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Friend

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[54] **SINGULATOR DEVICE FOR LETTER MAIL**

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[52] **U.S. Cl.** **271/10,** 271/116, 271/122

[51] **Int. Cl.** **B65h 3/52**

[58] **Field of Search** 271/121, 122, 124, 125, 271/116, 10, 34, 35, 51, 64

[56] **References Cited**

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Attorney, Agent, or Firm—Walter S. Pawl

[57] **ABSTRACT**

The singulator device has a flat conveyor belt for edge-feeding a continuous supply of letter mail pieces, having their address sides facing in the same direction and extending axially of said belt on their top edges in random endwise overlapping sequence on said belt between converging vertical guide walls, for funneling said mail pieces toward the nip of a first pair of rollers with high friction material on their peripheries, one of the rollers being driven forwardly through a slip clutch to pass the letter mail singly between the rollers and thereby frictionally drive the other roller against its reverse torque drive applied to it by a friction clutch, so that this roller will move back any overlapping letters that might enter the nip on its side of the passing letter which is next to said forwardly driven roller until said letter has cleared the nip, there being another set of at least one similar pair of rollers having their nips spaced slightly downstream from that of the first pair. One of the rollers in each pair of the second set may be an idler roller biased resiliently against the other so as to accommodate varying thicknesses of mail passing therebetween. The forwardly driven roller(s) in this set may be driven at a somewhat higher speed to pull the mail pieces which reach their nips through the first pair of rollers, which are thus driven at the higher speed as permitted by their respective slip clutches. The forwardly driven roller of the first pair is furthermore mounted on a lever extending substantially normally to the path of the mail pieces, so that this pull causes the lever to shift into a "stop" position, braking the slip clutch drive to the roller and thus causing the roller to hold back any overlapping mail which may tend to enter the nip on the corresponding side of the piece being pulled therethrough. When this piece passes the nip, the lever is allowed to shift back to its normal "run" position by reason of a return spring biasing it thereto, and this roller then resumes its single feed to the nips of the pairs of the second set of rollers.

A third pair of rollers spaced further downstream not more than the length of the shortest piece of mail that might be fed to this device, and the drive roller of this pair is positively driven at a further increased speed to pull the piece through the lower speed rollers to secure a positive output of single letter mail with a fixed spacing between pieces so that they may be properly fed to a cancelling machine.

