

Aug. 13, 1935.

A. WINKLER ET AL

2,011,464

DEVICE FOR REMOVING FROM A PILE OF SHEETS THE SHEET LOWERMOST AT THE TIME

Filed March 20, 1934

2 Sheets-Sheet 1

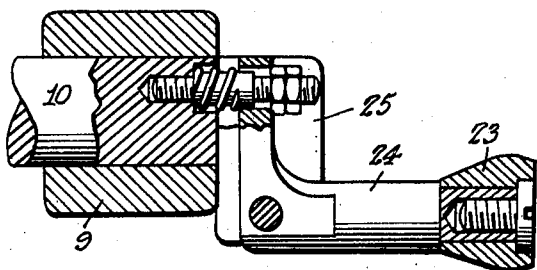
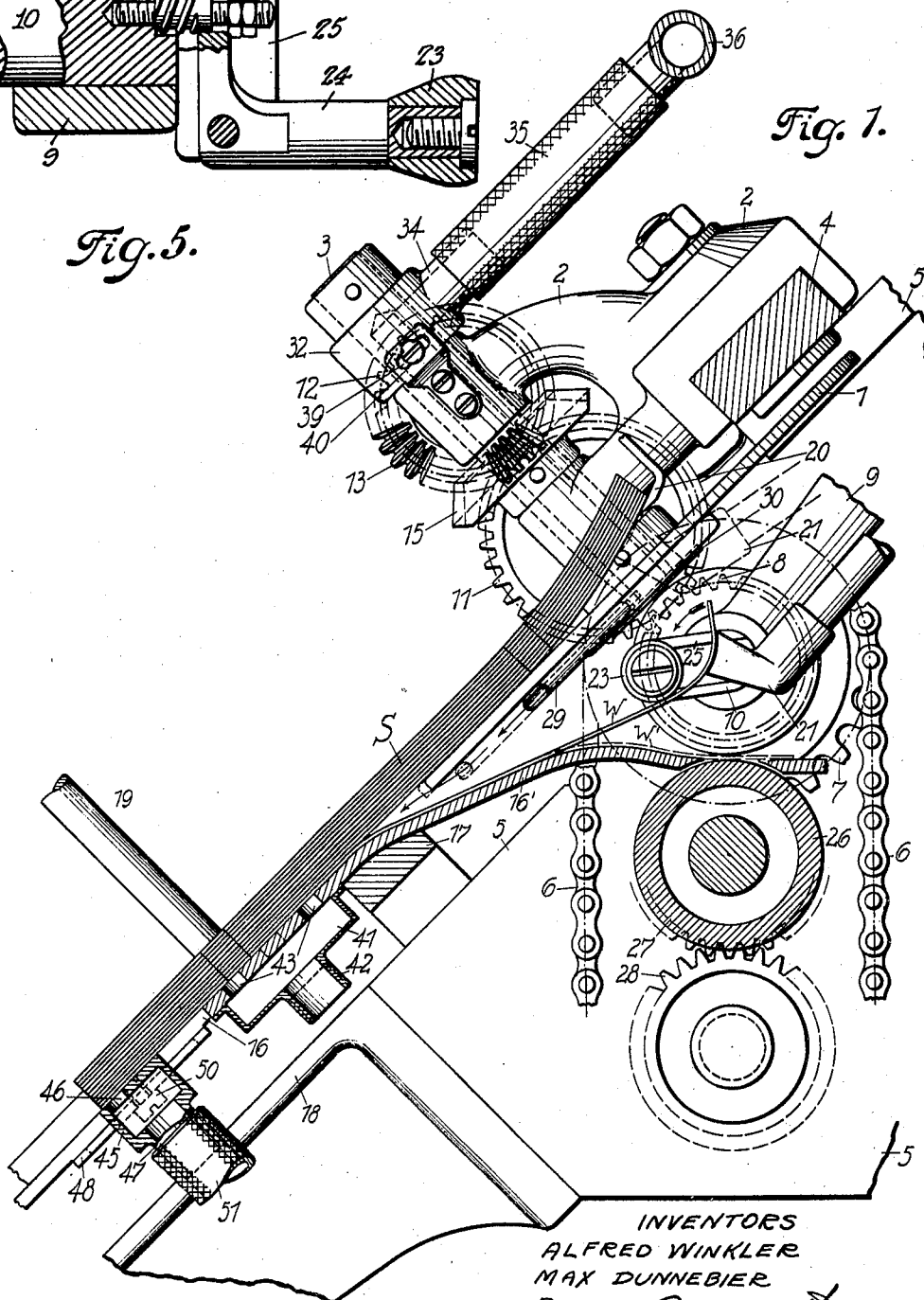


Fig. 5.



