Jan. 19, 1965 K. REHM 3,166,313

ARTICLE HANDLING DEVICE

Filed Aug. 24, 1961 4 Sheets-Sheet 1

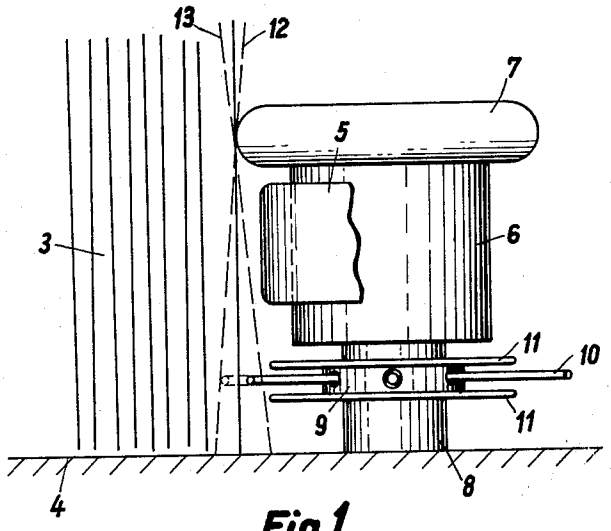


Fig.1

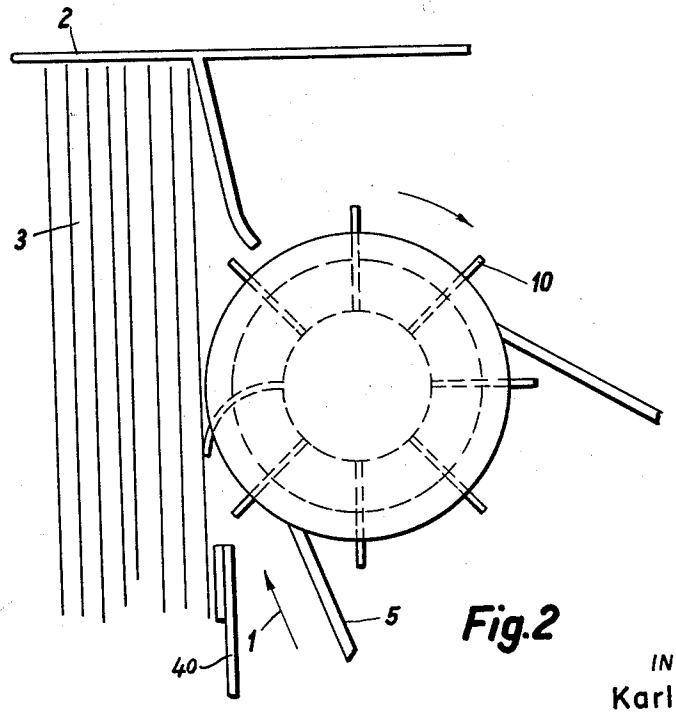


Fig.2

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ARTICLE HANDLING DEVICE

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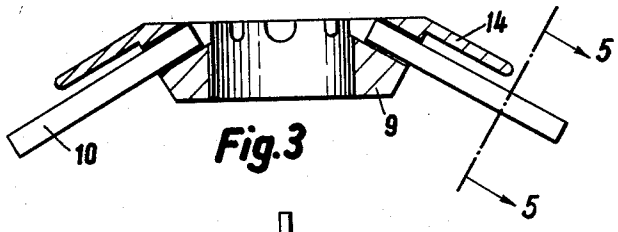