5 Claims, 3 Drawing Figures

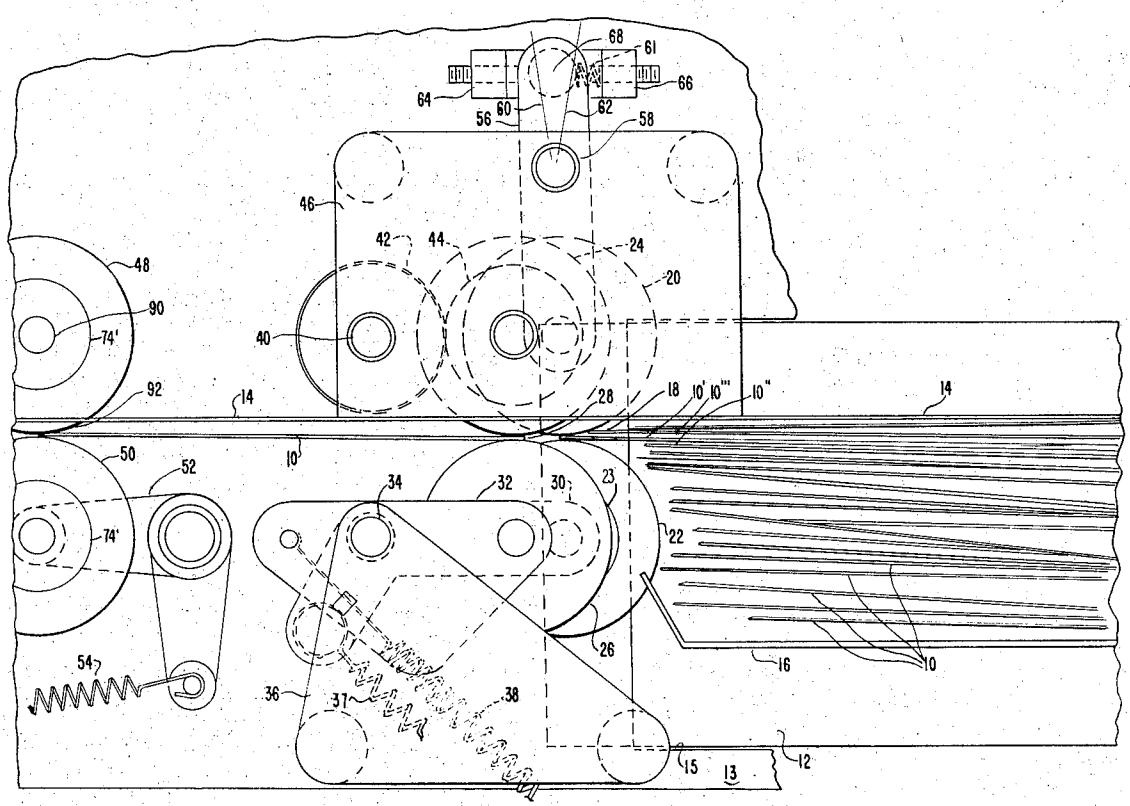


FIG. 1