INVENTORS
ALFRED WINKLER
MAX DUNNEBIER

By S. P. Walchamper Atty

Aug. 13, 1935.

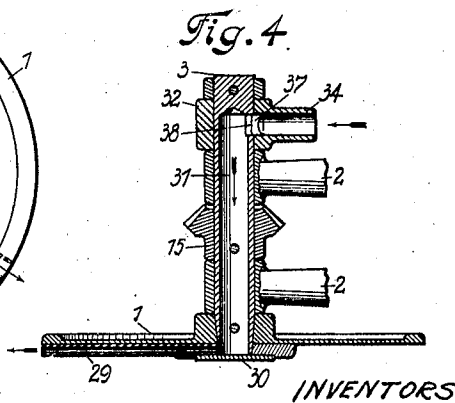
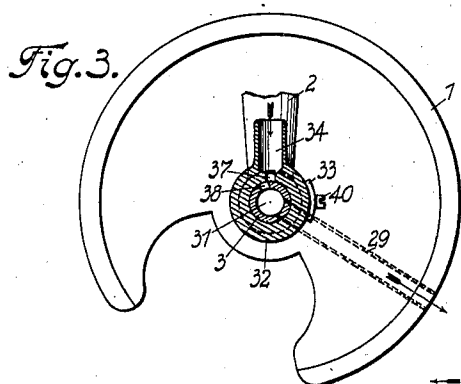
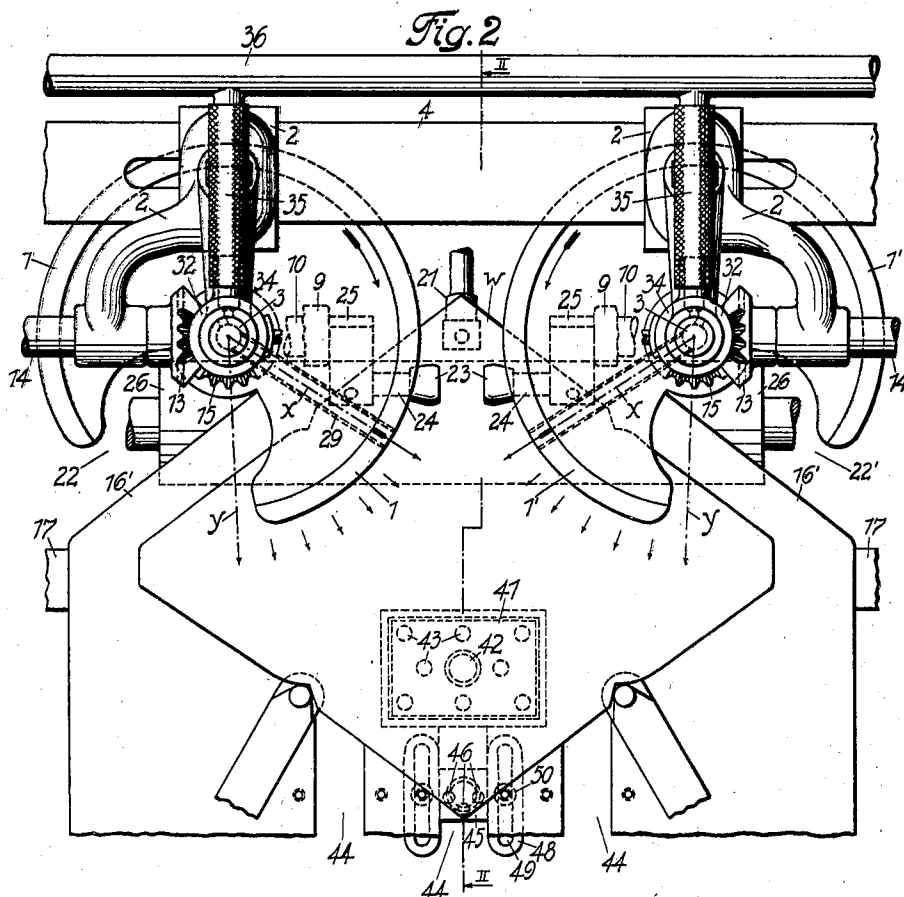
A. WINKLER ET AL

2,011,464

DEVICE FOR REMOVING FROM A PILE OF SHEETS THE SHEET LOWERMOST AT THE TIME

Filed March 20, 1934

2 Sheets-Sheet 2



INVENTORS
ALFRED WINKLER
MAX DUNNEBIER
By *J. P. Walcott* Att'y

UNITED STATES PATENT OFFICE

2,011,464

DEVICE FOR REMOVING FROM A PILE OF SHEETS THE SHEET LOWERMOST AT THE TIME

Alfred Winkler and Max Dünnebler, Neuwied,
GermanyApplication March 20, 1934, Serial No. 716,519
In Germany March 23, 1933

