May 1, 1934. A. GAYLER 1,957,260

MACHINE FOR SEPARATING MACULATE PARTS OF SHEET PAPER

Filed April 12, 1932 7 Sheets-Sheet 1

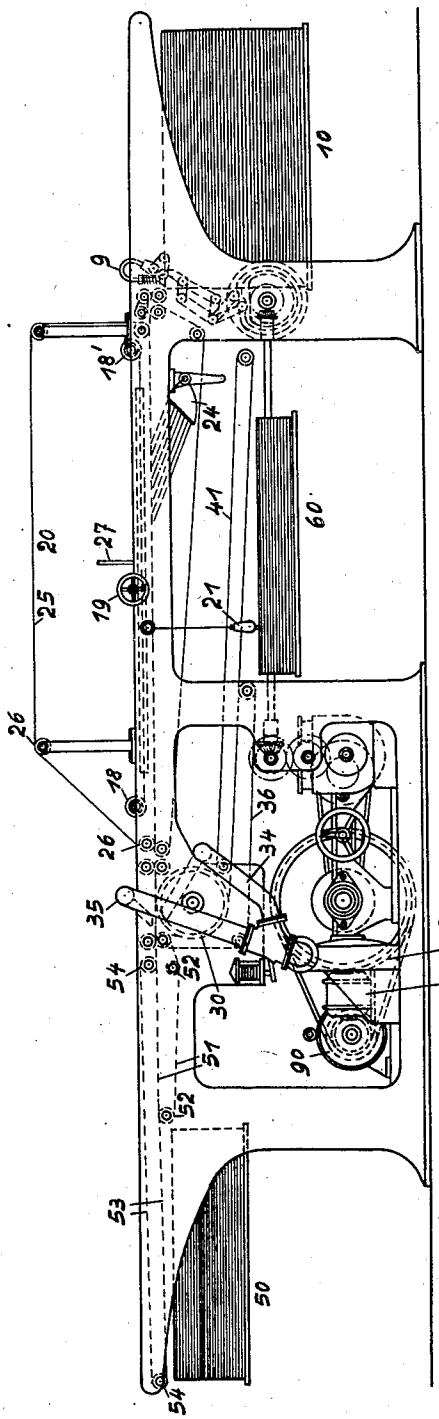


Fig. 1

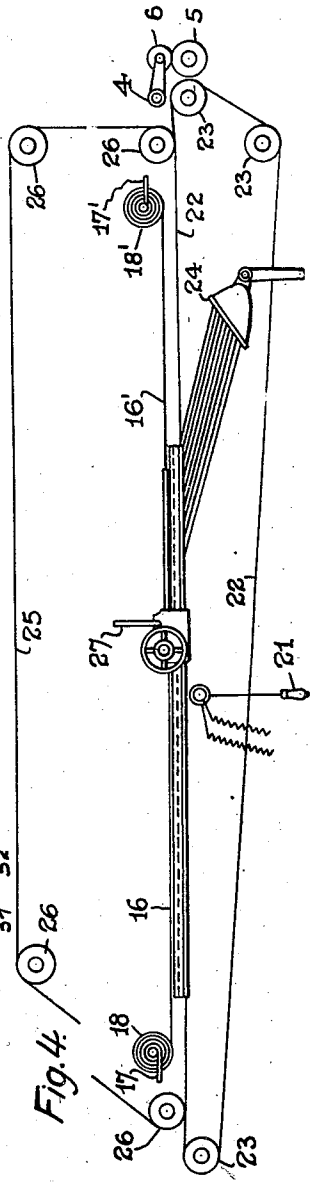


Fig. 4.

