April 23, 1963 E. RICHERT 3,086,770

APPARATUS FOR SEPARATING FLAT PILED ARTICLES

Filed April 4, 1961

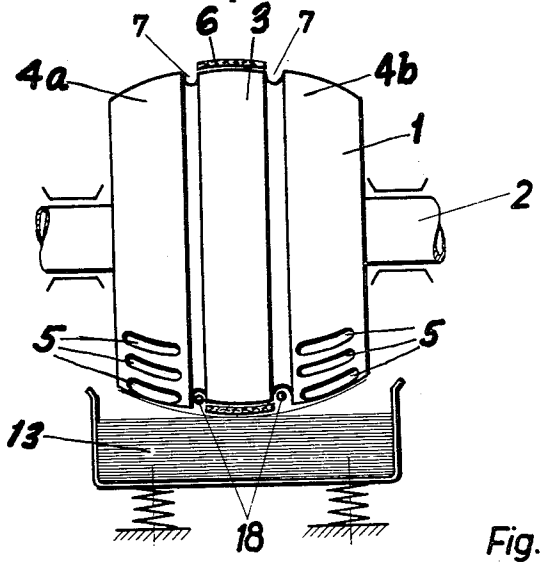


Fig.1

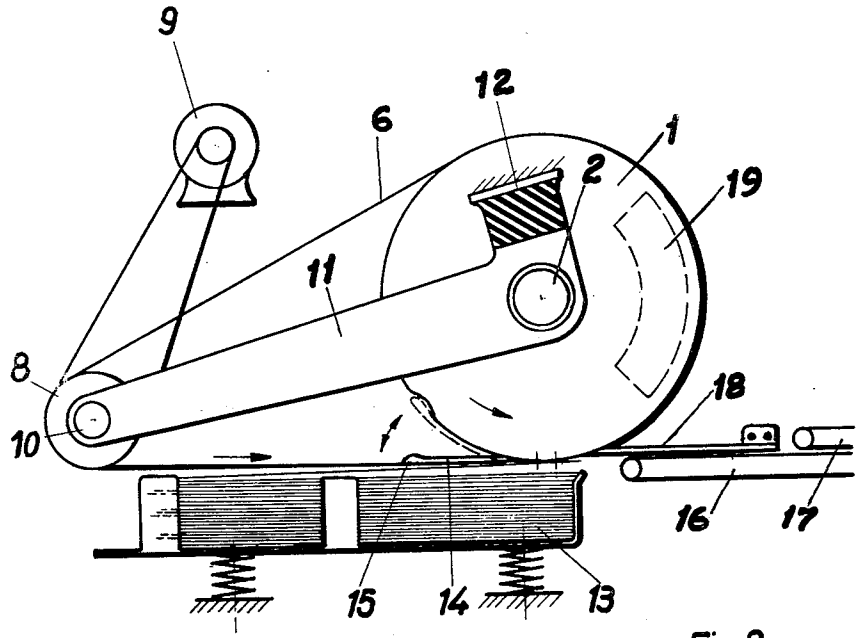


Fig.2

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3,086,770

Patented Apr. 23, 1963

3,086,770
APPARATUS FOR SEPARATING FLAT PILED ARTICLES

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Filed Apr. 4, 1961, Ser. No. 100,604
Claims priority, application Germany Apr. 21, 1960
9 Claims. (Cl. 271—27)

The present invention relates to apparatus for removing articles from a pile one at a time, and more particularly to apparatus for the separation of successive members of piles of letters, postcards, papers and the like.

Frequently, areiclts of paper, plastics, leather, and the like which have been piled one on the other have to be separated one at a time for further processing. If these articles are all made of the same material, and are all of the same size, then the separation of individual articles from the pile is not difficult. However, if the articles to be separated differ in dimensions, material of composition or in kinds of surfaces and weights, then separation is more difficult and the apparatus has to be designed with particular care.

For separation purposes it is known to use pneumatic means, such as rollers, suction arms or rotating perforated tapes, which are connected to a vacuum pump. The intensity of the stream of air suction current is varied so that the article to be processed is drawn on by the suction and can be discharged therefrom at a predetermined later time or position, being, for instance, transferred to a conveying system. Apparatus has also been proposed to bend the articles in one direction during the suction operation, so that they are more completely separated from the articles lying beneath.

The conventional types of arrangements have the disadvantage of producing incomplete separation. Frequently, two items are drawn off simultaneously, or a subsequent item momentarily sticks to the previous one so that the spacing between two articles varies. The further processing of the articles usually requires that the spacing be ample and relatively uniform.

An object of this invention is therefore to provide an improved device for removing articles successively and separately from a stack.

A further object of this invention is to provide means for controlling the spacing of separated articles.