8 Claims. (Cl. 271—32)

The invention relates to a device for removing from a pile of sheets the sheet lowermost at the time. In the case of certain kinds of such sheet-removing devices it has in itself long been known to introduce compressed air, between the lowermost sheet to be removed and the rest of the pile, in order to do away with the pressure of the pile which acts on the lowermost sheet and causes a great deal of friction during its withdrawal. For example, the United States Patent specifications 1,834,565 and 1,945,248 relate to such sheet removing devices. The former is concerned with a so-called fold feeding apparatus in which the lowermost sheet of the pile is removed from the pile by means of a pair of rollers rotating in opposite directions and is simultaneously folded once. In this case the compressed air is blown from both sides of the pile into the space which is closed on all sides by the feed-rollers and the pile. The second of the devices mentioned above on the contrary removes the lowermost sheet of the pile, without simultaneously folding it, with the aid of a rotating roller which carries on its periphery a gripping device, which acts suctionally or otherwise and with which it first starts the separation of the sheet at its front edge, after which it then conveys the end of the sheet between itself and a counter-roller. Both rollers then jointly draw the sheet completely from under the pile, this being able to be effected either all at once or at intervals if the sheets are arranged in echelons under and behind one another. In this case the compressed air is blown from the front of the pile, where the separation of the sheet is started, between the sheet in the act of being removed and the rest of the pile.

The device according to the present invention is more particularly intended to render possible with an unrestricted action the introduction of compressed air between the sheet to be removed and the rest of the pile for the purpose of doing away with the pressure of the pile even in the case of such sheet-removing devices as those in which rotating feed-discs of known type are utilized. These feed discs serve as carriers of the portion of the pile which projects over a fixed pile-table and are provided with a recess through which the sheet of the pile lowermost at the time can pass with its front end, at which its detachment from the pile is started with the aid of a sucker or the like, so that this end of the sheet passes under the feed-discs, in which position it is then withdrawn from under the pile. Immediately after the passage of a sheet-end through the recesses in the feed-discs the latter

run with their tongues, which bound the recesses, under the rest of the pile again.

In the sheet-removing devices of this type in view of the absence of a space closed on all sides by the pile and the feeding means there cannot be employed currents of compressed air, which are introduced from the sides of the pile in accordance with the United States Patent specification 1,834,565; on the other hand the action of the compressed air, which is supplied from the front of the pile according to the United States Patent specification 1,945,248, is, when feed-discs are employed, extremely impaired, apart from the difficulty of accommodating the means necessary for the same. This is to be attributed to the circumstance that when feed-discs are employed the so-called edge of the bend about which the lowermost sheet at the time is bent before the commencement of its withdrawal proper and at which the compressed air penetrates between this sheet and the rest of the pile, is comparatively far from the front edge of the pile, in front of which the blast-nozzles for the supply of the compressed air must be situated. The compressed air must therefore pass along a path from the nozzles to its entrance between the lowermost sheet and the pile, which is so long that for by far the greatest part it blows ineffectively without materially relieving the lowermost sheet from the pressure of the pile. Above all, this defect cannot be avoided when compressed air is supplied from the front of the pile in accordance with the United States Patent specification 1,945,248 and when feed-discs are employed, if rectangular sheets are to be removed, in the direction of one of their edges, from the pile and fed forward or any such sheets at all as possess a front edge at right angles to the direction of feed. On the contrary, nozzles may be arranged according to the United States Patent specification 1,945,248, under some circumstances indeed, when sheets are fed in the direction of one of their diagonals, for example in the case of blanks for the manufacture of envelopes, in front of the side edges running from the tip obliquely backwards and in front of the bearing-elements of the feed-discs, which nozzles consequently are situated nearer to the said edge of the bend, but in this case also the accommodation of the blast-nozzles as well as of the air-supply members connected to said nozzles and particularly their adjustment, when there is a change as regards the shape of the sheets, presents difficulties. Moreover accessibility to the individual parts of the device is rendered difficult by such an arrangement of the blast-nozzles.

For the purpose of doing away with these defects the blast-nozzles, which introduce the compressed air between the lowermost sheet of the pile in the act of being removed and the pile are arranged, according to the present invention in the case of sheet-removing devices fitted with feed-discs which are of the kind and which act in the manner described, directly in or on the feed-discs, so that the blast-air has to flow only a short distance from the nozzle-mouth to its forcible entry into the pile at the edge of the bend, and this holds good for the treatment of sheets of all shapes to be met with, without a special adjustment for the individual sizes of the various shapes as regards the distance of the air-supply members from the edge of the bend of the sheet being necessary. In this manner the intended action of the compressed air is ensured to the maximum extent attainable even when feed-discs are employed. The direction of flow of the compressed air is at an angle to the direction in which the sheet is withdrawn, which is smaller than 45 degrees and which diminishes with progressive withdrawal. When the feed discs, as is preponderatingly the case, are in pairs, there is advantageously employed in combination with each of them a current of air passing in the said direction against the pile-support, so that the air-currents cross and oppose one another in a manner which is particularly favourable for their action.

