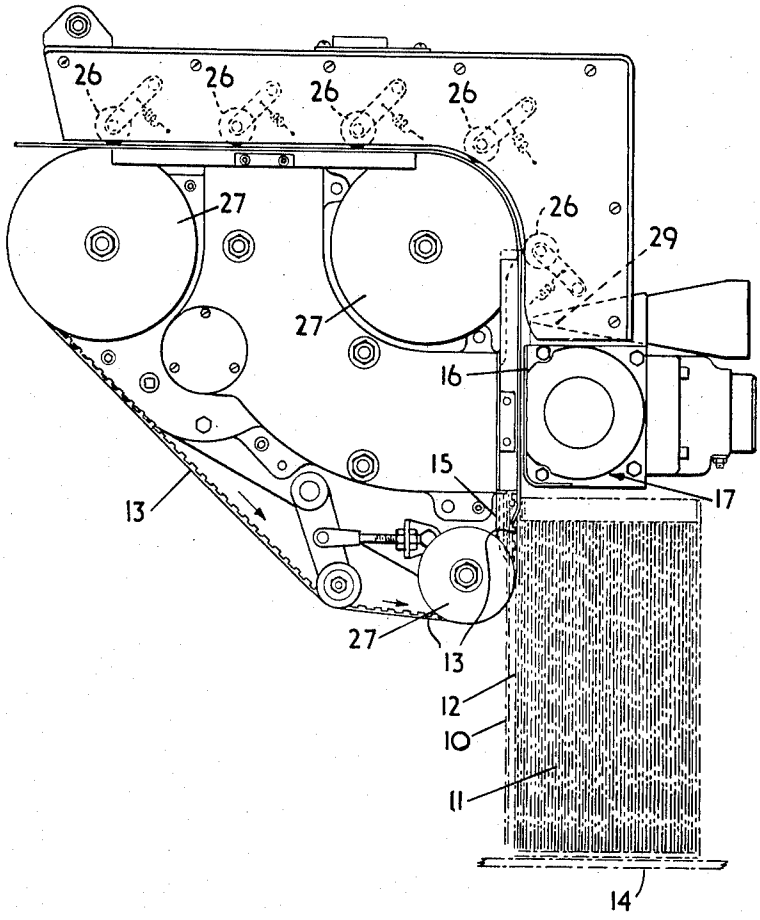
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SHEET FEEDING APPARATUS

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FIG.1.

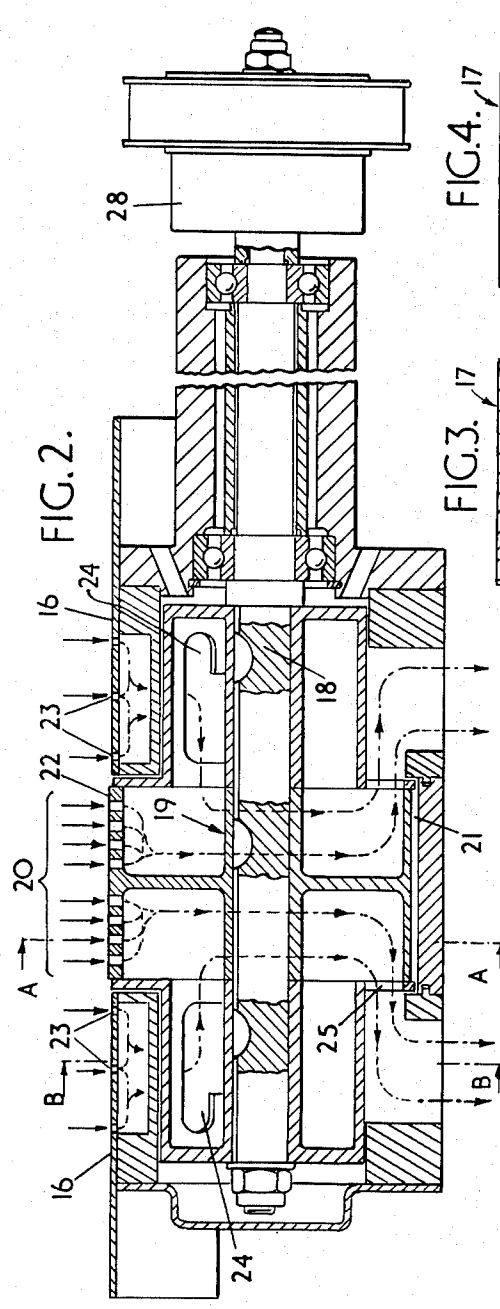


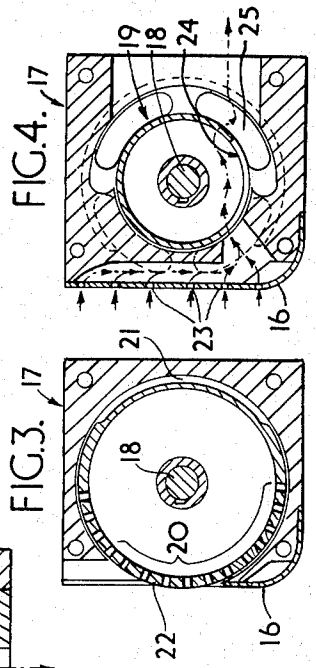
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SHEET FEEDING APPARATUS