Fig.3

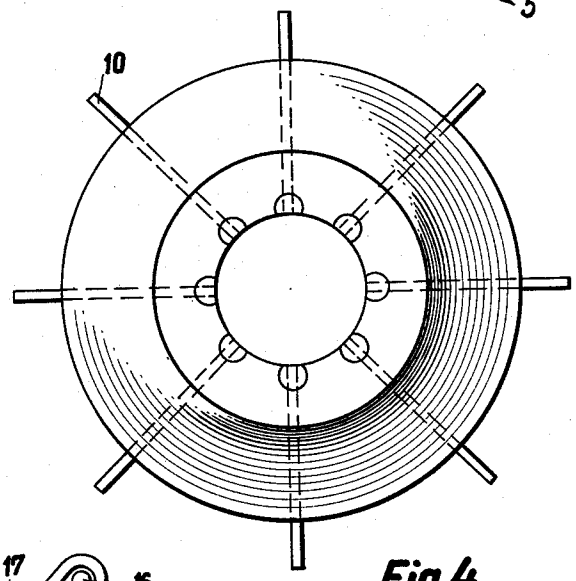


Fig.4

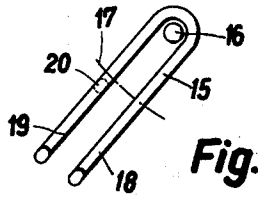


Fig.6

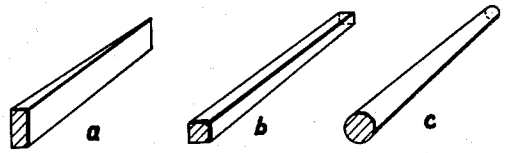


Fig.5

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ARTICLE HANDLING DEVICE

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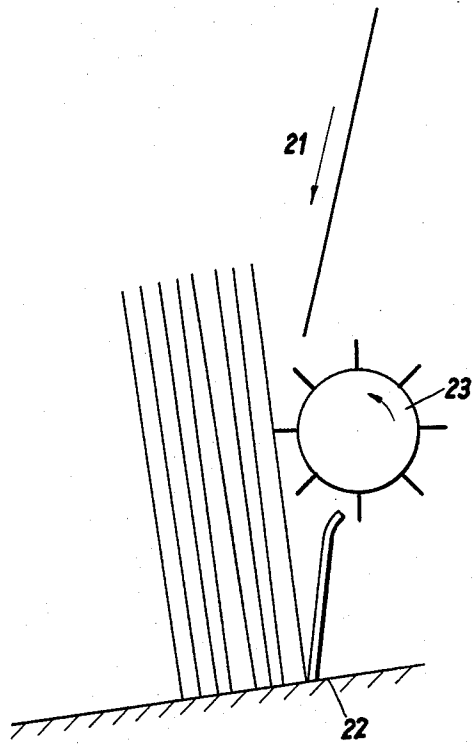


Fig.7

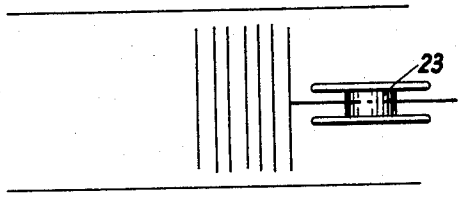


Fig.8

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ARTICLE HANDLING DEVICE

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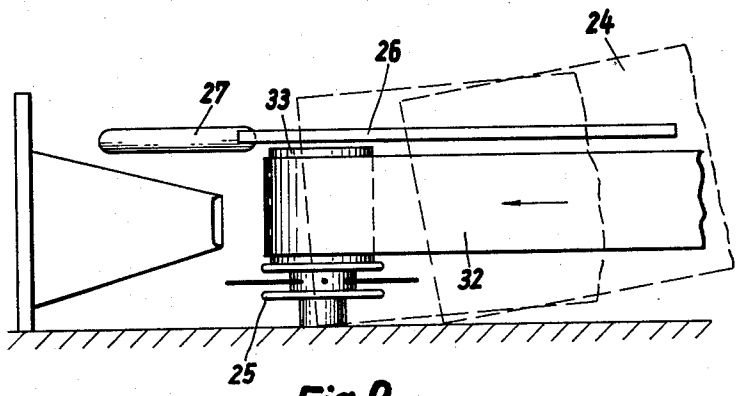


