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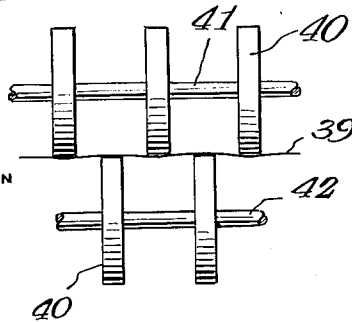
C. WEBER

2,979,330

SHEET SEPARATING DEVICE

Filed April 15, 1957

2 Sheets-Sheet 1



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C. WEBER

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SHEET SEPARATING DEVICE

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2 Sheets-Sheet 2

Fig. 5.

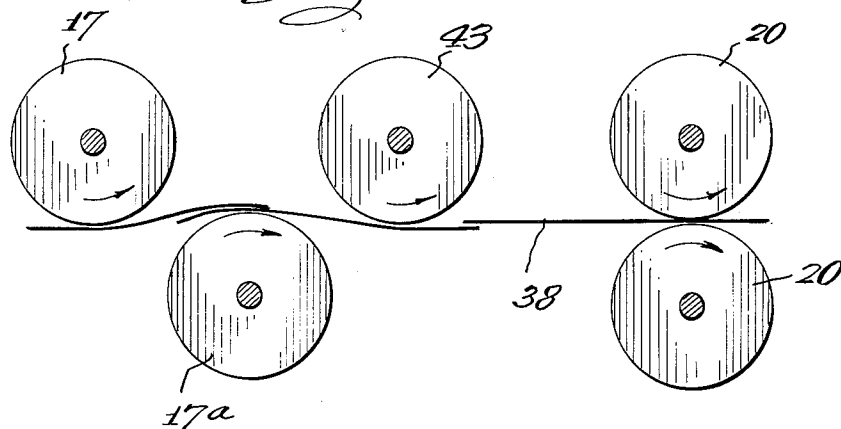
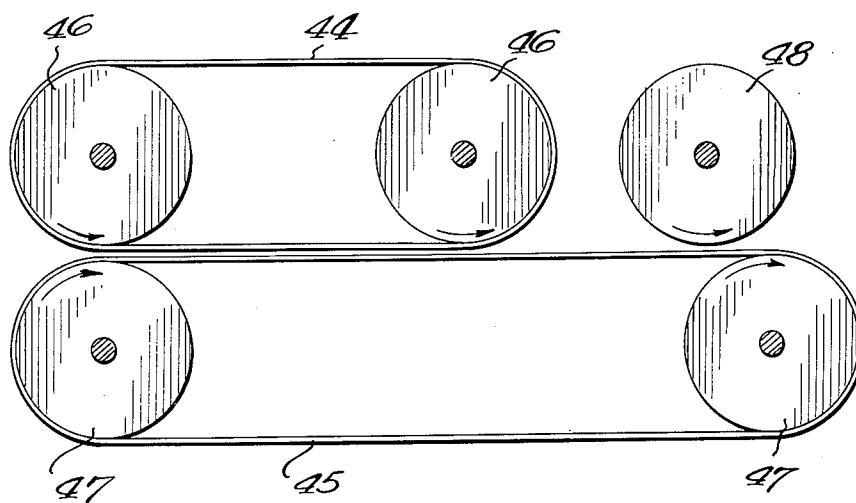


Fig. 6.



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SHEET SEPARATING DEVICE

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16 Claims. (Cl. 271—36)

This invention relates to a sheet separating device and more particularly to a device for positively separating sheets of paper superimposed on each other.

Many machines, which are currently in use today required a paper feed which introduces a single sheet of paper at a time to the machine. The fact that a single sheet feed is required has often presented a problem since, as is well known, sheets of paper tend to adhere together. Thus in a machine such as a money counter, errors may be introduced; in a machine such as a check signer, checks may be skipped; and in printing, pages may be left blank.

It is therefore an object of this invention to provide a device for positively separating sheets of material such as paper.

It is a further object of the invention to provide a device for separating sheets of material superimposed on each other which comprises opposed advancing means arranged to receive the sheets therebetween and means for driving the advancing means at different speeds to separate the sheets.

It is a still further object of this invention to provide a device for separating sheets of material such as described above which also includes means for discharging the separated sheets from the device one sheet at a time.

Other objects and advantages of the invention will be better understood by the following description taken together with the accompanying drawings.

