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(54) Process for printing rectangular products and screen printing machine suitable for said printing.

(57) A rectangular product (20), such as a crate or tray is printed by simultaneously using two screens (5, 6) of a screen printing machine, which are located next to each other and in planes extending at a right angle to each other.

After printing of two subsequent sides of the product, the product (20) is removed from the screens (5, 6) and rotated through 180° whereupon the product is once again pushed against the screens for printing the two other subsequent sides of the product.

A screen printing machine for executing this process comprises a frame (13), a squeegee (10) for feeding ink from a tank (7) to the top side of two vertical screens (5, 6) extending at right angles and next to each other, a product clamp (19) and a platform (8) for feeding, for discharging and for maintaining the product during printing.

The platform (8) carries a guide (4) at its bottom side. In order to turn the product (20) alternately clockwise and anticlockwise into the two printing positions for printing the four sides of the product the guide element (4) is able to engage a first rotary guide track (9a) which turns the products during its movement to the screens (5, 6) through 90°. After printing of two subsequent sides the guide (4) moves back over guide track (9a) and returns to a position allowing engagement with a second guide track (9b) turning the product once again through 90° but in an opposite direction.

After said second printing the printed product (20a) is discharged through feeding-discharge station (3).

The ink tank (7) of the printing machine is positioned at the bottom of the machine and a pump (18) pumps ink to the top side of the screen. A drip tray (12) collects excess ink also at the bottom side of the screens.

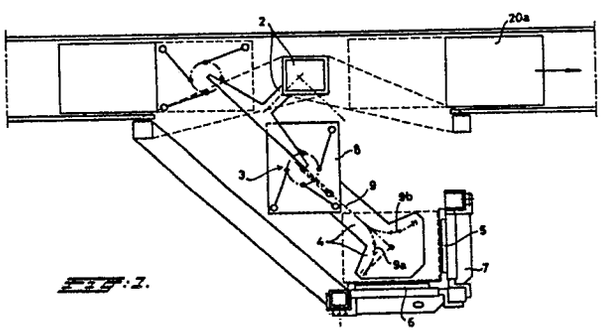

FIG. 1.

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Process for printing rectangular products and screen printing machine suitable for said printing.

The invention relates to a process for printing substantially rectangular products on four sides, using a screen printing machine, at least comprising a frame, screens standing in a vertical position, a squeegee which constantly feeds fresh ink through a screen, means which convey ink out of a tank to the top side of the screen, ink collection means under a screen to collect excess ink, and positioning elements for holding the product for printing in a desired position.

Such a process for the printing of injection moulded crates and trays and the like using a screen printing machine is generally known. This process presents the disadvantage that the operation of the screen printing machine is difficult because two opposite screens always have to print the crate simultaneously, and the shape and setting of the screens have to meet very accurate standards if in a subsequent operation a second colour has to be fitted into the first printing. The price which has to be paid for the slightest discrepancy is that the side printed with one screen is not always certain to be printed in the correct manner by the second screen.

Another disadvantage of the above-mentioned process using such a screen printing machine is that the setting, control and operation of this machine are difficult to carry out by one person, because a product is always being printed on two sides, so that work has to take place simultaneoulsy on two sides of said product.

A process is also known in which use is made of a screen printing machine in which four sides of a product in the form of a tray or crate are printed simultaneously. It will be clear that the above-mentioned problems are then additionally increased through the fact that work now has to be carried out on all four sides and the product infeed has to take place from the top or bottom, infeed from the bottom only having been achieved.

In this known process another problem is that the cleaning of screens in such a screen printing machine is extremely difficult.

A further disadvantage of this process to be mentioned is that two devices always have to be used for one colour here, one for the long side and one for the short side of the product, so that two screens per type of product are always used, which in printing smaller series leads to the necessity of always requiring four screens ready for use. Moreover, there are always two machines in use for each colour, which leads to a long production line.