Fig.9

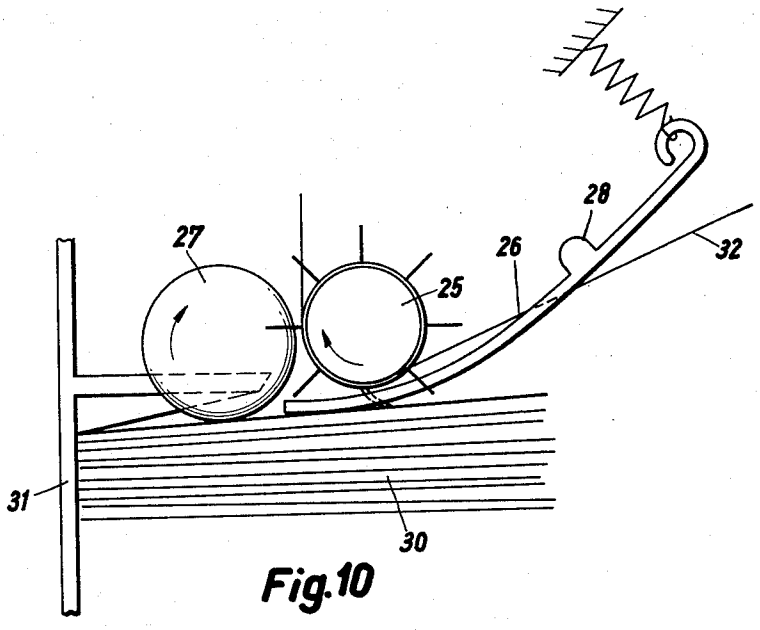


Fig.10

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United States Patent Office 3,166,313 Patented Jan. 19, 1965

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ARTICLE HANDLING DEVICE

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16 Claims. (Cl. 271—86)

The present invention relates generally to article handling devices, and, more particularly, to a device for stacking material to be conveyed, such as mail shipments.

Flat material to be conveyed, and especially mail shipments, such as postal checks and forms, are frequently stacked in automatic devices. In a device proposed elsewhere, shipments are fed along an upright conveying path and move against a stationary wall which serves as reference edge for the stack. The stacked shipments stand substantially upright on a movable stack support, which may be an endless belt. The feeding device is movable with respect to the stack support. The movement of the feeding device with respect to the stack is usually controlled by a probing lever.

Individual shipments have different properties. There are light shipments which, under certain circumstances, are so sharply stopped or braked upon entering that they do not travel as far as the stationary wall. With light shipments there is also the danger that they will stand up in the stack especially if they are delivered from the conveying path with their bottom edges slightly tilted with respect to the stack support. There is also danger with heavy or smooth shipments, since they may recoil or bounce back a bit after impact with the stationary wall. Considered together, these occurrences are detrimental to good and proper stack formation.

With these defects of the prior art in mind, it is a main object of this invention to provide a stacker wherein proper and even stacking may be attained even when handling shipments of different sizes and weights.

Another object of the invention is to provide a stacker which may operate properly when disposed in any position whatsoever.

A further object is to provide a stacker which is particularly useful for proper and even stacking of light shipments.

Still a further object is to prevent rebounding of heavier shipments fed to the stacker and to assure that lighter shipments arrive at their destination before a braking effect brings them to a halt.

These objects and others ancillary thereto are accomplished according to preferred embodiments of the invention wherein a stationary wall is provided to align the shipments fed to the stacker by conveyor feed means. A rotating roller is provided having projecting bristles which engage the shipments and assure that their leading edges abut against the stationary wall. The roller is designed so that bending movement of the bristles is confined to a radial plane of the roller.

Additional objects and advantages of the present invention will become apparent upon consideration of the following description when taken in conjunction with the accompanying drawings in which:

FIGURE 1 is an elevational view of a stacker to which the shipments are fed laterally.

FIGURE 2 is a plan view of the stacker illustrated in FIGURE 1.

FIGURE 3 is a sectional view of one type of brush roller.

FIGURE 4 is a plan view of the roller illustrated in FIGURE 3.

FIGURES 5*a*–5*c* are fragmentary perspective views of different cross section bristles which may be used, with

the section being taken generally along line 5—5 of FIGURE 3.

FIGURE 6 is a schematic view of a pair of bristles formed of a single element.

FIGURE 7 is an elevational view of a stacker to which the shipments are fed from the top.

FIGURE 8 is a plan view of the stacker illustrated in FIGURE 7.

FIGURE 9 is a side elevational view of a stacker having means particularly adapted to handle light shipments.

FIGURE 10 is a bottom view of the stacker illustrated in FIGURE 9 with the shipments omitted.