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MACHINE FOR SEPARATING MACULATE PARTS OF SHEET PAPER

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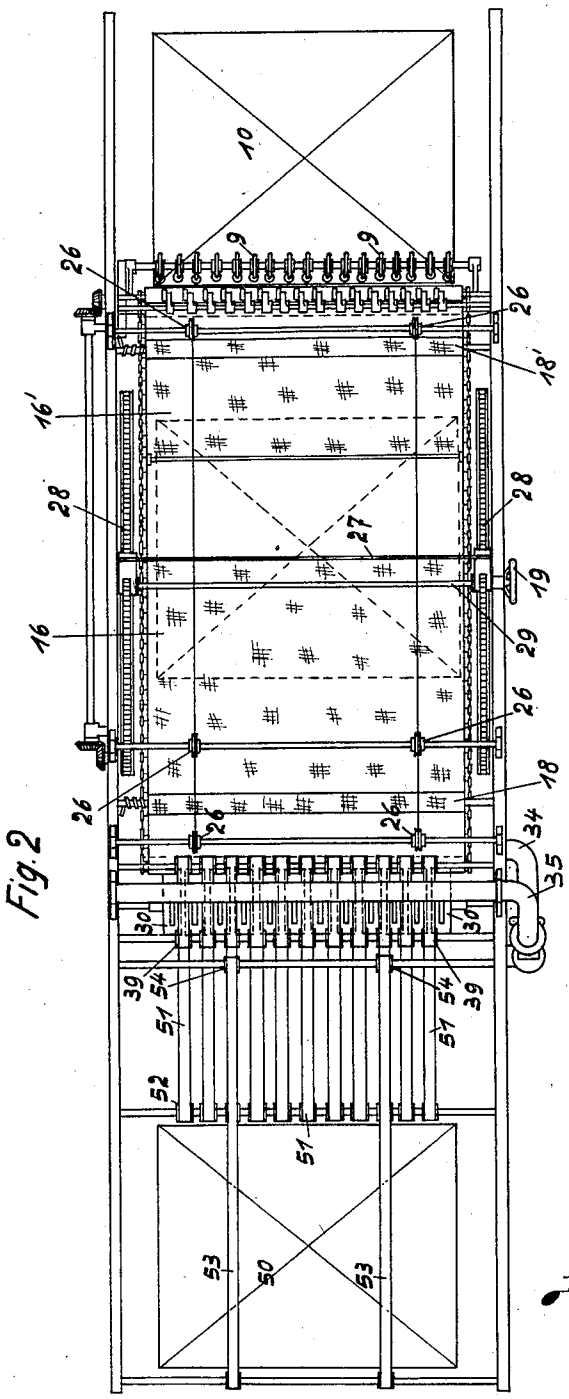


Fig. 2

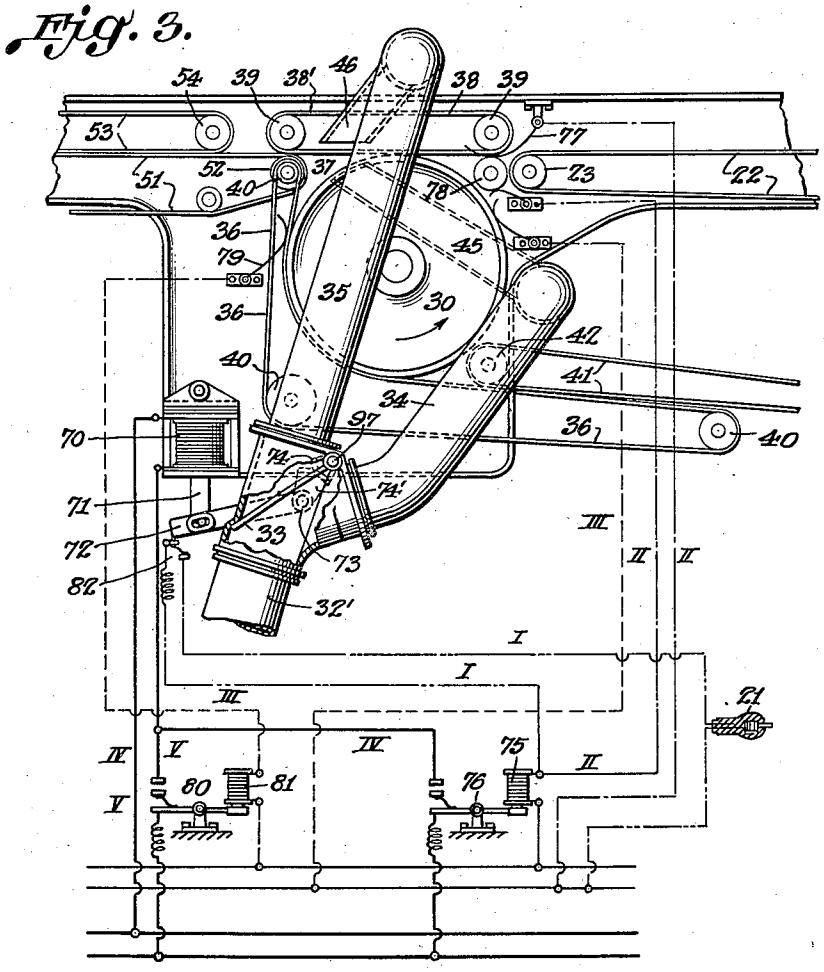
Inventor:

May 1, 1934. A. GAYLER 1,957,260

MACHINE FOR SEPARATING MACULATE PARTS OF SHEET PAPER

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Fig. 3.