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Claims priority, application Great Britain, Apr. 4, 1962, 12,380/62

7 Claims. (Cl. 271—12)

This invention relates to sheet feeding apparatus, such as for example apparatus for feeding sheets in the form of football pool coupons, bank cheques, punched cards or the like bearing encoded information for processing in a document sorting machine.

The invention has for its principal object to afford a reliable feed of successive single sheets from a stack of sheets.

The invention consists of a single sheet feeding apparatus comprising sheet transporting means adapted for engaging the front face of the foremost sheet of a stack of sheets and transporting said sheet edgewise in a forward direction, a fixed head having a ported face in proximity to the path of the rear face of the transported sheet with negative air pressure applied to said ports at intervals synchronised with the operation of the sheet transporting means so as to permit the traverse past the head of the foremost sheet and to retain temporarily on the head any second sheet adhering to the formost sheet, and rejecting means synchronised in operation with the sheet transporting means and the fixed head and operating to drive in reverse direction to that aforesaid any second sheet which has been retained on the fixed head.

In one form of the aforesaid apparatus according to the invention the rejecting means consists of a continuously rotatable drum having ports, preferably in a larger diameter sector of its generally cylindrical face, and a negative air pressure applied to the interior of the drum, the ported part of said cylindrical face being exposed through the ported face of the fixed tank one in each revolution of the drum.

Conveniently the aforesaid sheet transporting means consists of at least one endless belt running in proximity to the ported face of the fixed head in the opposite direction to the adjacent part of the surface of said drum with ports in the belt through which is applied a negative air pressure serving intermittently to suck the forward marginal part of the front face of the foremost sheet on to the belt to abstract the foremost sheet from the stack and transport same past the fixed head.

One example of the practical realisation of the invention is described with reference to the accompanying drawings wherein:

FIGURE 1 is a side elevation of sheet feeding apparatus according to the invention,

FIGURE 2 is a longitudinal cross-section of the rejecting head embodied in FIGURE 1,

FIGURE 3 is a vertical cross-section on the line A—A of FIGURE 2, and

FIGURE 4 is a vertical cross-section on the line B—B of FIGURE 2, but with the moving parts 90° displaced to that shown in FIGURE 3.

The illustrated embodiment of the invention comprises a magazine **10** for accommodating a stack **11** of paper sheets with the sheets disposed in parallel vertical planes also parallel with the plane of a feed gap between the forward and reverse running elements forming parts of sheet transporting and rejecting means respectively hereinafter described. Means is provided for urging the front face of the foremost sheet **12** of the stack into engagement with the forward running elements **13** of the sheet transporting means; for example the magazine **10** may consist of an open-topped and open-front box-like holder resting on a conveyor belt **14** so that the conveyor urges the front face of the magazine **10** towards said forward running elements **13** as described in the commonly owned, copending United States application of Stanley H. A. Thompson et al. Serial No. 228,942 filed October 8, 1962 for Document Processing Machines.

The sheet transporting means comprises two parallel running toothed endless rubber belts **13** passing over continuously driven toothed pulley wheels **27** so that the belts follow parallel triangular courses with their upward vertical runs defining one side of the feed gap. The belts are ported in longitudinally spaced apart regions and the said vertical runs move before respective hollow shoes **15** to which are applied a partial vacuum.

On the opposite side of the feed gap to the vertical runs of the belts **13** is the ported (**23**) flat low friction face **16** of a fixed sheet rejecting head generally designated **17**. Within the head **17** is disposed the rejected means comprising an end of a rotatably mounted shaft **18** keyed to a drum **19** having ports **20** in approximately one half of its circumference with another part **21** of the circumference stepped inwardly to a lesser radius than that of the ported sector **22**. The ported sector **22** of the drum projects through a window in the ported face **16** of the head **17** and reaches slightly beyond the plane of said face **16**. The shaft **18** is continuously driven via a toothed pulley wheel **28** and toothed belt (not shown) in synchrony with the movement of the belts **13**.

The ports **23** and **20** in the face **16** of the rejecting head and periphery of the drum **19** communicate through valve ports **24** and **25** in the drum, to a vacuum source (not shown).