Of the drawings:

Fig. 1 is a perspective view, partially broken away, of a sheet separator;

Fig. 2 is a partial front view of a portion of the separator showing another embodiment of the first series of rollers;

Fig. 3 is a diagrammatic view of the rollers showing the progression of the sheets during operation;

Fig. 4 is a partial perspective view showing yet another embodiment of the separating rollers;

Fig. 5 is an enlarged side elevational view of still another embodiment of the separating rollers; and

Fig. 6 is an enlarged side elevational view of yet another embodiment of the separating device showing separating belts.

The sheet separating device 10 of this invention includes a pair of parallel rectangular sides 11 and 12 which may be of any suitable sturdy material, such as wood or metal, and in which are positioned the various other necessary components. A platform 13, which is partially broken away in Fig. 1, is positioned between the sides 11 and 12 substantially perpendicular thereto and provides a support on which a stack of sheets to be separated may be placed as they are being introduced to the separating device. A protector plate 14, also partially broken away in Fig. 1, is provided to prevent the operator from exposing his hands to unnecessary danger.

A feed roller 15 is mounted on a shaft 16 which is positioned for rotation in holes (not shown) toward the front

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of the sides 11 and 12. A rectangular aperture 13a in the platform 13 is provided which allows a portion of the periphery of the feed roller 15 to extend slightly above the surface of the platform 13. Thus, the roller 15 can operate to feed sheets to the device from the bottom of the stack.

A pair of series of separating rotating members or rollers 17 are mounted on shafts 18 and 19 which are positioned in a vertical plane in the walls 11 and 12. Each pair of rollers 17 is located in substantially the same vertical plane and the rollers are placed just short of being in contact with each other. A pair of series of discharging rotating members or rollers 20 is mounted, in the same planar relationship as the rollers 17, on shafts 21 and 22 which are similarly positioned in the walls 11 and 12 and are located rearwardly of the separating rollers 17.

The separating rollers and the discharging rollers may be staggered, as is more clearly shown by the rollers 40, in Fig. 2, so that they are not in contact with each other. However, the distance between the mounting shafts 41 and 42 is slightly less than twice the radius of the rollers 40 so that the edges of the rollers overlap.

If desired, another set of separating rollers 43 may be added to the separating device of this invention at a point between the separating rollers 17 and the discharging rollers 20 as is more clearly shown in Fig. 5. These added rollers 43 may either be in line with the first set of rollers 17 or may be staggered similar to the rollers 40 shown in Fig. 2. A still further embodiment of the separating rollers of this invention is shown in Fig. 6. Therein a pair of elongated belts 44 and 45 is positioned for rotation about a series of rollers 46 and 47.

The rollers 15, 17, 20, 40, 43 and the belts 44 and 45 are constructed so that at least their surface is made of a material having a high coefficient of friction. Normally a rubber roller or belt will be satisfactory for this purpose so that the sheets will be frictionally engaged during the separating.

The sheet separating device 10 is driven by any suitable source (not shown) having a drive shaft and pulley on which the belt 23 may be operatively positioned. The power of the driving source is thus transmitted by the belt 23, in the direction shown by the arrows, to the pulley 24 which is attached near the end of the shaft 22. Thus the shaft 22 and the rollers 20 positioned thereon are rotated in the direction indicated by the arrows. A spur gear 25 is also attached to the shaft 22 between the pulley 24 and the side 11. The gear 25 meshes with a similar gear 26 of substantially the same size which is attached to the shaft 21. Thus the rotation of the shaft 22 will also cause the rotation of the shaft 21 and the rollers 20 positioned thereon at substantially the same speed and in the direction indicated by the arrows.

A pulley 27 which is similar to the pulley 24 is attached near the end of the shaft 21, outward of the gear 26. A belt 28 positioned around the pulley 27 connects it to the larger pulley 29 which is attached near the end of the shaft 18. Because of the difference in size between the pulley 27 and the pulley 29, the rotational speed of the shaft 18 will be about $\frac{1}{4}$ that of the shafts 21 and 22, in the direction indicated by the arrows. A spur gear 30 is also attached to the shaft 18 between the pulley 29 and the side 11. This gear meshes with a similar but smaller gear 31 attached to the shaft 19. Thus the rotation of the shaft 18 will cause the rotation of the shaft 19. However, because of the difference in size between the gears 30 and 31, the shaft 19 will rotate at a speed which is about twice that of the shaft 18, in the direction indicated by the arrows.