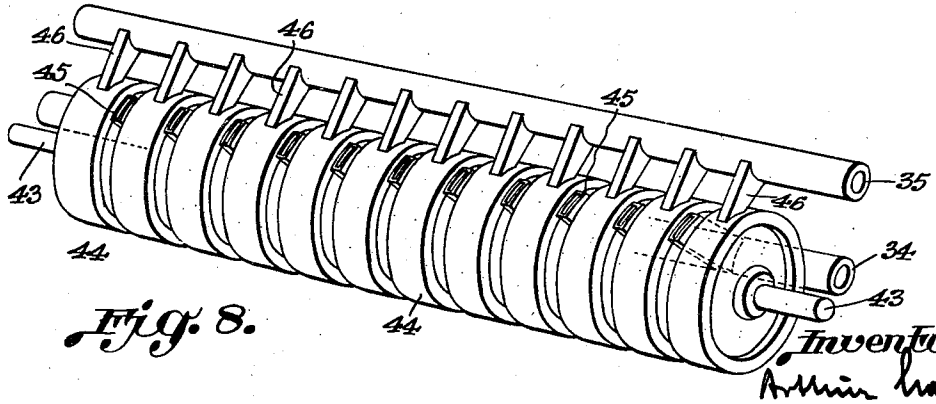


Fig. 8.

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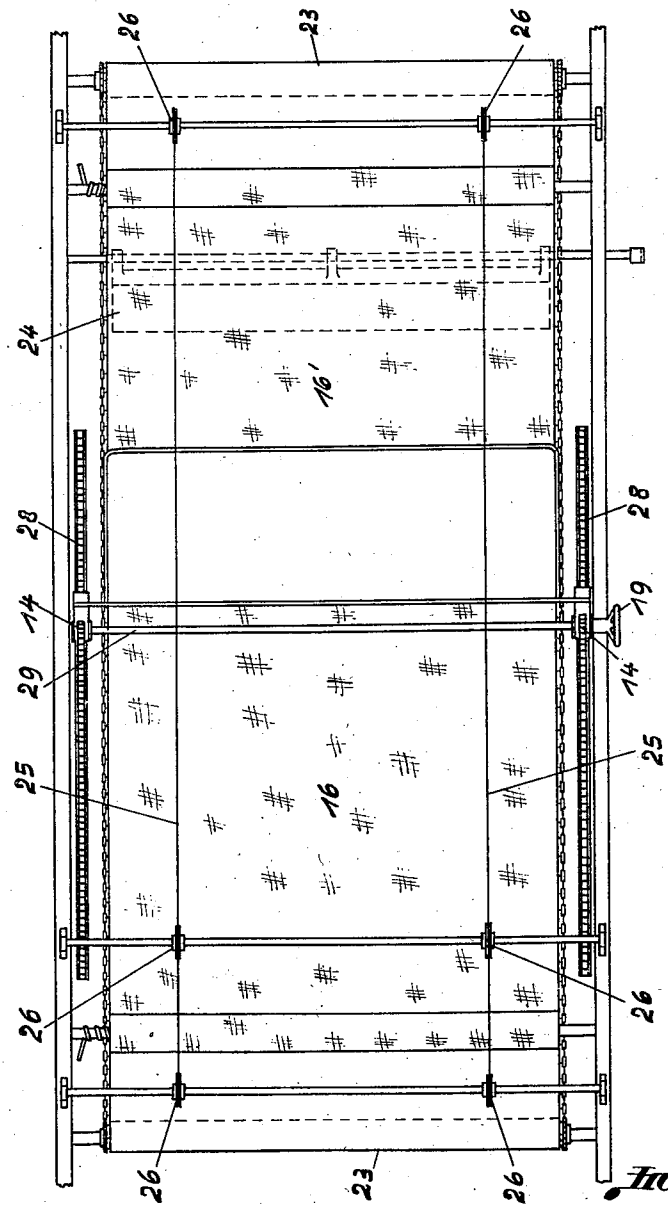


Fig. 5

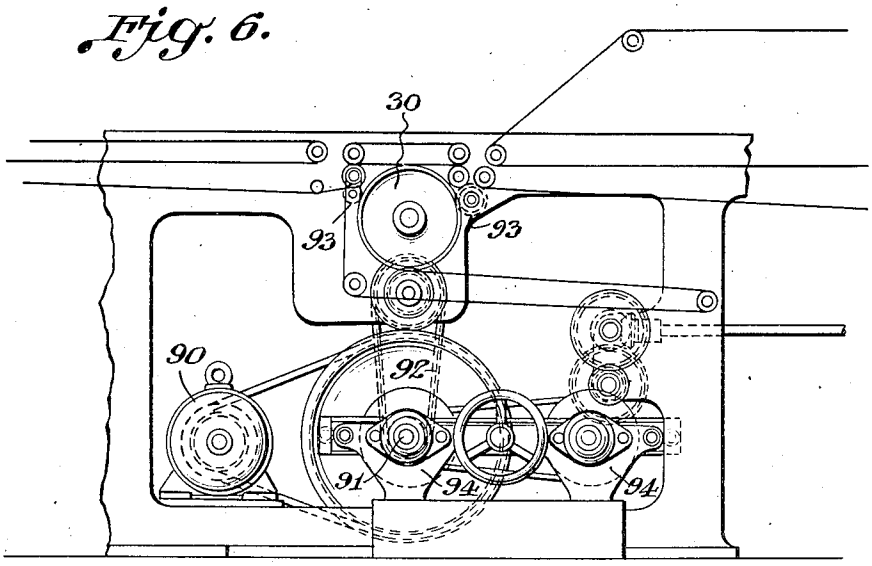
Inventor:

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Fig. 6.