The compressed air is according to the invention so distributed that during the rotation of the feed-discs the stationary surface of the pile-support within a sector is swept by compressed air, and the angle of the sector may at will be so selected that there results in the case of each shape of sheet to be operated upon the most favourable effect as regards the relief from the pressure of the pile.

Moreover, means for distributing the compressed air which enable the position of the entire surface of the sectors swept by the compressed air likewise to be varied to conform to the most favourable conditions at the time, are within the scope of the invention.

The subject-matter of the invention is moreover a device which facilitates the individual removal of the sheets from underneath the pile by making it difficult for the next sheet to be pulled away with it. This consists of a suction device which is built into the pile-table and which is adjustable to suit the various shapes of sheet, and which, as soon as the sheet which is running off has released the extreme edge of the next sheet, holds the latter fast by suctionally seizing it and so prevents it from being drawn with the sheet running off.

Finally, another feature of the invention is that in addition to the means which according to the invention are united with the feed-discs and which conduct the compressed air between the sheet in the act of being removed and the rest of the pile, another arrangement, which is well known per se, is provided, by means of which, when kinds of paper are being operated upon which render particularly difficult the individual removal of the sheets, a second current of compressed air can be directed through the pile-table against the under surface of the pile, which current causes the lowermost sheet itself to be lifted off the pile-table during its removal and which is therefore likewise freed from its friction with said table.

One embodiment of the invention is represented by way of example in the drawings.

Fig. 1 shows a vertical section through the entire sheet-removing device in the direction of withdrawal on the line II—II of Fig. 2, the pile of sheets itself being drawn in side elevation.

Fig. 2 a plan of the device as seen looking in a direction at right-angles to the pair of feed discs employed,

Fig. 3 a section, parallel to the plane of a feed-disc, through the compressed air distributing device,

Fig. 4 a vertical section through a feed-disc and its shaft with the distributing devices for the compressed air which are arranged thereon and also with its bearing-members and driving members, and

Fig. 5 is a part sectional plan to an enlarged scale showing one of the rollers 23 Figs. 1 and 2 and the means for mounting the same.

In the example illustrated in the drawings a sheet-withdrawing device of a type which is well known per se, is taken as a basis, a pair of feed-discs 1, 1' being employed. The bearings 2 for the shafts 3 of the feed-discs 1, 1' are adjustably arranged on the transverse rail 4, which is fixed on the two side-cheeks 5 of the device. The drive of each of the feed-discs 1, 1' (Fig. 2), which rotate in opposite directions indicated by the arrows, is effected from a suitable part of the machine by means of a chain 6. In Fig. 1 there are represented only the driving parts belonging to the feed-disc 1; those belonging to the feed-disc 1' are identical but however they are specially arranged. The chain 6 so drives the chain wheel 7 that the latter makes one complete revolution for each sheet removed. It is mounted, together with a toothed wheel 8, on the shaft 10, which runs in the side-cheek 5 at the corresponding side of the machine and in a bearing-arm 9. The toothed wheel 8 drives the toothed wheel 12 through the intermediate wheel 11 which runs loosely on a bolt carried by the side-cheek 5, which toothed wheel 12 is secured together with the bevel-wheel 13 on the shaft 14 (Fig. 2): the latter runs likewise in the side-cheek 5 at the corresponding side of the machine and in a lateral arm on the bearing 2. The bevel wheel 13 engages with a bevel wheel 15 of the same size which is secured on the feed-disc shaft 3. Since, as also is the case with the two bevel-wheels 13 and 15, the two toothed wheels 8 and 12 have the same number of teeth, the discs 1 and 1', like the chain-wheel 7, make one complete revolution for each sheet removed.

In the drawings it is assumed that the pile S consists of blanks, for the manufacture of envelopes, which are to be withdrawn individually from under the pile S in the direction of the diagonals connecting the points of their bottom flaps and closure flaps. The pile S rests with one part of its surface on the pile-table 16, which is arranged on the transverse rail 17 and a similar rail, which is not illustrated, connecting together the pair of brackets 18. Adjustable pile-stops 19 ensure the position of the pile S of sheets on the pile-table 16. The part of the pile S which projects beyond the starting-line of the bent portion 16' of the pile-table rests, in the manner which is evident from Fig. 2, on the feed-discs 1, 1', while the foremost tip of the pile is supported by the tongue 20 in a position in which it is bent upwards away from the feed-discs 1, 1'.