The object of the invention is now to provide a process in which the above-mentioned disadvantages do not occur.

This object is achieved according to the invention in that a rectangular product is fed in and printed, simultaneously using two screens placed next to each other in planes lying at right angles to each other, and the product is positioned and held in the vertical direction during printing.

In such a process, two subsequent sides of a rectangular tray or crate are always held in the vicinity of a screen while these two sides are always positioned accurately at the same place in the same position, so that these two sides can be printed in one operation.

The rectangular products can now be pushed into the enclosed angle between these two screens, so that also when no product is present, the screens can be cleaned from the side where the product is normally fed in.

The squeegees and ink infeed can also be placed close together, so that control and operation at one side of the screen printing machine is possible.

It is particularly advantageous for the rectangular product to be taken sliding and rotating about a vertical axis through 90° into the printing position and to be removed rotating back after printing.This means that the entire printing of one colour can be handled at one place, so that only one screen need be used for the long side and one screen for the short side of the rectangular product. In multicolour printing in particular, this is a great advantage, since the printing is now constantly identical and is positioned in the same way, so that only one setting-up is necessary for the next colour, and only one screen is always in use for the long side and one for the short side of the rectangular product to be printed.

The product is preferably turned alternately clockwise and anticlockwise, so that the whole printing time can be kept short if the rotation and translation of the rectangular product are carried out simultaneously.

For achieving the last-mentioned advantage in the optimum way, during rotation in a different direction the translation of the product is limited to the distance necessary for rotation of the product through twice 90°, without contact with the screens of the printing machine.

The invention also relates to a screen printing machine for printing substantially rectangular products on four sides, at least comprising a frame, screens standing in the vertical position, a squeegee which constantly feeds fresh ink through a screen, means conveying the ink out of the tank to the top side of a screen, ink collection means

below a screen to collect excess ink, and positioning elements to hold the product for printing in a desired position, which according to the invention is characterized in that two screens are placed next to each other in two planes standing at right angles to each other, while positioning elements for positioning the product for printing and for holding it in the vertical direction are present.

Such a screen printing machine has the abovementioned advantages.

It is particularly advantageous if the tank of the screen printing machine is placed in a lower position than the screens, and all setting, operating and movement elements for the screens, squeegees and positioning elements are placed higher up than the screens.

This means that the setting and movement elements for the different parts are not soiled by the ink flowing along the screens. In order also to minimize the possibility of soiling when the ink is being replenished, the tank where the ink is pumped to the top side of the screen is placed at the bottom of the screen printing machine, so that at this place the ink does not have to be lifted up for replenishment. This design works very well, since underneath the screens there is an ink collection device in the form of a collecting channel in which excess ink pumped by a pump out of the tank to a screen is collected and flows back through a pipe into the tank. Pump setting means, which are generally known for this type of application, ensure that any excess is kept within reasonable limits, so that the machine is not dependent on the screen surface through which the ink has to be fed.

The screen printing machine according to the invention is expediently placed next to a conveyor track for the rectangular procucts to be printed, from which these products are placed by means of a manipulator in the infeed station of the screen printing machine, and are conveyed from there to the processing point by a platform which during this movement turns 90° in one direction and after the first printing slides back in the direction of the infeed station, and turns back before making a full rotation and sliding again to the processing point for the second printing, so that, as already stated, the whole printing of one colour can be handled at one place, since only one screen is in use for the long side and one screen for the short side. By advantageously achieving the movement of the product for printing from and to the processing point by means of a platform which has a guide underneath it, and which carries out the translation and rotation of the product and serves as a support during the clamping of the product, the printing time can be kept short if the rotation and translation are carried out simultaneously.

For this, the guide of the platform is expediently designed in such a way that, on the one hand, the centre of the platform follows a straight guide track while, on the other hand, a point near a corner point can mate with a first or second turning guide track, thereby permitting the platform to carry out a bend track to the left or a bend track to the right. These bends are designed in such a way that the platform, on the one hand, undergoes a rotation of 90° from the initial position each time when the entire track has been run through and, on the other hand, during this rotation and translation the places of the platform at which the product is supported by its corner remain inside the angles enclosed by the screens.