With more particular reference to the drawing, FIGURES 1 and 2 show the shipments being fed in the direction of arrow **1** along an upright conveying path to the stacker. The shipments strike against a stationary wall **2**, at which they are stopped or braked. The stacked shipments **3** rest on a stack support **4** which is usually movable and which can be fashioned in a manner known per se as a conveyor belt which is slowly driven in a direction toward the head of the stack. One belt **5** of the upright conveying means is guided around roller **6**. The use of a cambered roller **7** which supports the shipments in their movement toward stationary wall **2** due to their inertia is known in the art. The cambered roller **7** and roller **6** are mounted on a common shaft **8**. At the foot of shaft **8**, a feeler or probing lever **40** is usually provided which responds to changes in the stack length. This lever controls the relative movement between the head of the stack and the stacker entrance unit or the unit which carries the rotating stacking member and the delivery end of the conveyor means in response to the prevailing stack length. The drive mechanism which interconnects the lever and the stacker entrance unit is not shown. The probing lever is adjusted so that the shipments press against each other in stack **3** with a certain pressure, which is called the stack pressure.

If light shipments, especially postcards, are moved in the direction of the arrow **1** toward the stationary wall **2**, they are braked by contact with the stacked shipments and especially by the stack support **4**. Therefore, a tipping moment is exerted on these shipments and there is danger that the light shipments will become obliquely disposed in the stack, by lifting their rear corners, or they may even stand up on their shorter edges. This movement to oblique position is enhanced by the cambered roller **7** which imparts a force to the top portion of the shipments which increases their speed in this region.

In order to prevent light shipments from becoming obliquely disposed, the present invention provides a brush roller **9** having elastic bristles **10**. The brush roller is positioned so that the bristles engage the shipments in their lower portions. The bristles compensate for the braking forces. Therefore, the shipments move uniformly against stationary wall **2**. Moreover, rebounding which may occur with heavy or slippery shipments is prevented by the bristles **10**.

The bristles **10** are preferably made of a material having a high coefficient of friction, for example, perlon fiber, polyvinyl chloride, or Vulkolan. It is important that the elastic bristles only bend in the radial plane of the brush roller. If the bristles were allowed to bend upward in the axial direction of the brush roller, they would push upwardly on a shipment and raise it or cause it to stand up. In order to prevent axial flexing of the bristles, two plane circular disks **11** are provided on the roller above and below the bristles. The radius of these disks is less than the length of the bristles and the disks prevent movement of the bristles in axial direction.

The above-mentioned probing lever has a small amount of play or control deflection, and the shipments may abut against the stack in a slightly inclined position, as indicated by dash lines 12 or 13. The bristles 10 must be sufficiently long that even a shipment 12 will be securely engaged thereby.

Bristles 10 may be placed in the brush roller 9 and tilted obliquely downwardly with respect to the axis of the brush roller (FIGURES 3, 4). However, the bristles 10 may bend upwardly. A downwardly sloping conical surface 14 may be provided, to maintain bristles 10 in proper position. Flexing of bristles 10 downwardly is not disturbing since this would press the shipments against the stack support, which is desirable.

The bristles may be provided with different cross sections. FIGURES 5*a*, 5*b* and 5*c* show bristles with rectangular, square, and circular cross sections, respectively. Bristles having a rectangular cross section are fastened to the brush roller with the longer side of the rectangle oriented in the direction of the axis of the brush roller. This results in lengthwise stability of the bristles in the direction of the roller axis so they will not bend upwardly or downwardly. With this construction the circular disks 11 may, under certain circumstances, be omitted.

The bristles may also be combined into pairs. Preferably, a bristle 15 will be bent over, as shown in FIGURE 6. This bristle may be inserted in openings provided in brush roller 9 and held in position by a pin 16, for example. The dash line 17 indicates the position of the periphery of circular disk 11. The two ends of the bristles 18 and 19 may have different lengths. This may be accomplished by cutting the end 19 at point 20 so that it projects only slightly outwardly of the circular disk 17. With such an arrangement shipments in the stack which assume position 12 are engaged only by the end 18. With shipments which assume position 13, end 18 will bend over, and the shipment will be moved against wall 2 by the short end 20.

FIGURES 7 and 8 illustrate an embodiment wherein the shipments are fed from the top in the direction of arrow 21. The shipments stand at substantially right angles to the stationary wall 22. The brush roller 23 assures that even light shipments travel as far as the stationary wall 22 and are not previously arrested by a braking effect. In this arrangement, the brush roller 23 is positioned so as to engage the shipments approximately along their central portions in the direction of conveying.