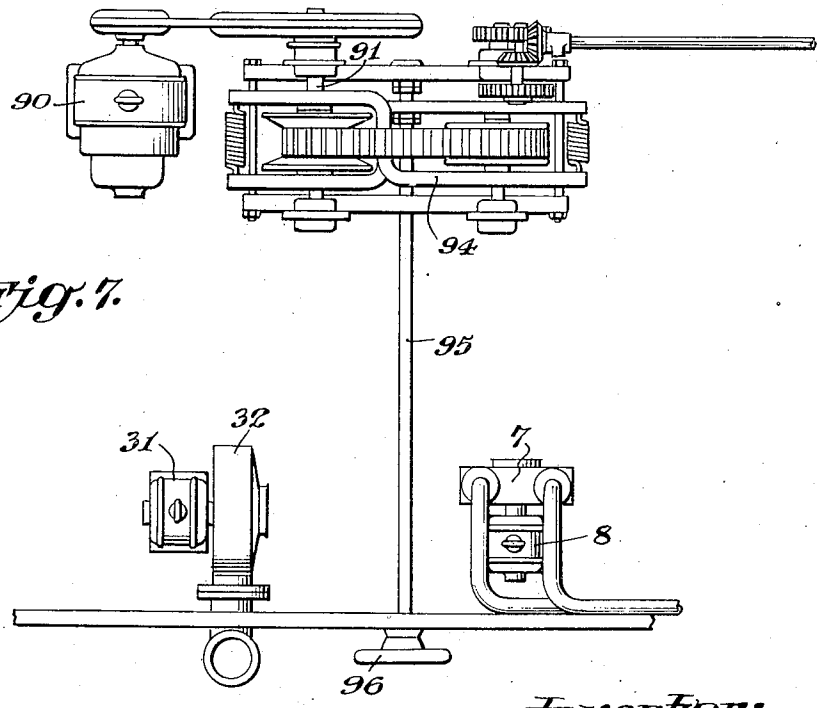


Fig. 7.

Inventor:
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Fig. 9

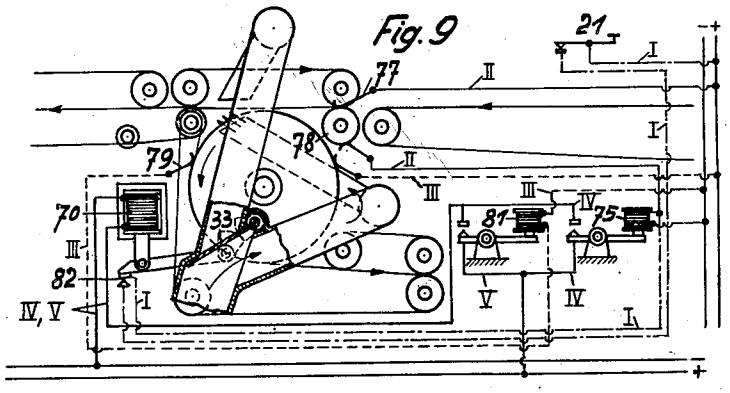


Fig. 10

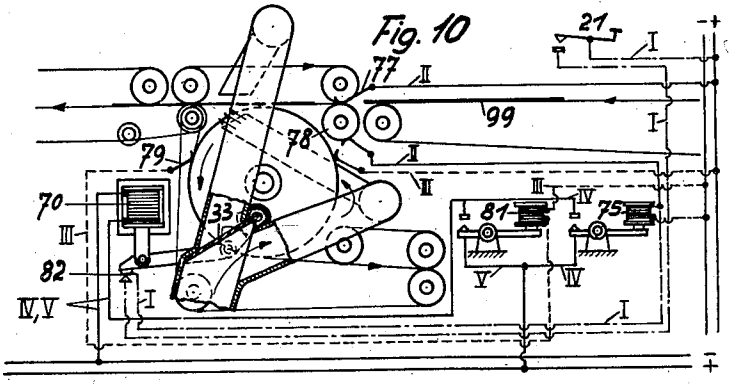
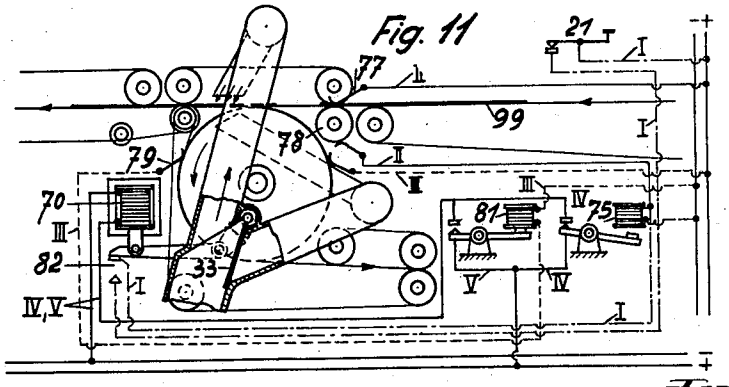