The guide is also expediently provided with blocking means which interrupt the translation when the product rotates back in the initial position. The translation then turns round as a result of the blocking, while the guide of the corner point then goes into the other guide track and the product returns to the printing station turned 180°.

The invention will now be explained with reference to an example of an embodiment shown in the drawing, in which:

Fig. 1 - shows a top view of a screen printing machine according to the invention, placed next to a conveyor track where the rectangular products for printing, such as trays, are brought in, and on which they are replaced after printing;

Fig. 2 - shows a cross-section of a screen printing machine with a conveyor track on the rear side;

Fig. 3 - shows a longitudinal view of the screen printing machine with a conveyor track placed to the right thereof.

The figures show a screen printing machine comprising a frame 13, screens 5 and 6 standing in the vertical position, an ink pump 18 for pumping ink out of an ink tank 7 to the top side of the screen in the form of an ink nozzle 16, and ink collection means in the form of a drip tray 12. The drip tray 12 is connected to a recirculation pipe 11 opening out into the tank 7.

The screen printing machine is provided with squeegees 10 and with an infeed station/discharge station 3 for the products for printing.

A rotary platform 8 is present for the transportation of a tray or crate for printing to the screens 5 and 6 standing at right angles to each other. The device also has positioning means in the form of a clamping element 19.

The ink tank 7 is placed low, so that filling and replenishing can take place low down, which excludes the possibility of ink going onto higher up parts of the machine during filling of the tank. Viewed in the upward direction, there then follows first the platform 8, with below it its guide element

which can move in straight guide track 9 and curved guide tracks 9a and 9b. Above this there then follow the screens 5, 6 placed next to each other and standing at right angles to each other, with underneath them drip trays 1/2 which at their lowest points carry recirculation pipes 11 to take the excess ink fed to a screen back to the tank 7. These screens 5, 6 are each fixed in a frame 13, which also carries the drip tray 12. The frame 13 is also provided on the top side with fastening means and setting mears 14, so that the screen can be accurately set relative to the positioned crate wall 15.

The frame bears on the top side an ink feed nozzle 16 which is connected by means of a pipe 17 to an ink pump 18. The latter pump pumps the ink out of the tank to the ink feed nozzle 16, from where the ink flows downwards along the screen, so that a stream of fresh ink is always flowing along the screen and the squeegee always presses a part of this stream through the screen in a screen operation, while the remainder of the ink flows back via a drip tray 12 and the recirculation pipe 11 to tank 7.

The screen printing machine according to the invention works as follows:

A first unprinted crate 20 is picked up from a conveyor belt 1 by manipulator 2 and placed in feed and discharge station 3, while a printed crate 20a is also removed by a manipulator in the same station 3 of the screen printing machine. The manipulator 2 subsequently returns to the rest position. The platform 8 with the unprinted crate 20 on it slides through guide element 4 via straight track guide 9 in the direction of the printing station, followed by a movement in which the platform 8 rotates through 90° as a result of first rotary guide track 9a. On arrival at the printing station, a vertical product clamp 19 goes into operation, so that the crate 20 positioned on the platform 8 is clamped. The squeegees 10 then move along the vertically placed screens 5 and 6, fed with ink and standing at right angles to each other, so that the two faces 15 of the crate 20 lying behind the screens are printed in the positioned state.

The product clamp 19 then releases the rectangular product again, and the platform 8 limited by blocking means 21 slides back just far enough to allow the crate to be rotated back again through 90° to its vertical position and the guide 4 of the platform then follows a second guide track 9b during sliding back of the platform once again to the printing station where the crate 20, now turned through 180° relative to the first time, is positioned again by the product clamp 19 and printed by the screens 5 and 6.