By means of the co-operative action, which is assumed to be well known, of the feed-discs 1, 1' 75

with the oscillatory sucker 21, which is arranged between them and which seizes the sheet lowermost at the time directly behind its tip and draws the latter off the supporting tongue 20, the portion of the lowermost sheet of the pile, which is resting on the feed-discs 1, 1' passes in the first place through the recesses 22, 22' in the feed-discs 1, 1' and under the latter, so that the sheet occupies the position indicated in Fig. 1 by *w*.

Thus the sheet is bent away from the rest of the pile about a line, the so-called edge of the bend, which is situated over the transverse rail 17 at that place at which also the bent portion 16' of the pile-table 16 starts. At this place the current of compressed air must penetrate between this sheet and the pile in order to do away with the pressure exerted by the pile on the sheet which is running off. It is evident that the compressed air if introduced according to the United States Patent specification 1,945,248 from the front of the pile up to this position had to traverse an unfavourably long open stretch. It is likewise evident that even the adjustable arrangement of blast-nozzles in front of the feed discs along the oblique front edges of the pile, which is possible only in the case of the removal of the sheet in the direction of a diagonal in accordance with the example illustrated, causes difficulties and renders access to the device difficult.

When the sheet has reached the position *W* shown in Fig. 1 its tip which is still held fast by the sucker 21 is seized by the rollers 23 of a pair of feed-fingers, which are mounted on the shafts 10 for the chain-wheels 7, which shafts are situated under the feed-discs 1, 1'. The shafts 10 rotate in the direction of the arrow so that the rollers 23 light from above on the tip of the sheet at both sides of the sucker 21 and in front of the latter and strip it from the sucker 21.

Each of the two rollers 23 is loosely revoluble on a bolt 24 which can be turned in such a manner in the part 25, which is fixed on the shaft 10 after the manner of a crank, that the rollers 23 can be moved radially with regard to the shaft 10. A spring which acts on the bolt 24 presses the latter and the roller 23, which is fixed on it, into an outer limiting position determined by a stop. When the rollers 23 leave the position shown in Fig. 1 and continue to rotate about the shafts 10 they lay the end of the sheet which has been stripped off from the sucker 21 in the first place on the upper bent end 16' of the pile-table 16 and then press it against the periphery of a roller 26, which is journaled in the side cheeks 5 perpendicularly under the shafts 10 of the feed-finger rollers 23. At the same instant this roller 26, which is driven at intervals—from a device, which is not illustrated—by means of a toothed wheel 27, which is mounted upon it and an intermediate toothed wheel 28, begins to make a partial revolution at substantially the same peripheral velocity as that of the feed-finger rollers 23, due to their rotation about the shaft 10, at the place at which they rest on the sheet. When therefore the feed-finger rollers 23 have pressed an end of the sheet on the counter-roller 26, the rotation of the rollers 23 about their bolts 24 ceases, in consequence of the counter-roller 26 revolving with them, as long as said rotation of the roller 26 continues. The sheet situated between the rollers 23 and the roller 26 is consequently seized positively and is drawn out under the pile *S* by the amount corresponding to the partial rotation of the roller 26. Then it

comes to rest in the position *w'* (Fig. 1) illustrated in dotted lines, until the end of the sheet following next is laid over it in the same manner, which end is then drawn out with it under the pile by the same amount. There arises in this manner from the sheets arranged in echelons one above and behind another a web of sheets, within which the edges of the individual sheets are a distance apart, measured in the direction of their motion, which corresponds with the amount by which the sheets are drawn out at the time. This so-called echelon-interval may, for example, when envelope blanks are being operated upon—which the work-pieces in the drawings are taken for granted to be—correspond to the width of the closure-flap gumming, so that the blanks arranged in echelons can be conducted from the withdrawing device directly to a spread-gumming device for the purpose of applying the closure-flap gumming.

In each case during the described withdrawal of a sheet under the pile compressed air is also supplied between the sheet in the act of being withdrawn and the rest of the pile in order to relieve said sheet from the pressure of the pile. In the case of the construction illustrated by way of example in the drawings the arrangement described below serves this purpose.