Fig. 11



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Fig. 12

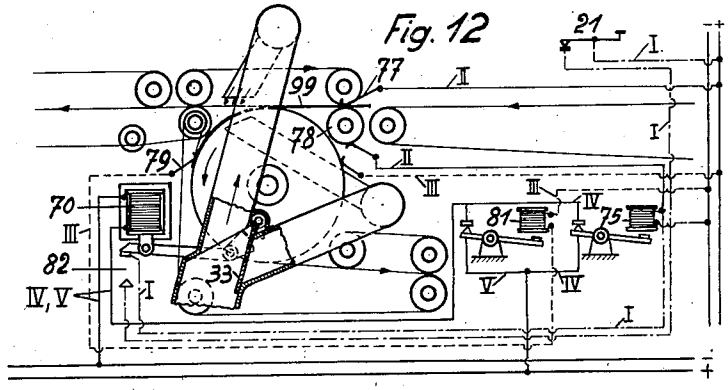


Fig. 13

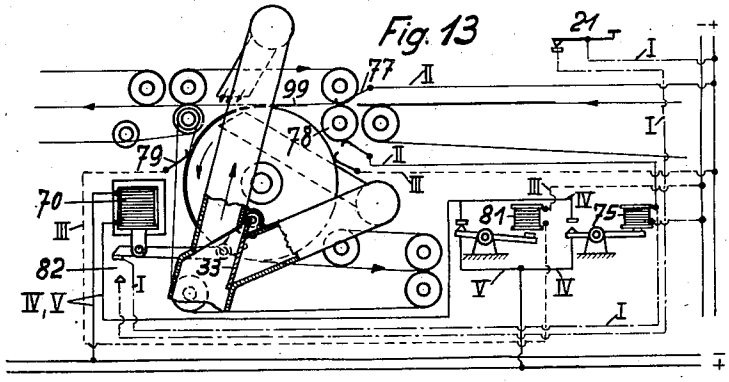
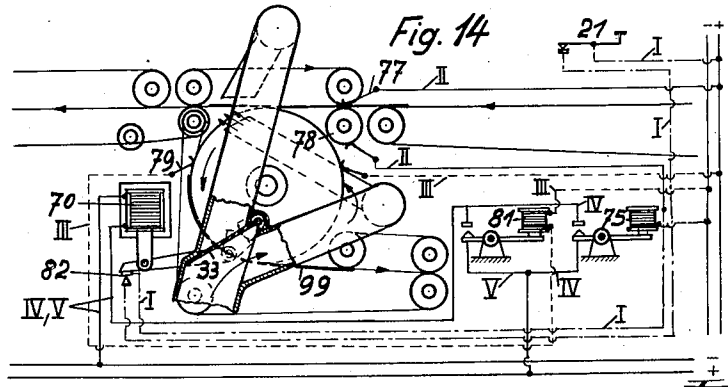


Fig. 14



Inventor:
Arthur Gayler

Patented May 1, 1934 1,957,260

UNITED STATES PATENT OFFICE

1,957,260

MACHINE FOR SEPARATING MACULATE PARTS OF SHEET PAPER

Arthur Gayler, Reutlingen, Germany

Application April 12, 1932, Serial No. 604,715
In Germany August 15, 1930

4 Claims. (Cl. 214—11)

The present invention relates to a machine for separating maculate parts of sheet paper from immaculate parts thereof. This separation has been done until now as a rule by hand.

An important feature of the invention resides in the provision of automatic means for conveying the goods to be examined from a source of supply over an inspection field to a place of deposit and of motor driven means controlled by the attendant for removing the maculate sheets.

Another important feature of the invention resides in the provision of independent means for controlling the speed of presenting the single sheets from the source of supply to the automatic conveying means.

Several other features of the invention, constructions and combinations of parts will be apparent from the following description and the annexed drawings, which show a preferred embodiment of the new machine.

In the drawings Fig. 1 is a side elevation of a machine constructed in accordance with my invention.

Fig. 2 is a plan of the machine shown in Fig. 1.

Fig. 3 is a side elevation of the separating means on a larger scale partly in longitudinal section, showing also a diagram of the electric controlling means.

Fig. 4 is a side elevation of the inspection field, and

Fig. 5 is a plan view of the parts shown in Fig. 4.

Fig. 6 is an elevation and

Fig. 7 a plan view of the principal parts of the motor drive and of the air supplying means of the machine.

Fig. 8 is a perspective view of the drum and of the upper pipe for the compressed air.

Figs. 9 to 14 show tracings of the circuits in different phases of the operation.