The platform 8 then slides back, after being released by the product clamp 19, to the feed and discharge station 3, in order to discharge the fully printed rectangular product 20a from there.

Claims

1. Process for printing substantially rectangular products (20) on four sides, using a screen printing machine, at least comprising a frame (13), screens (5, 6) standing in a vertical position, a squeegee (10) which constantly feeds fresh ink through a screen, means (18) which convey ink out of a tank (7) to the top side of the screen, ink collection means (12) under a screen to collect excess ink, and positioning elements (8, 19) for holding the product for printing in a desired position, characterized in that a rectangular product (20) is fed in and printed, simultaneously using two screens (5, 6) placed next to each other in planes lying at right angles to each other, and the product is positioned and held in the vertical direction during printing.

2. Process according to Claim 1, characterized in that the product (20) is taken sliding and rotating about a vertical axis through 90° into the printing position and is removed rotating back after printing, preferably the product (20) is turned alternately clockwise and anticlockwise into the printing position.

3. Process according to Claim 2, characterized in that a guide (4) with guide tracks (9a, 9b) changes the rotation of the product and conveys the product into the direction of the discharge point (3) only after rotation in one direction.

4. Process according to Claim 3, characterized in that before rotation in another direction the translation of the product is limited to the distance necessary for rotation of the product through twice 90°, without contact with the screens.

5. Screen printing machine for printing a substantially rectangular product on four sides, at least comprising a frame (13), screens (5, 6) standing in the vertical position, a squeegee (10) which constantly feeds fresh ink through a screen, means (18) conveying the ink out of the tank (7) to the top side of a screen, ink collection means (12) below a screen to collect excess ink, and positioning elements (8, 19) to hold the product for printing in a desired position, characterized in that two screens (5, 6) are placed next to each other in two planes standing at right angles to each other, while positioning elements (8, 19) for positioning the product (20) for printing and for holding it in the vertical direction are present.

6. Screen printing machine according to Claim 5, characterized in that an ink tank (7) is placed in a lower position than screens (5, 6), and all setting, operating and movement elements for the screens (5, 6), squeegees (10) and positioning elements (8,

19) are placed higher up than the screens.

7. Screen printing machine according to Claims 5 or 6, characterized in that in the free position of a positioning element comprising a product clamp (19) a passage for a product is present opposite the screen faces.

8. Screen printing machine according to Claim 7, characterized in that provision is made for feed and discharge means (8) which take the product (20) sliding and rotating about a vertical axis through 90° into the printing position and discharge it rotating back after printing.

9. Screen printing machine according to Claim 8, characterized in that the feed and discharge means (8) are designed in such a way that the product (20) can be turned alternately clockwise and anticlockwise into the printing position, and preferably the feed and discharge means (8) comprise a guide element (4) which by means of a first rotary guide track (9a) and a second rotary guide track (9b) change the rotation of the product and take the product into the direction of the discharge point (3) only after rotation in one direction.

10. Screen printing machine according to Claim 9, characterized in that the guide (4) is provided with blocking means which before rotation in another direction limit the translation of the product to a distance necesary for rotation through twice 90°, without contact with screens (5, 6).

11. Screen printing machine according to one or more of the preceding Claims 5 - 10, characterized in that the feed and discharge means (8) comprise an essentially closed platform with guide element (4) on the bottom side.