To summarize the present invention, in one aspect it consists of the combination of a suction drum and a pick-off belt, more specifically a rotatable drum having suction holes through its surface is connected to an evacuating system so that the topmost article of a pile of articles is drawn to the drum, and thus separated from the next lower article. The drum is preferably shaped to bend the topmost article for easier separation. The belt passes around the drum, and frictionally engages the top member of the pile and moves the top member in the direction of movement of the belt.

A further aspect of the present invention is a tongue, or clapper, arranged on the central portion of the drum surface, which surface is also the runway of the pull-off belt. The clapper lies in the direction of rotation of the drum and is pivotally mounted in such a way that its free end can move away from the surface of the drum. The clapper is adapted to hit the inside of the pull-off belt. The clapper hits the belt several times during each drum rotation thereby causing oscillations of the belt so that the top article of the pile is separated from the article lying beneath it and, on account of the oscillations and the additional statistic friction thus applied, is reliably pulled therefrom.

Further aspects include a weight mounted on the drum to unbalance it, causing it to oscillate during rotation, and rods cooperating with grooves to strip the lifted article from the drum.

The above mentioned and other features of this invention and the manner of attaining them will become more apparent by reference to the description of an embodiment thereof taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a front view of the suction drum with a pile of articles lying beneath it, and showing the positioning of the pull-off belt; and

FIG. 2 is a side view of the drum showing both the pull-off belt and the pile.

A bavic element of the arrangement is a rotatable drum **1**. The drum is connected to a vacuum source, (not shown), for example, with the aid of a hollow shaft **2**. The surface of the drum consists of the center portion **3** which is generally of cylindrical shape, and of the side portions *4a* and *4b*, which are tapered towards the edge of the drum. The side portions of the drum are provided with air suction apertures **5**, along a quarter to a third of their circumference. As clearly shown in FIG. 1 of the drawings the air suction apertures **5** are placed in only a portion of the circumference. The center portion **3** of the drum serves as a pulley or guide for the pull-off belt **6**. The belt **6** is shown in section so as to clearly illustrate its relation to the center portion **3** of the drum **1**. Grooves **7** are provided between the drum portions *4a* and *4b*, the purpose of which will be explained hereinafter.

The drum **1** is provided with an unbalanced weight **19**. As the drum rotates the weight **19** serves to cause vertical oscillations of the drum with shaft **10** as a pivot, the drum being pivotally connected to the shaft by arms **11**. The extent of oscillatory motion of the arms **11** is elastically limited by the restraining device **12**. The device **12** is mounted to any sturdy framing member (not shown) and may consist of any highly flexible material such as rubber or springs.

The pull-off belt **6** serves the dual purpose of rotating the drum and frictionally engaging the top article of the stack. The belt **6** is led over a further roller **8** rotating on shaft **10** which, is driven by a motor **9**. The piled articles to be conveyed are initially stacked on spring-mounted piling table **13** located adjacent to the drum.

One end of a clapper **14** is pivotally mounted to the center portion **3** of the drum **1** with the free end lying in the direction of rotation. That is, the pivoted end is ahead of the free end with respect to the direction of rotation. The drum rotates in the direction indicated by the arrow. The clapper **14** is provided at its free end with an additional weight portion **15**.

The conveying section to which the individual articles are discharged consists of the conveying belts **16** and **17**, between which the article is conveyed. In the plane of the conveying channel defined by the belt **17** are mounted two rods **18** engaging the two grooves **7** of the drum **1**. These rods are adapted to strip articles from the drum (which articles have been picked up by the suction of the apertures and with the aid of the pull-off belt **6**) and to guide the articles to the conveyor belts **16** and **17**.

The mode of operation of the apparatus is as follows. The pile of articles to be separated is positioned on the spring-mounted piling table **13**. The top article is subjected to suction through the suction holes **5** and is thus bent toward both sides of the drum. In this way the article is pressed against the underside of the pull-off belt **6**. Due to centrifugal force the clapper **14**, as soon as it is free of the pull-off belt **6**, drops away from the surface of the drum **1**. The free movement of the clapper

can be amplified by designing the clapper as a spring and by providing it with a corresponding predeflection and a weight **15**. As the drum continues rotation the clapper **14**, with its end **15**, hits the lower part of the belt running towards the drum. Upon hitting the belt **6** the spring **14** bounces back and the clapper is likely to hit the belt several times. The striking process will be repeated until the clapper **14** is completely rolled in between the drum **1** and the belt **6**. The oscillations of the belt **6** are transferred to the drawn-on article which thereby is reliably separated from the next successive article.