The feed-discs 1, 1' carry an air-supply pipe 29 on their under surface, which pipe opens into the free atmosphere at the periphery of the disc and produces the connection with a bore 31 in the feed disc shaft 3 which bore is below closed by means of a plate 30 and above does not pass completely through. On the upper end of said shaft a connecting piece 32 is arranged for the admission of the compressed air and said connecting piece is screwed fast on the bearing-member 2 by means of a plate 33. The union 34 of the connecting piece 32 is connected by means of a rubber tube 35 with the pipe 36, which is fed with compressed air from any source. The bore of the union 34 of the connecting piece 32 terminates at the feed-disc shaft 3 in a substantially rectangular slot 37. A similar slot 38 passes in the radial direction from the bore 31 in the feed-disc shaft 3 towards its outer surface. Consequently as long as during the rotation of the feed-disc shaft 3 the slot 38 in the latter is connected with the slot 37 in the connecting piece 32, the compressed air can pass from the supply pipe 36 through the rubber tube 35, the connecting piece 32 and the bore 31 of the feed-disc shaft 3 into the tube 29 fixed under each of the feed-discs 1, 1' in order to flow out of said tube 29 at the periphery of the disc. It is evident particularly from Figs. 2 and 3 that in this manner during the rotation of the feed-discs 1, 1' a sector can be swept by the compressed air flowing out of the tube 29, the area and angle of which can be adjusted to requirements at the time, by suitably choosing the width of the slots 37 and 38 in the connecting piece 32 and in the feed-disc shaft 3. In Fig. 2, in which only the lowermost sheet *w* of the pile is represented, while the feed-discs 1, 1', the feed-finger rollers 23 and the sucker 21 are represented in that position which they occupy when the withdrawal of the sheet under the pile begins, the sectors, swept by the compressed air, which result from the slots 37 and 38 being of the width assumed, are indicated by means of the small radial arrows; they are bounded by the radii *x* and *y* which are indicated by dots and dashes.

In order, according to the invention, also to be able to vary the position of the air-swept sectors to their full extent, the connecting piece 32 is

capable of being adjusted on the feed-disc shaft 3 by being twisted. For this purpose the plate 33 for securing it on the bearing member 2 is provided with a slot 39 through which its attachment-screw 40 passes. The yielding connecting tube between the connecting piece 32 and the air-supply pipe 36 renders possible this adjustment of the connecting piece 32, which of course even for a considerable variation in the position of the air-swept sectors requires to be made only within narrow limits.

Whereas, in this manner, when the position of the slot 38 in the feed-disc shaft 3 is fixed once for all relatively to the air-outlet tube 29 of the feed-discs 1, 1', the variation of the position of the air-swept sectors can be effected by adjusting the connecting piece 32, the adjustment of the feed-finger rollers 23 relatively to the feed-discs 1, 1' so takes place that in each case the flowing of the compressed air out of the tubes 29 on the feed-discs starts and stops at those instants at which also the drawing out from the pile of the sheet lowermost at the time commences and ends under the joint action of the feed-finger rolls 23 and their counter-roller 26.

It will be seen from Figs. 1 and 2 that with the aid of the described arrangement even in the case of the employment of feed-discs it is possible to supply the compressed air between the lowermost pile-sheet in the act of being removed and the rest of the pile, for the purpose of relieving the former from the pressure of the pile, at such a small distance from the edge of the bend situated above the transverse rail 17 that an absolutely certain action can be guaranteed in the case of all sizes of sheets coming into consideration.

In order to ensure that the sheet of the pile lowermost at the time shall be withdrawn separately by preventing the next sheet from being drawn with it, there is adopted in accordance with the invention the following arrangement:

In slots 44 in the pile-table 16 the hollow members 45 are so arranged that their upper surface lies in the plane of the table 16. In the surface of the suction-members 45 there are open the suction-openings 46 leading from their interiors, while the union 47 provided on their under surface serves for the connection to the suction pipe. Lateral plates 48 with slots 49 permit the suction-members 45 to be adjusted, in conformity with the sizes to be operated on at the time, by correspondingly shifting them in the slots 44. They are fixed with the aid of the screws 50. The union 47 is connected with a suction pipe, which is not illustrated, by means of the tube 51, which is represented broken off. The suction air is so controlled by means of an arrangement, which is of a well known kind and also is not illustrated, that the suction-action starts as soon as the lowermost sheet of the pile which is running off has sufficiently freed the openings 46 for the seizing of the edge of the next sheet and that it ends when the withdrawing movement of the sheet also ends. It is assumed in the drawings that only a single suction-member 45 is employed at the hind point of the pile S of blanks, but several of them may be accommodated in the slots 44 in the pile-table 16 and be utilized, in which case all are able to be connected to a common air-distributing device. The latter is also of particular value when operating on rectangular or such shapes as those having hind edges running transversely over the pile-table 16.

When special kinds of paper are being operated

upon, for example, pressed or hammered papers, which in consequence of their rough surface offer extraordinary resistance to withdrawal from under a pile, the introduction of compressed air between the sheet in the act of being withdrawn and the rest of the pile may not suffice under some circumstances for a removal which is free from objection. According to the invention there is consequently additionally provided another arrangement, which is well known per se, according to United States Patent specification 1,942,527 by means of which compressed air may moreover also be conducted under the under surface of the pile, that is also under the sheet to be removed, so that the latter is situated between two layers of air while being withdrawn from the pile. This additional arrangement consists of an air-chamber 41 arranged under the pile-table 16, which air-chamber can be connected by means of the union 42 to a compressed air conduit in case of need. The compressed air supplied then passes through the openings 43 in the pile-table 16 under the under surface of the pile S and in consequence of its sweeping through under the latter the friction which otherwise occurs between the sheet in the act of being drawn off and the pile-table 16, is also done away with.