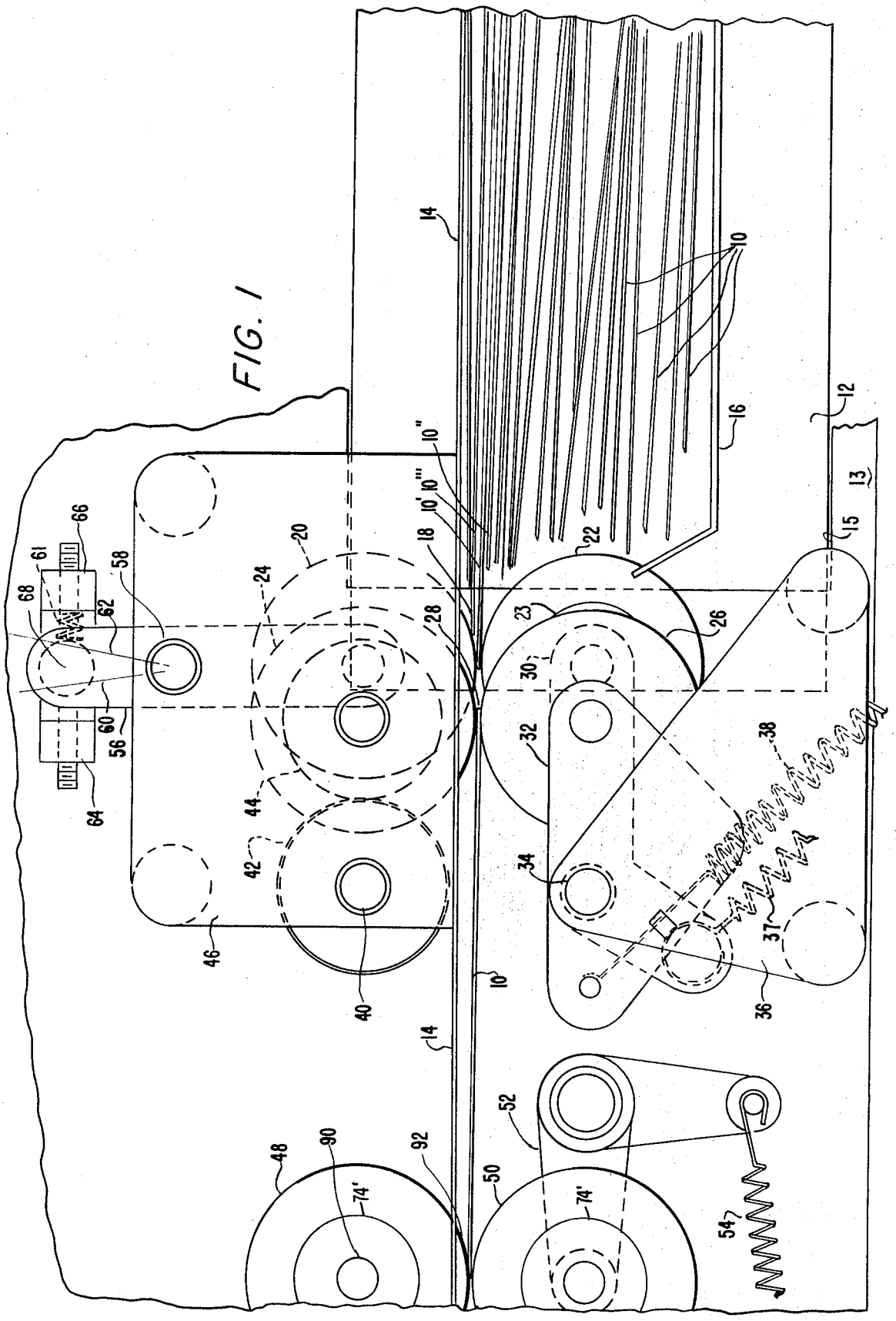
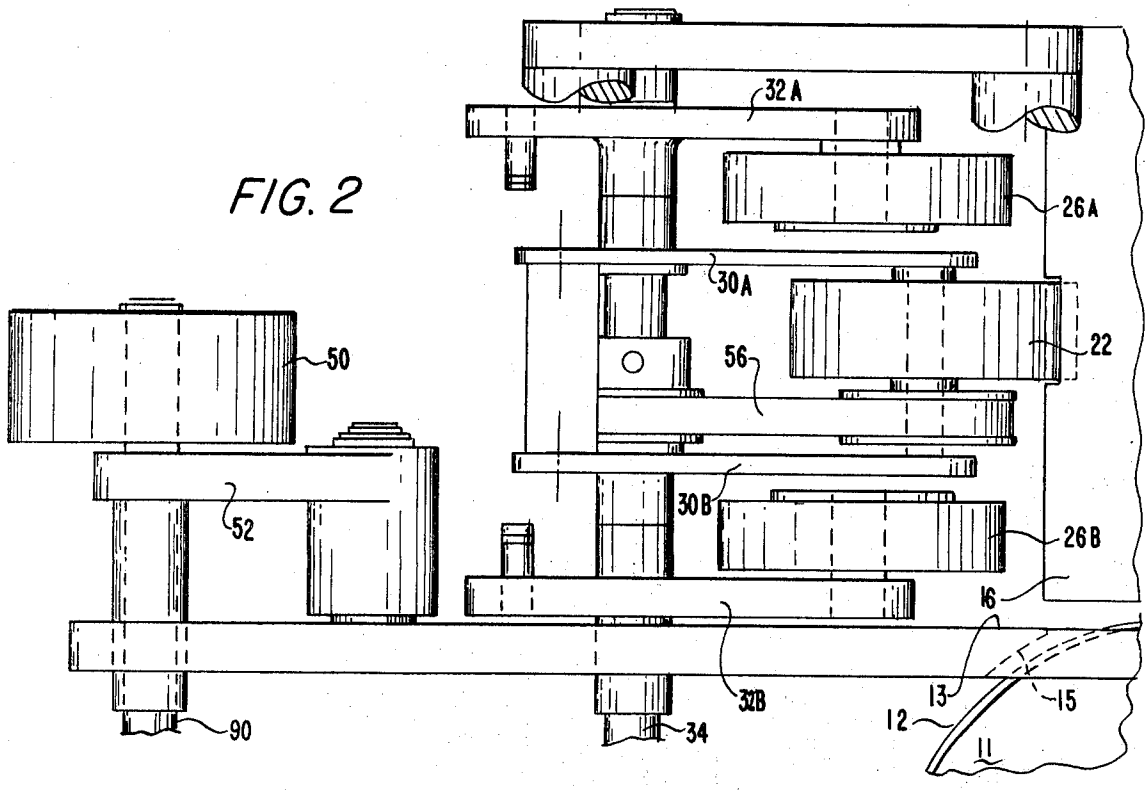

