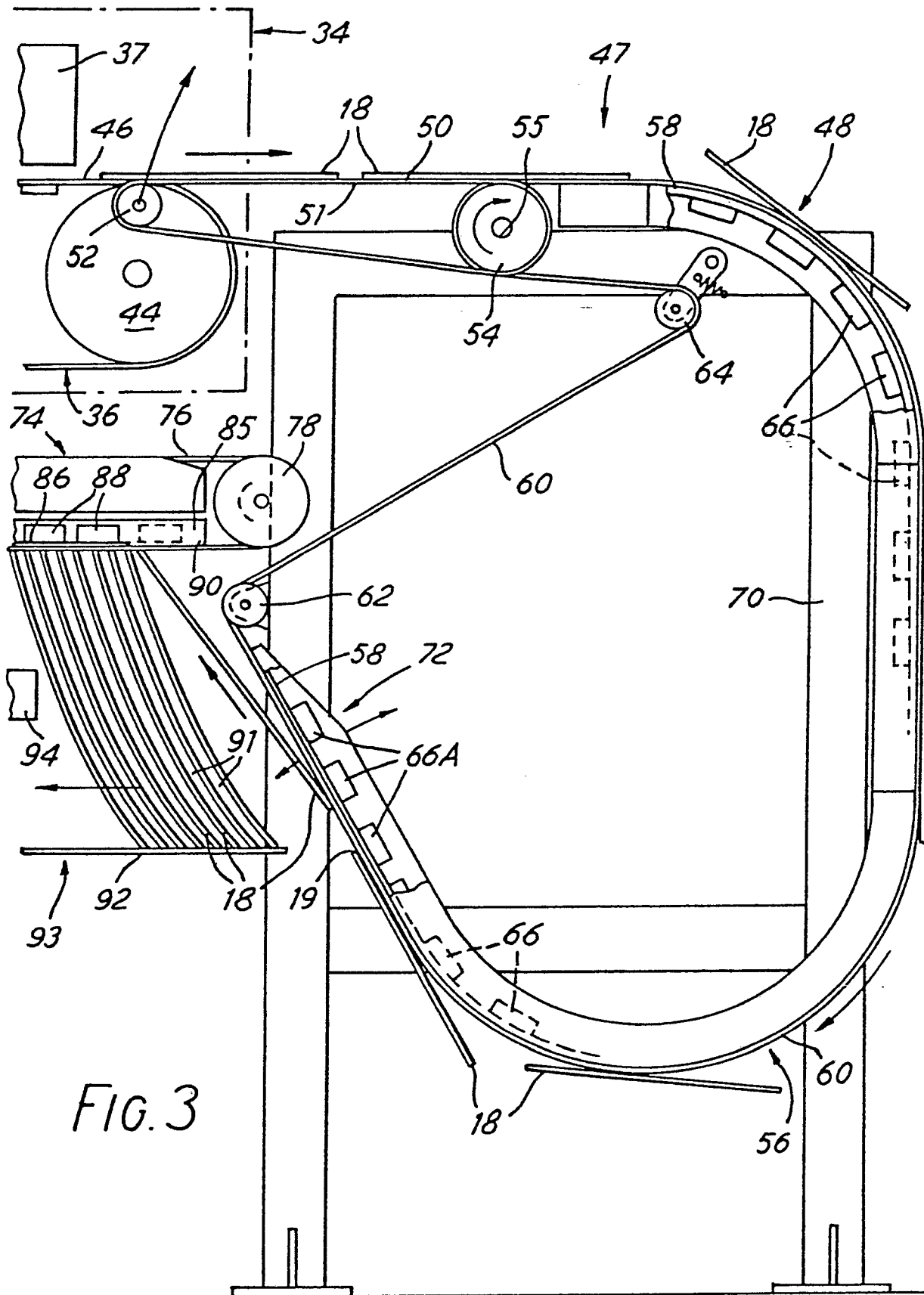


FIG. 3