Instead of the arrangements represented in the drawings, as a constructional example there may naturally be employed other suitable arrangements for obtaining in accordance with the invention, air-swept sector-surfaces and for varying the position of these sectors, which arrangements likewise are within the scope of the invention: likewise the fundamental principle of the invention is unaffected, whether the withdrawal of the sheets from under the pile is effected at intervals a web of sheets arranged in stepped relationship being formed, as is assumed in the example illustrated in the drawings, or whether said withdrawal is effected immediately completely, suitable devices being employed, what is of vital importance is solely the simultaneous employment of feed-discs of the kind described which are fitted according to the invention with blast-nozzles.

We claim:—

1. Means for removing from a pile of sheets the sheet lowermost at the time, comprising a machine-frame, a pile-table fixed on said frame and supporting on its hind upper surface a hind portion of the pile, one or more rotary feed-discs arranged with the upper surface substantially in the plane of the upper surface of the pile-table and supporting on said upper surface a front portion of the pile, means for mounting said feed-disc or feed-discs on the machine-frame, means for rotating said feed-disc or feed-discs, means for withdrawing the front portion of the lowermost sheet from the upper surface of the feed-disc or feed-discs and detaching said portion from the rest of the pile, means on the feed-disc or feed-discs for conducting a current of compressed air between said lowermost sheet, when the front portion of the same is withdrawn from the feed-disc or feed-discs, and the rest of the pile and means for removing the lowermost sheet from the upper surface of the pile-table and from under the rest of the pile.

2. Means for removing from a pile of sheets the sheet lowermost at the time, comprising a machine-frame, a pile-table fixed on said frame and supporting on its hind upper surface a hind portion of the pile, one or more rotary feed-discs

arranged with the upper surface substantially in the plane of the upper surface of the pile-table and supporting on said upper surface a front portion of the pile, means for mounting said feed-disc or feed-discs on the machine-frame, means for rotating said feed-disc or feed-discs, means for withdrawing the front portion of the lowermost sheet from the upper surface of the feed-disc or feed-discs and detaching said portion from the rest of the pile, a blast-pipe on each feed-disc for conducting a current of compressed air between said lowermost sheet, when the front portion of the same is withdrawn from the feed-disc or feed-discs, and the rest of the pile, means for conducting compressed air to each blast-pipe and means for removing the lowermost sheet from the upper surface of the pile-table and from under the rest of the pile.

3. Means for removing from a pile of sheets the sheet lowermost at the time, comprising a machine-frame, a pile-table fixed on said frame and supporting on its hind upper surface a hind portion of the pile, one or more rotary feed-discs arranged with the upper surface substantially in the plane of the upper surface of the pile-table and supporting on said upper surface a front portion of the pile, means for mounting said feed-disc or feed-discs on the machine-frame, means for rotating said feed-disc or feed-discs means for withdrawing the front portion of the lowermost sheet from the upper surface of the feed-disc or feed-discs and detaching said portion from the rest of the pile, a blast-pipe on each feed-disc for conducting a current of compressed air between said lowermost sheet, when the front portion of the same is withdrawn from the feed-disc or feed-discs, and the rest of the pile, means for conducting compressed air to each blast-pipe only while the blast-pipe is rotating through a part of each revolution and means for removing the lowermost sheet from the upper surface of the pile-table and from under the rest of the pile.

4. Means for removing from a pile of sheets the sheet lowermost at the time, comprising a machine-frame, a pile-table fixed on said frame and supporting on its hind upper surface a hind portion of the pile, one or more rotary feed-discs arranged with the upper surface substantially in the plane of the upper surface of the pile-table and supporting on said upper surface a front portion of the pile, means for mounting said feed-disc or feed-discs on the machine-frame, means for rotating said feed-disc or feed-discs, means for withdrawing the front portion of the lowermost sheet from the upper surface of the feed-disc or feed-discs and detaching said portion from the rest of the pile, a blast-pipe on each feed-disc for conducting a current of compressed air between said lowermost sheet, when the front portion of the same is withdrawn from the feed-disc or feed-discs, and the rest of the pile, means for conducting compressed air to each blast-pipe only while the blast-pipe is rotating through a part of each revolution, said air-conducting means comprising an axial tubular perpendicular shaft fixed on each disc and having an outlet to the blast-pipe on the disc and having an inlet, a compressed-air supply pipe on the machine-frame and a tubular connection between said pipe and said tubular shaft, said connection having an outlet intermittently registrable with said shaft-inlet and means for removing the lowermost sheet from the upper surface of the pile-table and from under the rest of the pile.