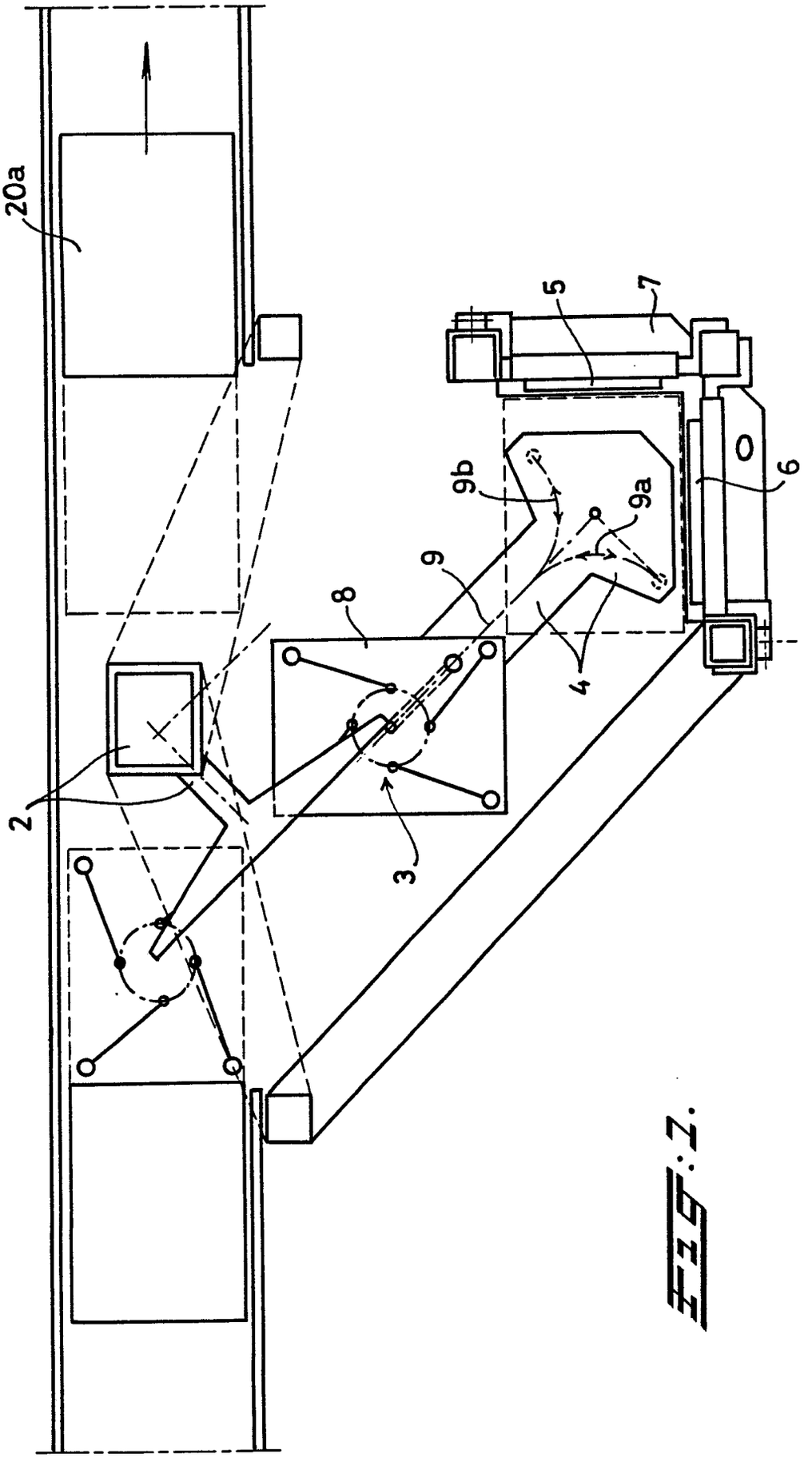

FIG. 2.