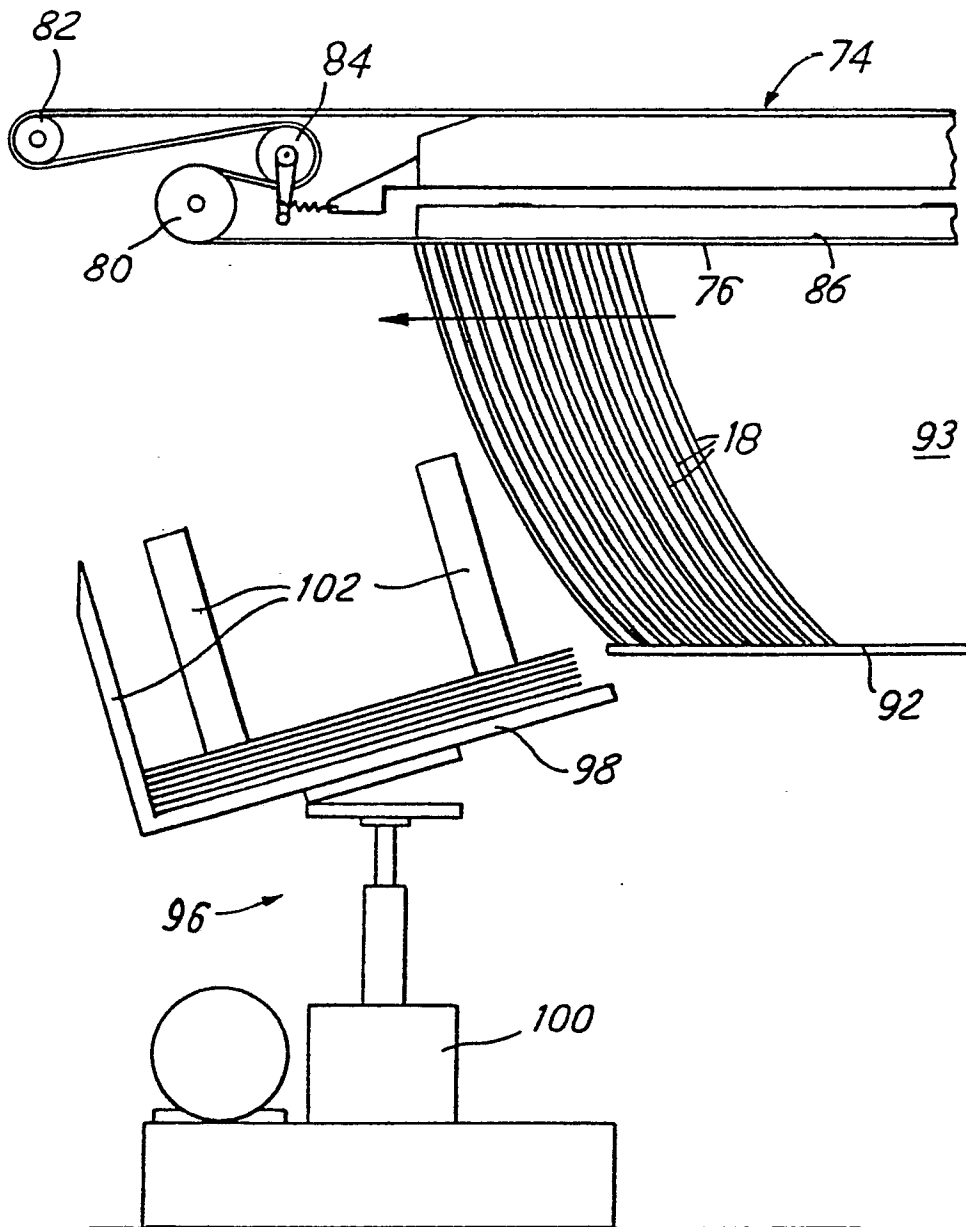


FIG. 4