5. Means for removing from a pile of sheets the sheet lowermost at the time, comprising a machine-frame, a pile-table fixed on said frame and supporting on its hind upper surface a hind portion of the pile, one or more rotary feed-discs arranged with the upper surface substantially in the plane of the upper surface of the pile-table and supporting on said upper surface a front portion of the pile, means for mounting said feed-disc or feed-discs on the machine-frame, means for rotating said feed-disc or feed-discs, means for withdrawing the front portion of the lowermost sheet from the upper surface of the feed-disc or feed-discs and detaching said portion from the rest of the pile, a blast-pipe on each feed-disc for conducting a current of compressed air between said lowermost sheet, when the front portion of the same is withdrawn from the feed-disc or feed-discs, and the rest of the pile, means for conducting compressed air to each blast-pipe only while the blast-pipe is rotating through a part of each revolution, said air-conducting means comprising an axial tubular perpendicular shaft fixed on each disc and having an outlet to the blast-pipe on the disc and having an inlet, a compressed-air supply pipe on the machine-frame and an adjustable tubular connection between said pipe and said tubular shaft, said connection having an outlet intermittently registrable with said shaft-inlet and means for removing the lowermost sheet from the upper surface of the pile-table and from under the rest of the pile.

6. Means for removing from a pile of sheets the sheet lowermost at the time, comprising a machine-frame, a pile-table fixed on said frame and supporting on its hind upper surface a hind portion of the pile, one or more rotary feed-discs arranged with the upper surface substantially in the plane of the upper surface of the pile-table and supporting on said upper surface a front portion of the pile, means for mounting said feed-disc or feed-discs on the machine-frame, means for rotating said feed-disc or feed-discs, means for withdrawing the front portion of the lowermost sheet from the upper surface of the feed-disc or feed-discs and detaching said portion from the rest of the pile, a blast-pipe on each feed-disc for conducting a current of compressed air between said lowermost sheet, when the front portion of the same is withdrawn from the feed-disc or feed-discs, and the rest of the pile, means for conducting compressed air to each blast-pipe only while the blast-pipe is rotating through a part of each revolution said air-conducting means comprising an axial tubular perpendicular shaft fixed on each disc and having an outlet to the blast-pipe on the disc and having an inlet, a compressed-air supply pipe on the machine-frame and a flexibly adjustable tubular connection between said pipe and said tubular shaft, said connection having an outlet intermittently registrable with said shaft-inlet and means for removing the lowermost sheet from the upper surface of the pile-table and from under the rest of the pile.

7. Means for removing from a pile of sheets the sheet lowermost at the time, comprising a machine-frame, a pile-table fixed on said frame and supporting on its hind upper surface a hind portion of the pile, one or more rotary feed-discs arranged with the upper surface substantially in the plane of the upper surface of the pile-table and supporting on said upper surface a front portion of the pile, means for mounting

said feed-disc or feed-discs on the machine-frame, means for rotating said feed-disc or feed-discs, means for withdrawing the front portion of the lowermost sheet from the upper surface of the feed-disc or feed-discs and detaching said portion from the rest of the pile, means on the feed-disc or feed-discs for conducting a current of compressed air between said lowermost sheet, when the front portion of the same is withdrawn from the feed-disc or feed-discs, and the rest of the pile and means for removing the lowermost sheet from the upper surface of the pile-table and from under the rest of the pile and suctional means under the part of the pile-table under the hind edge of the pile for suctionally holding the hind edge of the sheet next above the lowermost sheet while the latter is being removed.

8. Means for removing from a pile of sheets the sheet lowermost at the time, comprising a machine-frame, a pile-table fixed on said frame and supporting on its hind upper surface a hind portion of the pile and having a plurality of compressed air openings in its hind portion, one or

more rotary feed-discs arranged with the upper surface substantially in the plane in the upper surface of the pile-table and supporting on said upper surface a front portion of the pile, means for mounting said feed-disc or feed-discs on the machine-frame, means for rotating said feed-disc or feed-discs, means for withdrawing the front portion of the lowermost sheet from the upper surface of the feed-disc or feed-discs and detaching said portion from the rest of the pile, means on the feed-disc or feed-discs for conducting a current of compressed air between said lowermost sheet, when the front portion of the same is withdrawn from the feed-disc or feed-discs, and the rest of the pile and means for removing the lowermost sheet from the upper surface of the pile-table and from under the rest of the pile and means under the pile table for conducting a current of compressed air through the compressed air openings in the hind portion of the pile table.

ALFRED WINKLER.
MAX DÜNNEBIER.