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SEPARATING DEVICE FOR SHEET FEEDING APPARATUS

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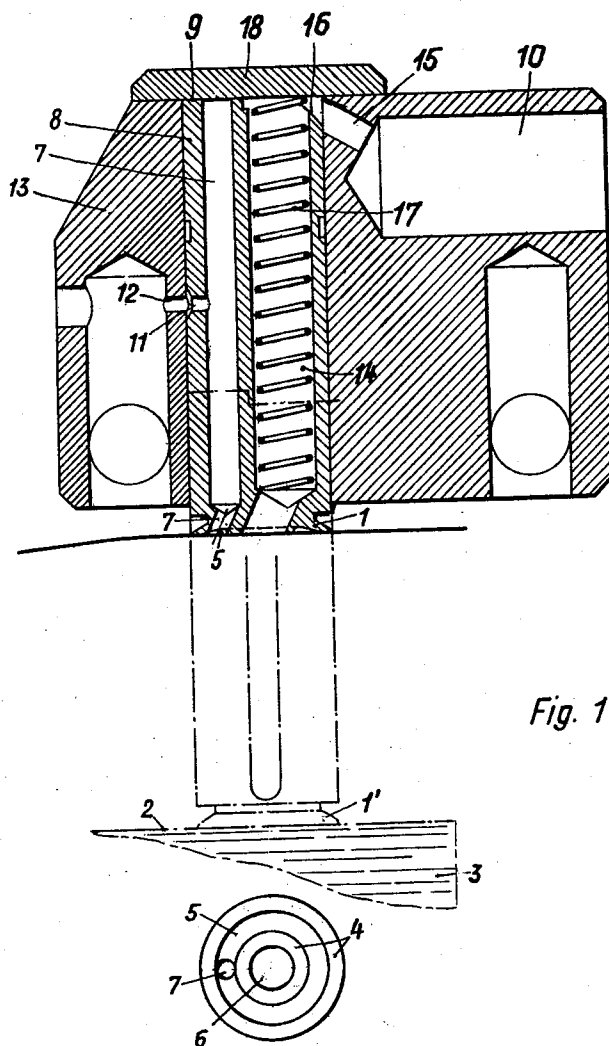


Fig. 1

Fig. 2

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SEPARATING DEVICE FOR SHEET FEEDING APPARATUS

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This invention relates to a separating device with a suction nozzle for detaching sheets of paper, cardboard, and the like, in sheet feeding apparatus. Separating devices are known in which the suction cup lowered on to the top sheet of a pile is disposed at the end of a piston which is provided with a longitudinal bore and which, after the opening of the suction cup has been closed by the sheet adhering thereto, is lifted together with the adhering sheet by the suction action on the piston.

In these circumstances, the problem is to reduce the suction effect in the lifted position to an extent such that while the reduced suction still holds the piston with the suction cup in its raised position, the sheet can nevertheless be easily detached from the suction cup in this position. The correct reduction of the suction causes considerable difficulty in practice, especially when conditions have to be changed for the purposes of sheets of different thicknesses and weights.

The invention solves this problem in that the under side of the suction cup coming into contact with the uppermost sheet has at least two suction zones separate from one another, and from each suction zone a separate longitudinal bore is taken through the piston, and that control means are provided which, towards the end of the piston stroke, shut off automatically at least from one of the suction zones the suction air which during the piston stroke acts on all the suction zones in the first instance.

The suction zone on which the suction air continues to act after the completion of the piston stroke preferably has a smaller area than the other zone or zones. In one advantageous embodiment, the smaller suction zone is situated in the centre of the suction cup and another larger zone is disposed in the form of a ring around said smaller suction zone. In this way it is easily possible to make the suction cup surface which is shut off from the suction air towards the end of the piston stroke five or six times as large for example as the central circular suction surface.

The invention renders it possible for all the suction zones of the cup to be subject to the full suction effect when the suction cup touches the sheet to be separated and on the lifting of this sheet, while the suction effect on the sheet is greatly reduced at the end of the stroke so that the sheet can easily be removed from the suction cup in the raised position, even when the suction effect on the still operative smaller zone of the suction cup is not shut off. The area of this suction zone may be so dimensioned that the adhesion of the sheet effected over its surface does not appreciably prevent the sheet from being removed, and this is of great practical importance especially in the case of the rapid feeding of sheets for high-speed processing machines, such as folding machines. Moreover, the suction air acting on the smaller suction zone can be throttled on the removal of the sheet.