The machine comprises the following principal parts: means such as 10, 9 for stacking the sheets to be examined and for delivering them one by one to an inspection field, an inspection field 20 for the examination of the delivered single sheets, and means, such as the rotary drum 30 and cooperating air blowing nozzles for separating immaculate sheets from the maculate sheets. The means for stacking the paper sheets and for feeding the single sheets of the stack may be of a common construction and need no detailed description. For an understanding it will be sufficient to say that the feeding is effected by suction. The electromotor 8, see Figs. 6 and 7, drives the ventilator 7, which creates the vacuum. A swinging mouth 9 connected by pipes or hoses to the ventilator lifts the upper sheet of the stack 10 every time and introduces it between the feeding roll 5 and the cooperating roll 6 pivoted on the axis 4. Sheet lifting means are well known to those familiar with the art, but for the sake of clearness the U. S. Patent Letters No. 1,468,754 of Walter H. Smith and the German Patent Letters No. 519,141 of Walter Rockstroh are referred to.

The sheet fed by the rolls 5, 6 comes on the endless transparent band 22 running over the rolls 23, see Figs. 4 and 5. Endless guide-threads 25 moving over rolls 26 keep the sheet down on the band 22. Underneath the upper part of the band 22 there are arranged one or several sources of light which is shining through the band and the paper thereon and enables the observer to distinguish the immaculate sheets from the maculate ones.

The extent of the transparent part of the band may be limited by nontransparent covers. To this end there is provided a nontransparent cover 16 one end of which is fastened to a movable alidade 27 and the other end of which is fastened to a roll 18. A spring 17 tends to turn the roll 18 and to tension the cover 16. The position of the alidade 27 may be adjusted in the direction of feed by means of the hand wheel 19 and the shaft 29 journaled to move with the alidade. The toothed wheels 14 keyed to the shaft 29 mesh with the toothed bars 28 fastened to the machine-frame. A second nontransparent cover 16' is connected at one end to the alidade by chains or the like and at the other end to the roll 18' provided with the spring 17' which tends to turn the roll 18' and to tension the cover 16'. The attention of the observer is thus concentrated to a limited surface, while the purpose of the adjustment of the alidade will be discussed later on.

The sheet leaving the transparent band 22 is at first taken hold of by the roll 78 and the endless belts 38 running over the rolls 39, and then by the latter belts and the drum 30, see Fig. 3. The sheet passing the contact line between the belts 38 and the drum 30 enters into the triangular room 37 confined between the drum 30, the belts 38, and the upper part of the belts 36 running over the rolls 40. Now means are provided to lead the sheet through the room 37 in the straight line of feed and to bring it by means of the endless belts 51 and 53 running over the rolls 52 or 54 respectively upon the pile 50, which is the pile of the immaculate sheets; or to divert

the sheet in the said trangular room out of its straight feed line downward and to bring it by means of the belts 36 and the endless belts 41 running over the rolls 42 upon the pile 60, which is the pile of maculate sheets.

I will now describe these diverting means which are an essential feature of my invention. The drum designated as a whole by the numeral 30 does not form a continuous cylinder. Moreover it consists of a plurality of sheaves or discs 44 fastened apart from each other on the shaft 43 to form gaps between them, see Fig. 8. A series of air blowing nozzles 46 engages between the belts 38 and is directed against the circumference of the sheaves, while a second series of nozzles 45 project into the gaps between the sheaves and blow jets of air in a direction away from the said circumference against the belts 38. Normally the nozzles 45 are in operation to keep the sheet in contact with the belts 38 so that the sheet may travel the straight way to the pile 50. But whenever the attendant detects a maculate sheet he is able to stop the air supply to the lower nozzles 45 and to bring the upper nozzles 46 into operation in order to push the sheet down so that it is seized by the belts 36 and the drum 30 and then by the belts 41 to be deposited on the pile 60. The nozzles 45 are branched off from the pipe 34 and the nozzles 46 are branched off from the pipe 35. The air is compressed in the ventilator 32 driven by the electromotor 31 and is led by the conduit 32' to the pipes 34, 35. By means of the valve 33 fastened to the axis 97 the air can be controlled to flow into the pipe 34 or into the pipe 35.

The movement of the valve 33 is effected by electrical means. To the axis 97 is keyed the toothed segment 74 meshing with the like segment 74' of the lever 72 pivoted on the shaft 73. The lever 72 is connected to the armature 71 of the electromagnet 70 which can be excited by the strong current IV or V. The circuit of the current IV is closed by the relay 76 and that of the current V by the relay 81.