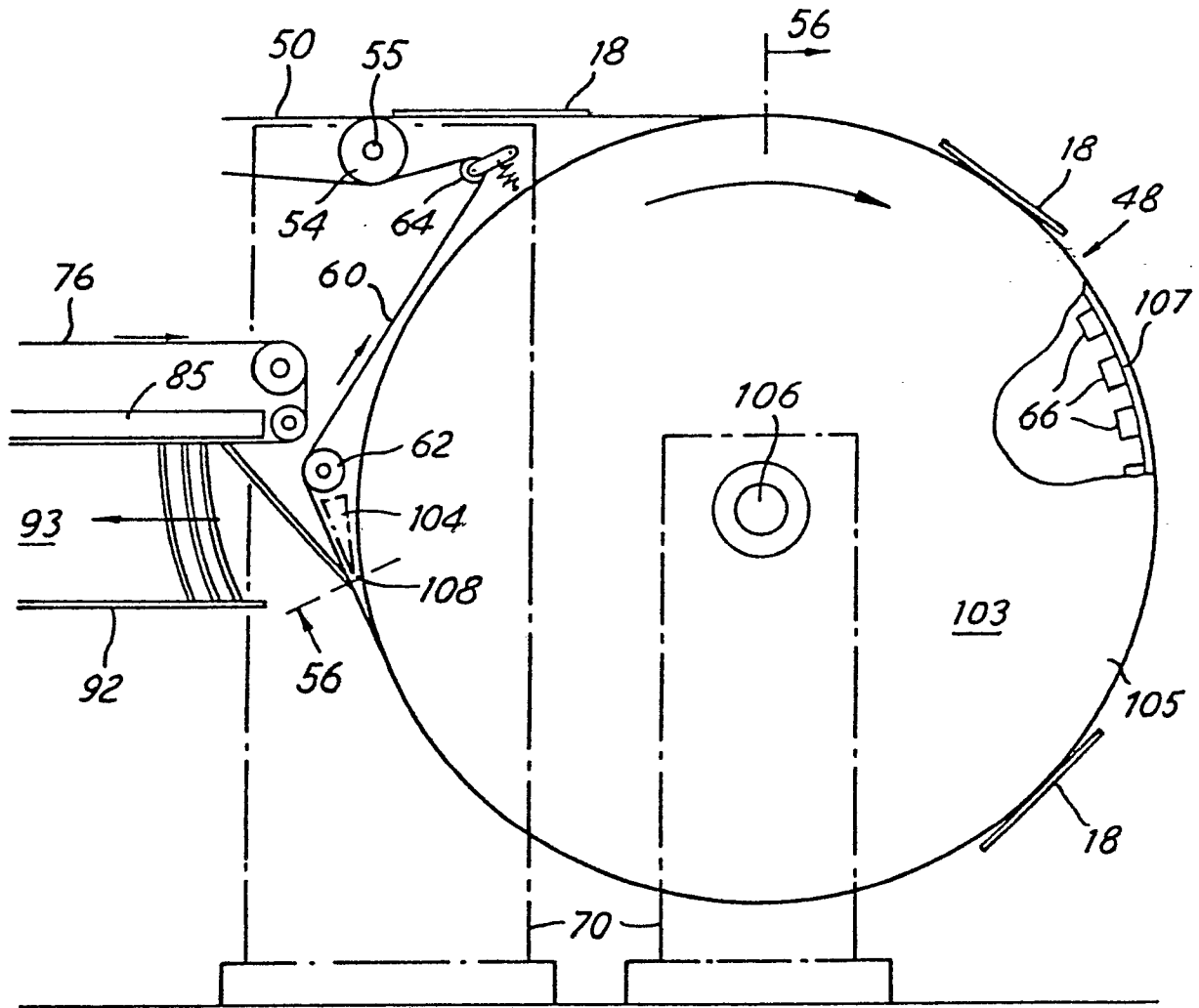


FIG. 5