14
10
16
12
13
15
10"
10'''
10'
10
18
22
20
24
28
23
26
30
32
38
34
37
36
44
42
40
46
10
14
52
48
90
92
50
74'
74'
54
66
61
68
58
62
60
56
64

FIG. 2


32A
26A
30A
22
50
56
52
30B
26B
16
32B
13
15
12
11
90
34

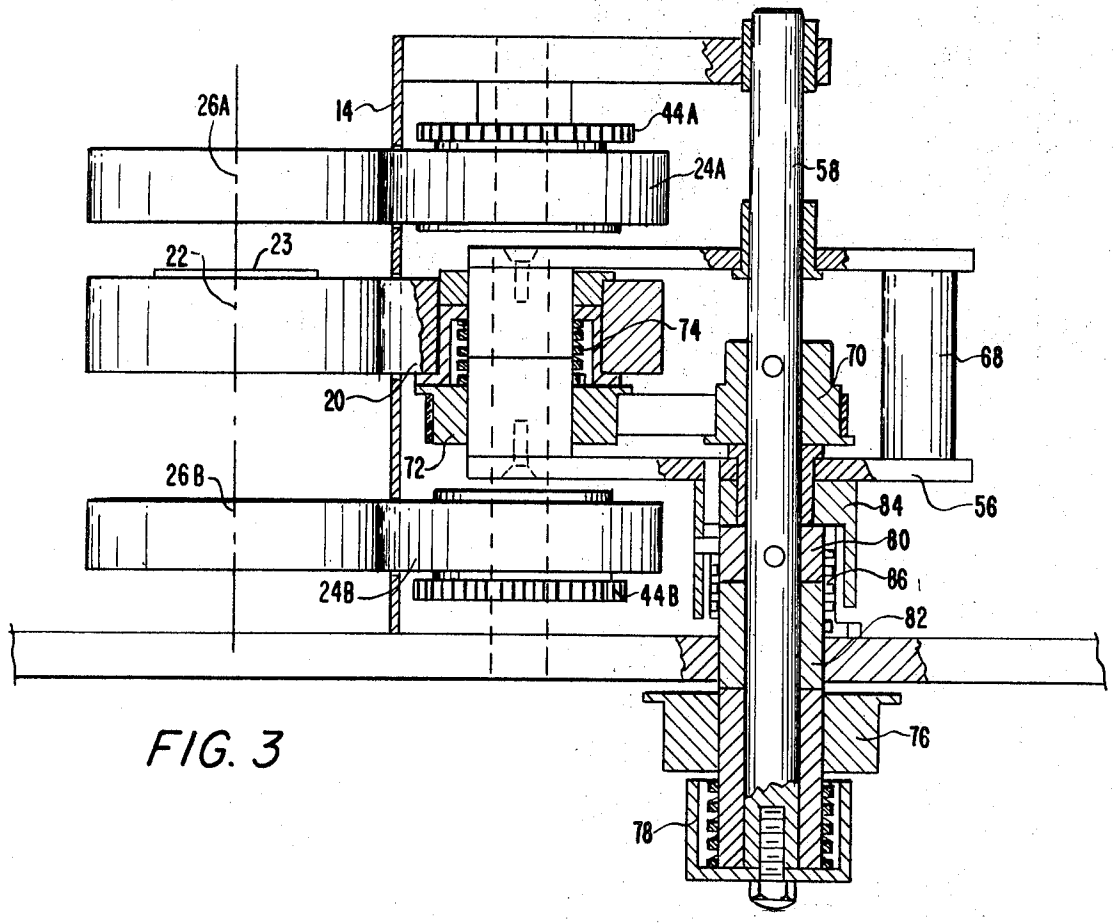

26A
14
44A
24A
58
22
23
74
70
68
20
72
26B
84
56
80
86
24B
44B
82
76
78

FIG. 3

SINGULATOR DEVICE FOR LETTER MAIL

Some of the singulator devices which have been used for feeding mail to a cancelling machine, include a pair of rollers which require frequent spacing adjustments that allow only one letter at a time to enter the nip between the rollers, and have not been very reliable without continuing attention. They have needed frequent or continual adjustments on account of wear of the rollers and because of varying sizes and thicknesses of the mail pieces fed into the singulator.

Others, as disclosed for example in the Breuers U.S. Pat. No. 3,044,770, are adapted to feed single sheets of material horizontally from a stack of evenly piled sheets, relying on the uppermost one to be the first fed to the nip of the pair of singulator rollers, the lower of which is driven through a slip clutch in reverse direction so as to prevent an overlapping sheet from entering the nip of the rollers under the first sheet until the first sheet clears this nip, but there is nothing to stop an overlapping sheet entering the nip over the top of the first sheet to be driven back and to be possibly jammed against the stack.

The object of the present invention is therefore to make a reliable singulator device which will need little attention or adjustment, and which will make it possible to efficiently singulate a batch of letter mail having a wide range of sizes and thicknesses, so that it will feed a continuous output of single mail pieces with spacing between them, as may be required, to a cancelling machine.

A further object is to have a first and second pair of rollers for effectively separating the leading piece from the rest of the mail which is edge fed into the nip of the first pair of rollers.

A further object is to add a third pair of rollers to receive said above discharged pieces and feed them one at a time to a cancellation machine at a slightly increased speed to provide a fixed spacing between the pieces as may be required for the input to said machine.

Other and more specific objects will become apparent in the following detailed description of the invention, as illustrated in the accompanying drawings, wherein:

FIG. 1 is a plan view of a letter singulator device made in accordance with the present invention,

FIG. 2 is an elevational side view thereof, and

FIG. 3 is a rear end view in elevation thereof.

There have been some feed roller systems used for automatically feeding one sheet at a time to printing presses and the like from a stack of identical sheets of laminar material such as paper, cardboard, etc. Many of such systems include a pair of rollers biased against each other to form a nip between their peripheries, one of said rollers being positively driven, the other being a drag roller of one type or another to stop the passing of any sheets that might enter the nip on its side in overlapping relation to the first sheet which is being conveyed by the positively driven roller, until this positively conveyed sheet has passed through the nip by itself and has exposed the previously overlapping sheet to the positively driven roller for its positive conveyance therethrough.

This type of rollers when applied to singulator operation for feeding mail pieces such as letters of various types in properly spaced single file relation, presented unusual problems due to the difference in sizes and

thicknesses of the mail pieces normally encountered in a batch of letter mail, since this mail could not be readily stacked in vertical stacks, like the laminar sheets of identical size and thickness referred to above. The mail pieces could therefore not be moved successively by a positively driven conveyor roller from the top or bottom of a stack, and overlapping pieces could not be kept from entering the nip of the rollers on the opposite sides of the leading piece of mail which was being conveyed therethrough.

The edge feeding type of conveyor rollers presented less of a problem, and it was found possible to arrange the rollers and their drives in a manner that would provide reliable and effective singulation for letter mail fed thereto in batches of randomly overlapping mail pieces.

In the present singulator, as illustrated, there are three sets of roller pairs **20–22, 24–26** and **48–50,** with their nips **18, 28** and **72** arranged in spaced relation along the path of the mail pieces **10** which are fed thereto by a conveyor belt **12,** on which they are placed edgewise between guide walls **14** and **16.** The belt is passed over the top of the drum **11** substantially at the level of the top of the table **13,** which has a suitable opening **15** therfor.