The relay 76 is operated by the electromagnet 75 excited by the currents of the circuits I and II. The circuit I is controlled by the hand-operated interrupter 21, while the circuit II is controlled by the interrupter 77 in contact with the metallic roller 78 when there is no sheet thereunder. The electromagnet 75 is therefore not excited and the relay 76 is closed only when both circuits I and II are interrupted. Every sheet interrupts the contact between the parts 77, 78, but the electromagnet 75 is deenergized only when the interrupter 21 is switched out too. This is done by the attendent whenever he observes a maculate sheet. On the other hand even if the switch 21 has been prematurely operated by the attendant, that is to say when the passing sheet has not yet reached the sliding contact 77, the electromagnet 75 is not deenergized.

The electromagnet 70, when energized by the current IV, operates the valve 33 to allow the compressed air to pass through the pipe 35 to the nozzles 46 and to divert the maculate sheet down into the room 37 so that the sheet is seized by the belts 36. The lifted armature 71 of the electromagnet 70 disconnects the contact 82 and interrupts the circuit I even if the attendent is prematurely switching in again the interrupter 21.

When the maculate sheet leaves the contacts 77, the electromagnet 75 becomes again energized and the relay 76 is opened. Notwithstanding the electromagnet 70 does not cease to keep the valve 33 open to the pipe 35 until the maculate sheet has not fully disappeared from the room 37. To this end there is provided a circuit V which is parallel to the circuit IV and is likewise adapted to excite the electromagnet 70 when it is closed by the relay 80. The latter is associated to the electromagnet 81 energized by the current III so long as the contact 79 is in immediate touch with the drum 30. But as soon as the maculate sheet enters underneath this contact and the latter interrupts the circuit III, the electromagnet 81 remains deenergized and the relay 80 closes the circuit V exciting the electromagnet 70, even when the circuit IV is already interrupted by the relay 76.

The drive of the drum 30 of the several conveyor belts, and of the swinging lifting device 9 for presenting the single sheets from the stack 10 is derived from the electromotor 90. The electromotor transmits its rotation to the shaft 91 which drives by means of the belt 92 the drum 30. The conveyor belts are driven by several gears 93 the movement of which is also derived from the shaft 91. On the other hand the shaft 91 drives by means of a well known gear 94 allowing an infinite variation of the speed the device 9. Such a gear is for instance shown and described in the U. S. Patent Letters No. 1,396,168 of Heinrich Friedrich Danger, dated Nov. 8, 1921. Thus the time of succession of the single sheets on the transparent band 22 and their distance from each other on the conveyors may be controlled independently from the speed of the conveyors. The alidade 27 is so adjusted that the distance between it and the contacts 77, 78 is not greater than the length of one sheet plus the distance between two sheets. If the observer detects a maculate sheet between the two covers 16 and 16' he operates the interrupter 21 just in the moment when the sheet has passed the alidade 27. Now the maculate sheet is the next which enters underneath the contact 77, 78, it thus operates the removing means and is then removed.— As the maculate sheet has disappeared under the alidade 27 or immediately thereafter the front margin of the maculate sheet interrupts the sliding contact 77, 78. The winding 75 is now not inducted and the relay 76 closes the circuit IV for the actuation of the electromagnet 70 which operates the valve 33 so that the compressed air blows from above. Simultaneously the electromagnet 70 opens the interrupter 82. All these operations are effected in the interval of about one second. As the observer ceases to operate the interrupter 21, the relay 76 remains in the same position in a non-inducted condition as both circuits of the winding 75 are interrupted, the one by the interrupter 82 the other by the sliding contact 77, 78. Thus the maculate sheet is blown into the opening 37 by the upper nozzles of the compressed air and is removed between the drum 30 and the belt-conveyor 36.

Before the rear margin of the sheet leaves the sliding contact 77, 78, the front-margin is yet interrupting the sliding contact 79, so that the relay 80 closes the circuit V connected in parallel with the circuit IV. Therefore when the rear-margin of the sheet leaves the sliding contact 77, 78 the circuit II inducts the winding 75 and the relay 76 interrupts the circuit IV of the electromagnet. But the interruption of the circuit IV does not affect the magnet and the valve as there flows a current in the parallel circuit V.

Only after the removed sheet has passed also the sliding contact 79, the winding 81 is again

inducted and the relay 80 interrupts the parallel circuit V. Now the electromagnet 70 is no more inducted and the valve is removed and the interrupter 82 is closed. The circuit I too is again closed and all devices are ready for the next removing process. The removed sheet is stacked in the piling station 60.