A pulley 32, which is similar in size to the pulley 27, is

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attached near the end of the shaft 19 and is connected by means of the belt 33 to the pulley 34 on the shaft 16. Thus the rotation of the shaft 19 in the direction indicated by the arrows will cause the rotation of the shaft 16 in the same direction but at about $\frac{1}{2}$ the speed.

The speed differential between the shafts 18 and 19 is important only insofar as it is transmitted to the rollers positioned thereon. Thus the same result with the rollers 17 could be achieved by using different sized rollers 35 and 36 as shown in Fig. 4 while rotating the shafts at the same speed.

In the embodiment shown in Fig. 5 both the rollers 17 and 43 will rotate at substantially the same speed while the roller 17a will be rotated at approximately twice that speed. The rollers 20 will rotate at twice the speed of the roller 17a similar to the rotation of the device as shown in Fig. 1. In the embodiment shown in Fig. 6 the belt 45 will be rotated at substantially twice the speed of the belt 44. The roller 48 will also be rotated at the same speed as the belt 45.

In operating the sheet separating device of this invention, a stack of sheets of material such as paper is placed on the platform 13 where they contact the feed roller 15. If, as is clearly shown in Fig. 3, a pair of sheets 37 and 33 comes into contact with the separating rollers 17 they will be frictionally received therebetween as is indicated by the sheet 39 shown in Fig. 2. Because the shaft 19 and the rollers 17 positioned thereon are rotating at a speed which is about twice that of the shaft 18 and the rollers 17 positioned thereon, the lower sheet 38 will be separated from the upper sheet 37 and advanced forward substantially faster than the sheet 37. The sheet 38 will thus be received first by the discharging rollers 20. Since the discharging rollers 20 are rotating faster than either of the separating rollers, they will immediately and positively discharge the separated sheet 38 from the device before ever contacting the upper or second sheet 37 which will be discharged next. Fig. 3 also indicates the relative speed of the various rollers in revolutions per unit time. In the embodiment shown in Fig. 6 the sheets of material will be separated by the belts 45 and 46 with the first emerging sheet being contacted by the roller 48 and the belt 45 to positively discharge the sheet from the device.

Thus when the sheet separating device of this invention is combined with a machine such as a money counter, a check signer or a printing press, there can be no danger of more than one sheet at a time entering the machine.

Having thus described my invention as related to the embodiments shown in the accompanying drawing, it is my intention that the invention be not limited by any of the details of description unless otherwise specified, but rather be construed broadly within its spirit and scope as set out in the accompanying claims.

I claim:

1. A device for separating sheets of material superimposed on each other, comprising: opposed advancing means arranged to frictionally receive said sheets therebetween, and means for driving said advancing means at different speeds in the same linear direction to separate said sheets.

2. A device for separating sheets of material superimposed on each other, comprising: a first rotatable member, a second rotatable member arranged to cooperate with said first member to receive said sheets therebetween in frictional engagement, and means for rotating said first and second members at different speeds in the same linear direction to separate said sheets and pass said sheets therebetween.

3. A device for separating sheets of material superimposed on each other, comprising: a pair of rotatable members, a third rotatable member opposed to said pair and arranged to cooperate with said pair to receive said sheets between said pair and said third member whereby said pair frictionally contacts one of said sheets and said

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third member frictionally contacts another of said sheets, and means for rotating said pair and said third member at different speeds in the same linear direction to separate said sheets and pass said sheets therebetween.

4. A device for separating sheets of material superimposed on each other, comprising: a first series of rotatable members, a second series of rotatable members opposed to said first series and arranged to cooperate with said first series to receive said sheets therebetween in frictional engagement, and means for rotating said first and second series at different speeds in a direction at their points of engagement with said sheets which is in alignment with the direction of advancing movement of said sheets to separate said sheets and pass said sheets therebetween.

5. A device for separating sheets of material superimposed on each other, comprising: a pair of series of rotatable members, a third series of rotatable members opposed to said pair and arranged to cooperate with said pair to receive said sheets between said pair and said third series whereby said pair frictionally contacts one of said sheets and said third series frictionally contacts another of said sheets, and means for rotating said pair and said third series at different speeds in a direction at their points of engagement with said sheets which is in alignment with the direction of advancing movement of said sheets to separate said sheets and pass said sheets therebetween.