The first set of rollers comprises a single pair **20–22,** for receiving the leading edges of the mail pieces **10** in the nip **18** between the rollers, one of which **20** is driven forwardly through friction clutches **78** and **74** having sufficient friction to normally move the mail pieces **10** by its highly frictional peripheral surfaces in contact therewith. The other roller **22** is reversely driven through a friction clutch **23** similar to clutch **74** but providing less frictional torque than the clutches **78** and **74** in the drive of the forwardly driven roller, but still considerably more than the low friction usually found between mail pieces, so that whenever an adjacent overlapping piece on the reverse driven roller side of the first piece **10′** like **10″** reaches the nip **18** of these rollers it is stopped by the reverse driven roller **22** until the first piece **10′** clears the nip **18.** Any overlapping piece like **10‴** that reaches the nip **18** on the driven side of the first piece **10′** before **10′** reaches nip **28,** is immediately picked up by the forwardly driven roller **20** and fed through the nip **18** while the first piece **10′** is driven backwardly by the reversely driven roller **22** and is held by it at the nip **18** until the forwardly driven piece **10‴** clears this nip. Thus, no more than one piece at a time will be allowed to pass through this nip **18.**

The second set of rollers comprises two roller pairs with their nips **28** spaced somewhat downstream from nip **18** along the path of the mail pieces **10** fed therethrough. These two pairs, **24A–26A** and **24B–26B,** are offset laterally on opposite sides from the single pair **20–22** of the first set, so that their axially overlapping portions will straddle the single pair.

The rollers **24A** and **24B** of the second set which are on one side of the path of mail are forwardly driven by gears **44A** and **44B** respectively, but may be driven at a higher speed than the roller **20.** The rollers **26A** and **26B** of the second set, on the other side of the mail path are idlers, or could be driven at the same speed as rollers **24A** and **24B,** and are biased thereagainst to accommodate varying thicknesses of the mail pieces **10** and to provide good friction feed by the driven rollers, if they are not driven themselves, so as to pull the

pieces through the first set of rollers at the higher speed and thereby to shift the brake lever **56** on which the slower driven roller **20** is mounted, from its normally biased "run" position **60** by spring **61,** into its brake or "stop" position **62,** for stopping the drive to this roller at the friction clutch **78,** whereby its friction clutch **74** will then allow it to be pulled forwardly at the higher speed of the mail piece passing therethrough.

It should be understood that if an additional piece of mail were to approach the nip **18** on the drive roller side of a piece already passing through this nip at this time, the drive roller **20** would stop and hold this additional piece of mail until the passing piece cleared this nip, when roller **20** would resume its normal forward drive.

The reason roller **20** would stop and hold the additional piece is that the first piece loses its contact with roller **20** as soon as the leading edge of the additional piece enters the nip and is held there because roller **20** is not being driven at this time. Roller **20** would prevent forward motion of the additional piece because its slip clutch friction is greater than the low friction between the mail pieces.

The third set of rollers comprises a single pair **48** and **50** having their nip **92** spaced downstream of the mail path from the nips **28** of the second set, a distance no greater than the shortest piece of mail **10** that may be fed therethrough. One of the rollers **48** is driven through a slip clutch **74** by shaft **90** at a still higher speed than that of the driven rollers **24–26** of the second set, the other roller **50** being either an idler or a driven roller biased against said roller **48** to accommodate the varying thicknesses of the mail pieces while providing good friction contact thereof with the positively driven roller **48.**

Since this roller **48** is driven through a slip clutch **74'** at a higher speed than the rollers of the second set, it will pull the mail pieces therefrom at the speed of said second set, even when the trailing portions of these pieces should extend into the nips **18** of the first set, until these trailing portions have cleared the corresponding nips **18** and **28,** when the slower drives are normally resumed at these nips as explained above.