Besides the advantage of loosening the pile lying below the article to be pulled off, the hitting of the clapper **14** upon the belt **6** has a further effect. By the striking force of the clapper the belt **6**, which has appropriately a high friction coefficient, is pressed against the article to be pulled off, thus engaging the article even more firmly.

On account of the unbalanced weight **19** the drum **1** oscillates. The weight **19** is mounted in a position such that the drum with a withdrawn article is just oscillated upwards when the pile, due to the oscillation caused by the action of the clapper **14**, is oscillated downwards. On account of this the separation of the withdrawn article from the pile beneath is still further facilitated. Due to the tapering of the marginal portions **4***a* and **4***b* of the drum there is effected an arching of the withdrawn article which not only facilitates the separation from the next successive article by stripping off sheets, but also stiffens the adhering article in the axis corresponding to the direction of conveyance. In this way the article is reliably fed against the rods **18**, which cooperate with grooves **7** to strip the withdrawn article from the drum and transfer the article to the conveyor belts **16** and **17**. The articles are thus spaced on the belts **16** and **17** at intervals which can be preestablished by the diameter and rotational rate of the drum **1** and the speeds of the conveyor belts **16** and **17**.

The inventive arrangement achieves both a high pull-off speed and a high separation accuracy which are not possible with the conventional types of arrangements.

While I have described my invention with reference to a specific embodiment, it is to be understood that the invention is to be interpreted by the state of the prior art and the appended claims.

I claim:

1. An apparatus for removing articles from a pile one at a time comprising a rotatably mounted drum having a central cylindrical portion and side portions separated thereby, said drum having air suction openings positioned only in the periphery of said side portions, driving means rotating said drum, means for supporting said pile adjacent the periphery of said drum, a belt for frictionally engaging the topmost article of said pile and passing around said central portion of said drum without covering said side portions and suction openings, means for separating said topmost article from said drum, and grooves which separate said side portions from said central cylindrical portion and cooperate with said separating means whereby articles held by said drum by said air suction are stripped from said drum by said separating means.

2. An apparatus for removing articles from a pile one at a time comprising a rotatably mounted drum having a central cylindrical portion and side portions separated thereby, said drum having air suction openings in the periphery of said side portions occupying only the portion of said periphery adjacent said pile, driving means rotating said drum, means for supporting said pile adjacent the periphery of said drum, a single means for mechanically coupling said drum and said driving means to drive said drum and to frictionally engage the topmost article of said pile, said means consisting of a belt passing around said drum at said central cylindrical portion separate from said side portions in which said suction openings appear, means for separating said topmost article from said drum, and grooves which separate said side portions from said central cylindrical portion and cooperate with said separating means whereby articles held by said drum by said air suction are stripped from said drum by said separating means.

3. Apparatus for removing articles from a pile one at a time comprising a rotatably mounted drum having a central cylindrical portion and side portions separated thereby, said drum having air suction openings positioned only in the periphery of said side portions, driving means rotating said drum, means for supporting said pile adjacent to the periphery of said drum, a belt for frictionally engaging the topmost article of said pile which passes around said central portion of said drum without covering said side portions and suction openings, and a clapper extending over a portion of said central drum surface one end of which is pivotally mounted to said drum and the other end lies in the direction of rotation of said drum.

4. An apparatus according to claim 3 wherein said clapper is provided with a portion of greater mass at its free end than in its remainder.

5. Apparatus for removing articles from a pile one at a time comprising a rotatably mounted drum having a central cylindrical portion and side portions separated thereby, said side portions of said drum being tapered in both directions from said central portion and having air suction openings positioned only in said tapered side portions, driving means rotating said drum, means for supporting said pile adjacent to the periphery of said drum, and a belt for frictionally engaging the topmost article of said pile which passes around said central portion of said drum without covering said side portions and suction openings.

6. Apparatus according to claim 5 wherein said air suction openings extend over no more than a third of the periphery of said tapered side portions.

7. Apparatus according to claim 5 wherein grooves separate said central cylindrical portion from said tapered side portions, and further comprising stripping rods fixedly mounted apart from said drum and cooperating with said grooves whereby articles held to said drum by suction are stripped from said drum by engagement with said rods.

8. Apparatus for removing articles from a pile one at a time comprising a rotatably mounted drum having a central cylindrical portion and side portions separated thereby, said drum having air suction openings positioned only in the periphery of said side portions, driving means rotating said drum, means for supporting said pile adjacent to the periphery of said drum, a belt for frictionally engaging the topmost article of said pile which passes around said central portion of said drum without covering said side portions and suction openings, and a weight which is attached to a portion of the interior periphery of said drum, whereby an oscillatory motion is imparted to said drum during rotation.

9. An apparatus according to claim 8 wherein said weight is mounted adjacent said air suction openings.

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