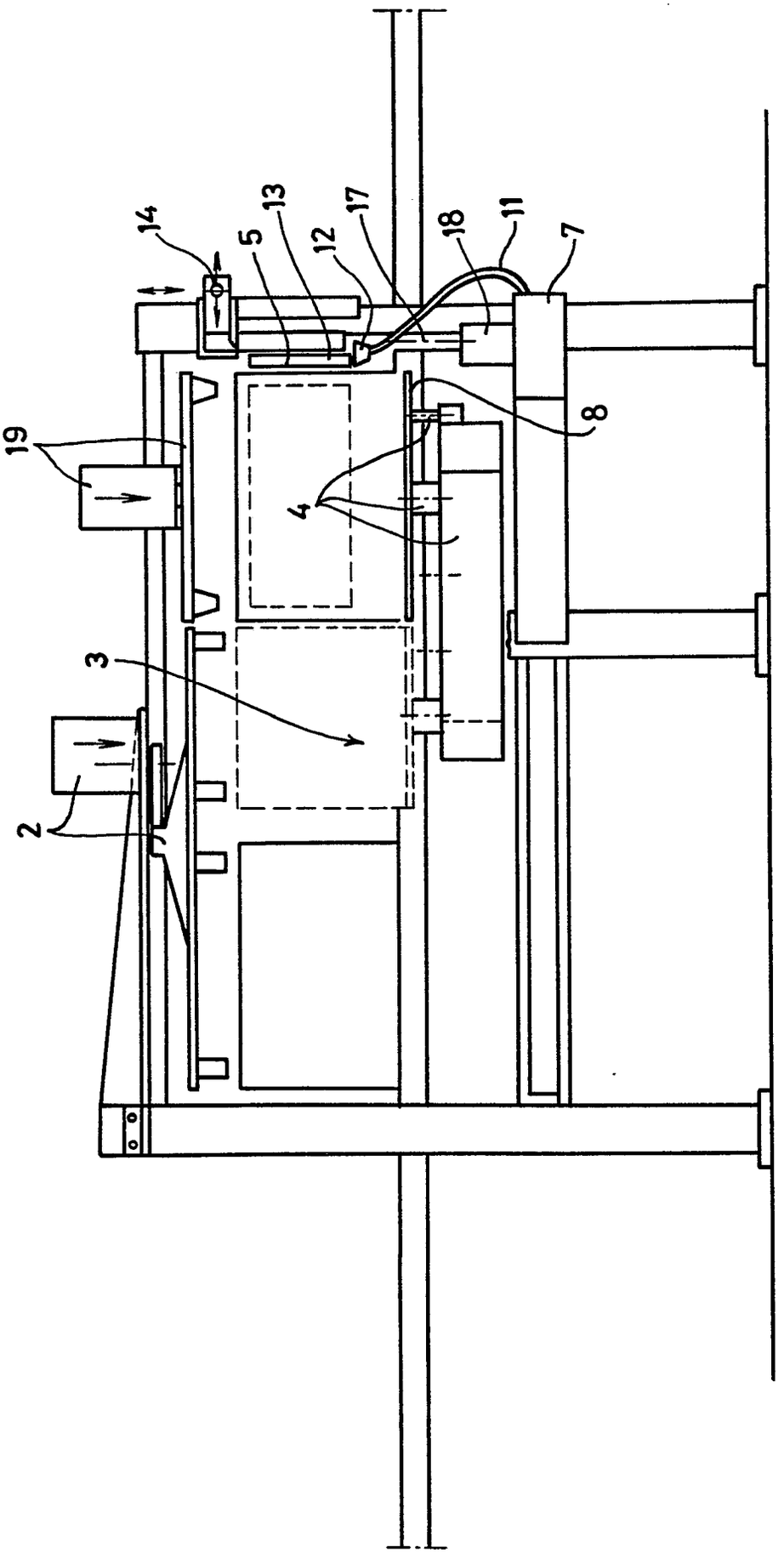

FIG. 2.