At the output end of the mail path through this device, as the leading piece of mail **10** is fed to a cancelling machine at the high speed of the third set of rollers, it will space itself from the next piece **10** which is passing through the nips **28** a predetermined distance depending on the relative speeds of the second and third sets of rollers. Thus, this spacing and the output speed can be accurately controlled by a proper selection of said relative speed.

While this arrangement of the rollers is illustrated as examplary, it may obviously be changed and many other obvious modifications in the details as well as the arrangement of parts of this singulator device may be made without departing from the spirit and scope of the present invention.

It will be observed in the drawings, that the roller **20** is driven by pully **72** through the slip clutch **74** in the hub. Pulley **72,** in turn, is driven by a belt from pulley **70** which is fixed to shaft **58.** Shaft **58** is driven by pulley **76** through the slip clutch **78,** which permits the shaft **58** to be braked by brake means **84–86–80** to a stop when lever **56** is moved to its "stop" position, which causes the sleeve member **84,** fixed to said lever, to tighten the coiled spring **86** about both the movable hub **80** and the stationary hub **82** to provide more friction between said hubs than the driven torque of the slip clutch **78,** thus causing this clutch to slip, leaving the drive shaft **58** motionless. When lever **56** is returned to its normal "run" position **60** by the spring **61** and the spring **86** is thus loosened, it releases the drive shaft **58** so that roller **20** may again be normally driven by the pulley **76** through the slip clutchs **78** and **74.**

Obviously there are other ways of achieving this drive control of the forwardly driven roller of the first pair. For example, roller **20** could be driven through an electric clutch instead of the slip clutch **78.** Rotation of the roller **20** could then be controlled by means of a photocell and lamp positioned across the mail stream.

What is claimed is:

1. In a singulator device for letter mail pieces of various sizes and thicknesses,

a first pair of rollers having high friction peripheral surfaces biased against each other to form a nip for receiving the leading edges of mail pieces as they are edge fed thereto,

one of said rollers having a forward drive means with a substantially high torque slip clutch therein,

the other roller having a reverse drive means with a lower torque slip clutch for moving back any adjacent overlapping pieces in said nip,

means for stopping said forward drive in response to a pull of a mail piece through the nip of said rollers forwardly at a greater speed than the normal forward drive thereof,

a second pair of similarly biased rollers having its nip spaced downstream from that of said first pair,

said second pair of rollers being driven forwardly at a higher speed than the first pair, so as to pull a mail piece entering its nip through the nip of said first pair of rollers and cause the forward drive means of said first pair to stop and the normally forwardly driven roller of said first pair to prevent any adjacent overlapping pieces from entering the nip of said first pair of rollers before said pulled piece passes therethrough.

2. The combination of a singulator device as defined in claim **1,** further having

a third pair of rollers spaced further downstream from said second pair not more than the length of the shortest piece of mail to be fed therethrough,

said third pair of rollers being driven at a suitably higher speed through a slip clutch to protect the pieces stretched between said second and third nips from excessive stress while providing for a suitable spacing between pieces in the output.

3. The combination of a singulator device as defined in claim **1,**

said second pair of rollers being laterally offset from said first pair so that they may axially overlap each other in the direction of the pair of the mail pieces and the spacing of their nips may be made suitably small.

4. The combination of a singulator device as defined in claim **3,** and

a third pair of rollers like the second pair symmetrically offset to the other side of said first pair, to stabilize the linear stresses on the mail pieces stretched between the axially spaced nips.

5. The combination of a singulator device as defined in claim **4,** and

a fourth pair of rollers spaced further downstream from said second and third pairs not more than the length of the shortest piece of mail to be fed thereto,

said fourth pair having a drive roller and an idler biased against it and frictionally driven thereby, said drive roller being driven at a higher speed than the second and third pairs, through a slip clutch to protect the pieces stretched between their nips from excessive stress while providing for a suitable spacing between pieces in the output as controlled by the relative speeds of said drives.

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