Above the fixed head **17** the belts **13** coact with idle rollers **26**, serving to continue the feed of the sheets from the sphere of operation of the rejecting head **17** to reading and/or sorting mechanism.

In operation a stack **11** of sheets is inserted edgewise on the floor of the magazine **10** with the vertical planes of the sheets parallel to the feed gap and the front face of the foremost sheet **12** urged into engagement with the upward runs of the ported belts **13**. As the ported areas of the belts **13** reach the upper marginal part of the front face of the foremost sheet **12** the vacuum in the shoes **15** behind the belts **13** is communicated through the belt ports and serves to suck the foremost sheet **12** against the belts **13** whereby the sheet **12** is lifted from the stack and transported into the region of the fixed head **17**. Shortly after the foremost sheet **12** has been gripped on the belts **13** the vacuum is applied (see FIGURE 4) through the valve ports **24** and **25** to the ports **23** in the face **16** of the fixed head and this serves to suck on to this face **16** any second or subsequent sheet that may be adhering to the foremost sheet **12**, whilst allowing the first sheet to proceed in view of the low friction between two overlapping sheets. Due to the interval between the application of the vacuum to the belts **13** and to the fixed head ports **23**, the fixed head releases for engagement by the belts, after clearance of the first sheet, any second sheet retained during the passage of a previous sheet. After the upper marginal part of the foremost sheet **12** has been transported past the fixed head and after the application of vacuum to the fixed head ports **23**, the vacuum is then applied to the ports **20** in the reverse running drum **19** with the result that the drum grips on its ported surface **22** any sheet retained on the fixed head face **16** and returns this sheet back towards the stack **11**. One advantage of the stepped form of the cylindrical surface of the drum **19** is that it avoids unnecessary wearing engagement between the drum **19** and the sheets whilst the drum ports **20** are outside the vicinity of the head face **16**.

The phasing between the application of the partial vacuum to the fixed head ports **23** and the drum ports **20**, and between these functions and the ports of the belts **13** can be varied to suit the grade of paper being handled and/or the speed of operation, for example by splining the shaft **18** so that the drum **19** and pulley **28** can be keyed at appropriate angular positions on the shaft.

To improve the separation of the sheets issuing from the stack an air nozzle **29** directs an air jet at right angles to the feed gap and between the stack **11** and the sheet rejecting head **17**. The air flow can be derived from the output of a centrifuged fan (not shown) whose input provides the negative pressure for the shoes **15** and the head and drum ports **23** and **20**.

It is to be appreciated that the above described ported belts **13** and ported drum **19** are not essential features of the invention since they can be replaced by equivalent elements adapted to frictionally engage the sheets at the appropriate periods in the sheet feeding cycle of operation of the apparatus.

We claim:

1. A single sheet feeding apparatus comprising sheet transporting means adapted for engaging the front face of the foremost sheet of a stack of sheets and transporting said sheet edgewise in a forward direction, a fixed head having a ported face in proximity to the path of the rear face of the transported sheet, means intermittently applying a negative air pressure to said ports at timed intervals which are so synchronised with the operation of the sheet transporting means in feeding said foremost sheet as to permit traverse of said foremost sheet past said head and to retain temporarily on the head any trailing second sheet adhering to the moving foremost sheet, and rejecting means disposed at said fixed head synchronised in operation with the sheet transporting means and the application of said negative pressure at said ports of the fixed head and operating to drive in reverse direction to that aforesaid any second sheet which has been retained on the fixed head, said rejecting means comprising a continuously rotatable drum the periphery whereof projects through the ported face of said head.

2. A single sheet feeding apparatus according to claim **1**, wherein a sector of the periphery of the drum has ports in communication through the drum with a vacuum source.

3. A single sheet feeding apparatus according to claim **2**, wherein the ported sector of the drum periphery is of larger radius than the remaining unported sector so that only the larger radius sector projects through the ported face of the head.

4. A single sheet feeding apparatus according to claim **2**, or **4**, wherein the connection of the vacuum source to the ported face of the head is controlled by valves opened and closed with rotation of the drum.

5. A single sheet feeding apparatus according to claim **1**, incorporating means for varying the phasing of the connection of the negative air pressure to the head ports, the engagement of the rejecting means with any second sheet, and the operation of the sheet transporting means.

6. A single sheet feeding apparatus according to claim **1**, wherein said sheet transporting means comprises at least one continuously drivable endless belt having ports in a part of its length passing over a shoe connected to a vacuum source.

7. A single sheet feeding apparatus according to claim **1**, incorporating a nozzle for directing an air jet perpendicular to the path of the sheets as they approach said head.

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