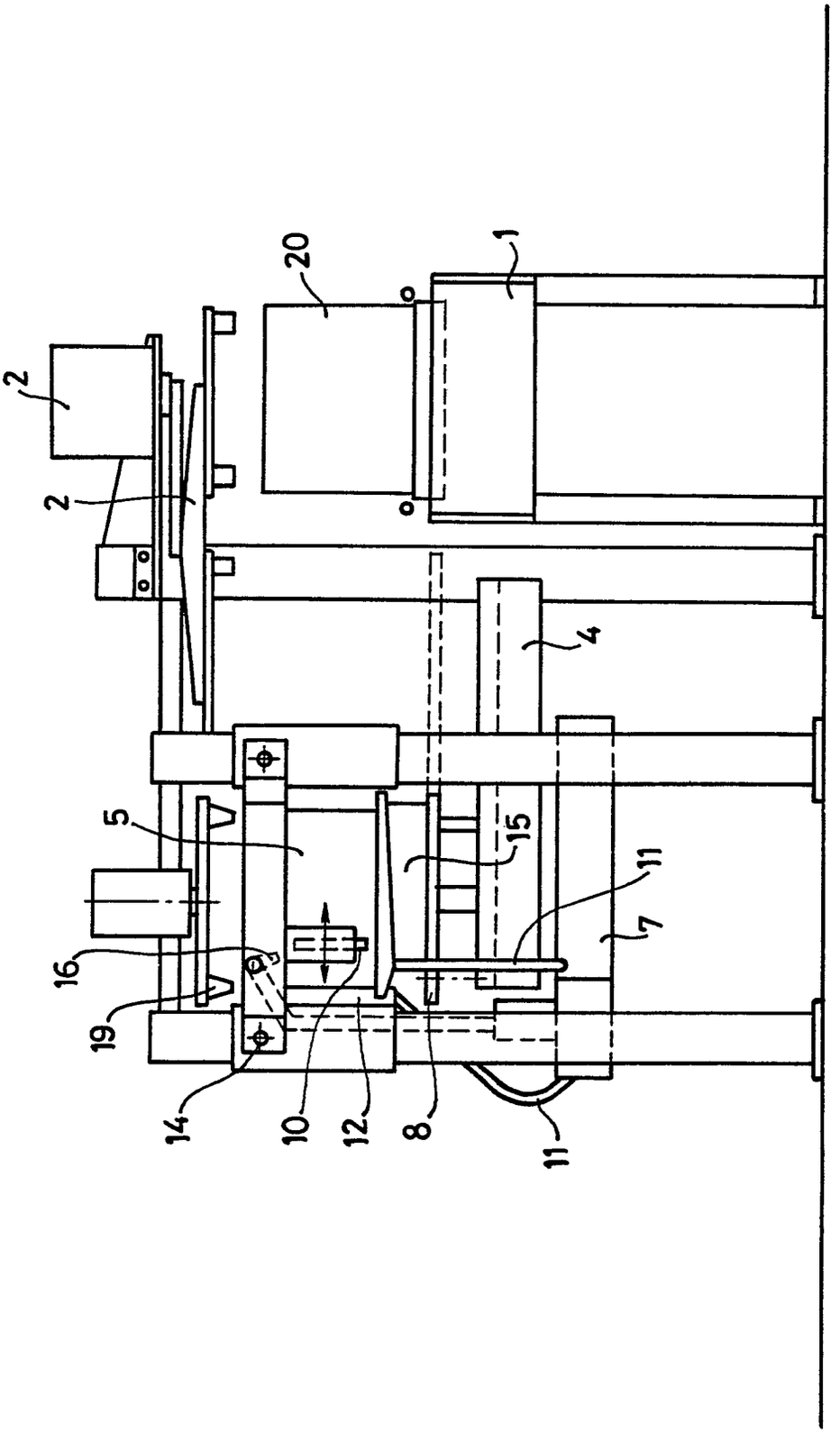

Fig. 3.

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 89 20 3084

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	DE-A-2207371 (ISAMAT-SIEBDRUCK)		B41F15/26
A	EP-A-0046474 (ALEXANDER SCHOELLER)		
A	US-A-2115757 (E.I. DU PONT DE NEMOURS)		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B41F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	26 MARCH 1990	LONCKE J.W.

CATEGORY OF CITED DOCUMENTS

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