When the suction effect on the large-area zone of the suction cup is shut off, venting of this zone is advantageously effected simultaneously.

Further features of the invention will be apparent from the following description of the exemplified embodiment shown in the accompanying drawings. This exemplified embodiment illustrates a pneumatic separating device with a piston, at whose end is disposed a suction cup having two suction zones of different sizes. In the drawings:

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FIG. 1 is a side view of the separating device showing the two end positions of the piston, with a vertical section through the upper part of the device.

FIG. 2 shows the underside of the suction cup.

On its underside 4 coming into contact with the uppermost sheet 2 of a paper pile 3, a suction cup 1 has two recesses, of which one annular recess 5 surrounds a central recess 6, the area of which is considerably smaller. From the annular recess 5 a bore 7 leads axially through the piston 8 of the separating device to the upper end face 9 of the piston, so that in the raised end position of the piston 8 the bore 7 is completely shut off from a suction line 10 by the contact of the edge of the bore against a cover 18 of a guide housing 13 wherein the piston 8 is reciprocable. In this position, a transverse bore 11 of the piston coincides with a bore 12 in the guide housing 13 of the piston, so that the annular suction recess 5 is vented in this position and cannot exert any adhesion effect on the sheet, which is held by suction only on the small central recess or suction area 6.

From this suction area 6 another axial bore 14 likewise leads to the upper end of the piston 8. This bore 14 is not completely shut off in the end position illustrated, however, but remains in communication with the suction line 10 by way of a duct 15, the cross-section being reduced, however, by the edge part 16 of the piston and the suction effect accordingly throttled.

A piston restoring spring 17 is disposed in the bore 14. I claim:

1. In sheet feeding apparatus, a suction nozzle for detaching individual sheets from a pile of sheets, said nozzle comprising a reciprocable piston defining a first longitudinal bore, a suction cup disposed at the end of the piston and in communication with said bore to constitute a first suction zone in said cup, the piston defining at least one other longitudinal bore in communication with said cup to constitute another suction zone in said cup separate from the first suction zone, means for applying suction to all said bores and corresponding suction zones, and control means automatically shutting off the suction from all but one of said zones towards the end of the stroke of the piston.

2. The suction nozzle in the sheet feeding apparatus of claim 1, wherein there are two of said suction zones in the suction cup, one of said zones having an area many times greater than that of the other zone.

3. The suction nozzle in the sheet feeding apparatus of claim 2, wherein the smaller one of said zones is centrally disposed in said suction cup while the larger zone forms an annulus around said centrally disposed zone.

4. The suction nozzle in the sheet feeding apparatus of claim 1, wherein said suction control means comprises means for throttling the suction applied to all but one of said zones at the end of the piston stroke.

5. The suction nozzle in the sheet feeding apparatus of claim 1, wherein said suction control means comprises means for venting said one zone by simultaneously placing it into communication with the atmosphere when suction is shut off.

6. The suction nozzle in the sheet feeding apparatus of claim 1, wherein said control means comprises conduit means in an edge of said piston and in communication with all but said one longitudinal bores, said conduit means being in communication with the means for applying suction at the end of the piston stroke.

7. In sheet feeding apparatus, a suction nozzle for detaching individual sheets from a pile of sheets, said nozzle comprising a housing, a cover for said housing, a piston reciprocably guided in said housing and defining a first longitudinal bore, a suction cup disposed at the end of the piston opposite said cover and in communication with said bore to constitute a first suction zone in said

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cup, the piston defining at least one other longitudinal bore in communication with said cup to constitute another suction zone in said cup separate from the first suction zone, means in said housing for applying suction to all said bores and corresponding suction zones, all but one of said longitudinal bores ending in openings which are in communication with said means for applying suction during the piston reciprocation but which are shut off by said housing cover at the end of the piston stroke, the piston housing defining a vent and a transverse bore in said piston in communication with all but said

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one bores, said transverse bore being aligned with said vent when said bore openings are shut off by the housing cover.

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