6. A device for separating sheets of material superimposed on each other, comprising: opposed advancing means arranged to frictionally receive said sheets therebetween, means for driving said advancing means at different speeds in the same linear direction to separate said sheets, and means for discharging said separated sheets from said device one sheet at a time.

7. A device for separating sheets of material superimposed on each other, comprising: a first rotatable member, a second rotatable member arranged to cooperate with said first member to receive said sheets therebetween in frictional engagement, means for rotating said first and second members at different speeds in the same linear direction to separate said sheets and pass said sheets therebetween, and means including a third and fourth rotatable member arranged to receive said separated sheets and to discharge said sheets from said device one sheet at a time.

8. A device for separating sheets of material superimposed on each other, comprising: a pair of rotatable members, a third rotatable member opposed to said pair and arranged to cooperate with said pair to receive said sheets between said pair and said third member whereby said pair frictionally contacts one of said sheets and said third member frictionally contacts another of said sheets, means for rotating said pair and said third member at different speeds in the same linear direction to separate said sheets and pass said sheets therebetween, and means including a fourth and fifth rotatable member arranged to receive said separated sheets and to discharge said sheets from said device one sheet at a time.

9. A device for separating sheets of material superimposed on each other, comprising: a first rotatable member, a second rotatable member arranged to cooperate with said first member to receive said sheets therebetween in frictional engagement, means for rotating said first and second members at different speeds in the same linear direction to separate said sheets and pass said sheets therebetween, and means including a third rotatable member arranged to cooperate with said second rotatable member to receive said separated sheets and to discharge said sheets from said device one sheet at a time.

10. A device for separating sheets of material superimposed on each other, comprising: a first series of rotatable members, a second series of rotatable members opposed to said first series and arranged to cooperate

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with said first series to receive said sheets therebetween in frictional engagement, means for rotating said first and second series at different speeds in a direction at their points of engagement with said sheets which is in alignment with the direction of advancing movement of said sheets to separate said sheets and pass said sheets therebetween, a third and fourth series of cooperating rotatable members positioned adjacent said first and second series and arranged to receive said separated sheets therebetween in a frictional engagement, and means for rotating said third and fourth series at a speed in excess of the speed of the fastest of said first and second series to discharge said sheets from said device one sheet at a time.

11. The device of claim 10 wherein said members of said first and second series and of said third and fourth series are laterally offset from each other and have slightly overlapping edges.

12. A device for separating sheets of material superimposed on each other, comprising: a pair of series of rotatable members, a third series of rotatable members opposed to said pair and arranged to cooperate with said pair to receive said sheets between said pair and said third series whereby said pair frictionally contacts one of said sheets and said third series frictionally contacts another of said sheets, means for rotating said pair and said third series at different speeds in a direction at their points of engagement with said sheets which is in alignment with the direction of advancing movement of said sheets to separate said sheets and pass said sheets therebetween, a fourth and fifth series of cooperating rotatable members positioned adjacent said pair and said third series and arranged to receive said separated sheets therebetween in a frictional engagement, and means for rotating said fourth and fifth series at a speed in excess of the speed of said third series to discharge said sheets from said device one sheet at a time.

13. The device of claim 12 wherein said members of said pair and said third, fourth and fifth series are lateral-

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ly offset from each other and have slightly overlapping edges.

14. A device for separating sheets of material superimposed on each other, comprising: a first rotatable belt, a second rotatable belt arranged to cooperate with said first belt to receive sheets therebetween in frictional engagement, means for rotating said second belt faster than said first belt in a direction at their points of engagement with said sheets which is in alignment with the direction of advancing movement of said sheets to separate said sheets and pass said sheets therebetween, a series of rollers positioned adjacent said second belt and arranged to receive said separated sheets therebetween in a frictional engagement, and means for rotating said rollers at substantially the same speed as said second belt to discharge said sheets from said device one sheet at a time.

15. A device for carrying and separating sheets of material comprising: opposed members, arranged to receive said sheets therebetween in frictional engagement and means for driving said members at different speeds, but in the same linear direction, to separate any superimposed sheets while they pass therebetween.

16. The device of claim 2 wherein the axes of said rotatable members define a plane which is substantially perpendicular to the plane of said sheets.

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