Figs. 9 to 14 illustrate detailed tracings of the circuits in different phases of operation of the machine and contribute also to a better understanding of the invention. Fig. 9 shows the tracing of the circuits in the normal working while immaculate sheets are passed therethrough. Fig. 10 shows the tracing of the circuits after the circuit I has been interrupted by means of the interrupter 21 operated by the attendant who detected a maculated sheet; the magnet 75 influenced by the circuits I and II is yet inducted by the latter circuit so that no further change in the tracing is to be seen; in the next moment the sheet 99 has already interrupted the contact 77, 78. Until this moment the attendant had to keep the interrupter 21 in the interrupted position. Both circuits I and II being interrupted no current flows through the magnet 75. This causes the circuit IV to become closed, the magnet 70 to be inducted, the valve 33 to be turned and the contact 82 to be opened. The attendant may now release the interrupter 21 as the circuit I remains interrupted. According to Fig. 12 the passing sheet interrupts the contact 79, whereupon the circuit III is interrupted, no current flows through the magnet 81, and the circuit V is closed, which has the same effect as the previously closed circuit IV. According to Fig. 13 the sheet has passed the contact 77, 78. The circuit II is closed, the magnet 75 is inducted and the circuit IV is interrupted. But the magnet 70 remains inducted by the circuit V. According to Fig. 14 the sheet has also passed the contact 79, the circuit III is closed, the magnet 81 is inducted, and the circuit V is interrupted. Therefore no circuit flows through the magnet 70, the valve is moved back, and the current I is finally closed by the contact 82 the tracing being now the same as shown in Fig. 9.

The machine operates as follows: the sheets to be sorted are stacked on the piling station 10. The suction-device 9 takes one sheet after the other from the stack and delivers it to the inspection-band 22. There the sheets are examined by the observer. The sheet held to be immaculate is allowed to pass. It is conveyed to the drum. In the room 37 it is held against the belts 38 by the compressed air blowing from below. It is then conveyed to the piling station 50. If the observer detects a maculate sheet he needs only to operate the interrupter 21 after the sheet has passed under the alidade 27.

It will be understood that the invention is not limited to the exact embodiment herein illustrated and described. Many modifications and changes can be made by persons skilled in the art without departing from the spirit of the invention.

The arrangement may be also made in such a manner that the maculate sheets are stacked on the piling station 50 and the immaculate sheets on the piling station 60 are turned upside down so that they—if there is necessary an examination of both sides of the sheets—may be removed from the piling station 60 and stacked again in the feeding station 10 for examination of their other side without the necessity of turning the total stack.

For the examination of both sides of the sheets there may be also combined two machines constructed in accordance with my invention with the modification that the second machine has no feeding apparatus 9 and joins the belt-conveyors 36 and 41.

All such and other modifications and changes are considered to be within the spirit of the invention.

What I claim is:

1. A machine for separating maculate parts of paper sheet from immaculate parts thereof, comprising in combination an inspection field, a source of supply, a place of deposit, motor driven means for conveying the sheet from a source of supply over the inspection field to a place of deposit, motor driven means for removing parts of the sheet out of the conveying path, and means controlled by the attendant for operating the removing means, these controlling means consisting of an electromagnet connected to the means operating the removing means, an electric relay for closing the current of the electromagnet and bringing the removing means in operative position, two windings on the relay, an interrupter in one of the windings operated by the attendant and an interrupter in the second winding operated by the conveyed sheet.

2. A machine for separating maculate parts of paper sheet from immaculate parts thereof, comprising in combination, an inspection field, a source of supply, a place of deposit, motor driven means for conveying the sheet from the source of supply over the inspection field to the place of deposit, a rotary drum between the inspection field and the place of deposit composed of sheaves over which the sheet is conveyed, fixed nozzles above the sheaves and the conveyed sheet, fixed nozzles between the sheaves and underneath the conveyed sheet, a source of compressed air, and means controlled by the attendant to direct the compressed air to the upper or to the lower nozzles.

3. A machine for separating maculate parts of paper sheet from immaculate parts thereof, comprising in combination, an inspection field, a source of supply, a place of deposit, motor driven means for conveying the sheet from a source of supply over the inspection field to a place of deposit, motor driven means for removing parts of the sheet out of the conveying path, and means controlled by the attendant for operating the removing means, these controlling means consisting of an electromagnet connected to the means operating the removing means, an electric relay for closing the current of the electromagnet and bringing the removing means in operative position, two windings on the relay, an interrupter in one of the windings operated by the attendant, an interrupter in the second winding operated by the conveyed sheet, and a further interrupter in the first winding operated by the operative electromagnet while in removing position.

4. A machine for separating maculate parts of paper sheet from immaculate parts thereof, comprising in combination, motor driven means for automatically conveying the sheet from a source of supply to a place of deposit, motor driven means for removing parts of the sheet out of the conveying path, and means controlled by the attendant for operating the removing means, these controlling means consisting of an electromagnet operatively connected to the said removing means, an electric relay for closing the current

of the electromagnet and bringing the removing means in operative position, two windings on the relay, an interrupter in one of the windings operated by the attendant, an interrupter in the second winding operated by the sheet while in the conveying path, a third interrupter in the first winding operated by the operative electromagnet while in removing position, and a further interrupter operated by the part of the sheet removed out of the conveying path, and a second electric relay associated to the last named interrupter for maintaining the closed current of the electromagnet and the operative position of the removing means, when the first relay interrupts the current of the electromagnet.

ARTHUR GAYLER.