The device may be arranged so that the shipments assume any other inclined position whatever in the stack. The use of the brush roller according to the present invention provides good stack formation with any shipment feeding arrangement.

FIGURES 9 and 10 show a further embodiment of the invention. Shipments 24 are delivered by the upright conveying means in an inclined position. Such shipments are accelerated too much by the cambered roller 27 so that the brush roller arrangement notwithstanding, there is danger of such shipments becoming obliquely disposed or standing up on their shorter edges in the stack. In order to prevent this, a resiliently supported brake yoke 26 is arranged above the brush roller 25, which brakes the shipments along their upper portions. The cambered roller 27 is provided adjacent to the brush roller but closer to the stationary wall 2. The brake yoke is supported at 28 and is pressed against stack 30 by the spring 29 with a fixed braking force. It brakes all shipments in their upper portions while, at the same time, the brush roller 25 continues moving the lower portions of the shipments. This renders it impossible for a shipment to become obliquely disposed. The cambered roller 27 assures that all shipments strike against the stationary wall 31. One belt of the upright conveying means 32 is guided around the roller 33 mounted on the shaft of the brush roller. This further feature of the invention makes it possible to stack even those shipments which are conveyed in an oblique position securely. This precautionary measure is important, especially when handling light shipments.

It will be understood that the above description of the present invention is susceptible to various modifications, changes, and adaptations, and the same are intended to be comprehended within the meaning and range of equivalents of the appended claims.

What is claimed is:

1. A stacking device for flat material to be conveyed, especially mail shipments, comprising, in combination: means forming a conveying path for shipments; a stationary wall against which the leading edges of shipments abut by being delivered from said conveying path; and a rotating stacking member at the delivery end of said path for aiding the stacking of shipments being delivered from said path against said wall by engagement with such shipments, said stacking member being a roller having bristle means extending therefrom and including bristles which are relatively limited in their flexing movement in the axial direction of the roller with respect to their flexing movement in the radial direction.

2. A stacking device as defined in claim 1, wherein said bristle means include two plane circular disks disposed above and below the bristles, respectively, the radius of said disks being smaller than the length of the bristles and preventing movement of the bristles in axial direction.

3. A stacking device for flat material to be conveyed, especially mail shipments, comprising, in combination: means forming a conveying path for shipments; a stationary wall against which the leading edges of shipments abut by being delivered from said conveying path; and a rotating stacking member at the delivery end of said path for aiding the stacking of shipments being delivered from said path against said wall by engagement with such shipments, said stacking member being a roller having bristle means extending therefrom and including bristles which are relatively limited in their flexing movement in the axial direction of the roller with respect to their flexing movement in the radial direction, said bristle means including bristles having rectangular cross sections, the longer sides of the rectangles being oriented in the direction of the roller axis.

4. A stacking device as defined in claim 1, wherein the bristles are formed in pairs and a common element holding each pair in place.

5. A stacking device as defined in claim 4, wherein the bristles forming a pair are of different length.

6. A stacking device according to claim 1, wherein the bristles are made of a material having a high coefficient of friction.

7. A stacking device as defined in claim 1, comprising a control probing lever which may be deflected for measuring the thickness of the stack, the bristle ends of said bristle means being movable in radial direction a distance greater than the control deflection of said probing lever.

8. A stacking device for flat material to be conveyed, especially mail shipments, comprising, in combination: means forming a conveying path for shipments; a stationary wall disposed laterally of said path and against which the leading edges of shipments abut by being delivered from said conveying path; and a rotating stacking member at the delivery end of said path for aiding the stacking of shipments being delivered from said path against said wall by engaging the lower portions of shipments being delivered, said stacking member being a brush roller having bristle means extending therefrom and including bristles which are relatively limited in their flexing movement in the axial direction of the roller with respect to their flexing movement in the radial direction.

9. A stacking device for flat material to be conveyed, especially mail shipments, comprising, in combination: means forming a conveying path for shipments; a stationary wall disposed laterally of said path and against

which the leading edges of shipments abut by being delivered from said conveying path; a rotating stacking member at the delivery end of said path for aiding the stacking of shipments being delivered from said path against said wall by engaging the lower portions of shipments being delivered, said stacking member being a brush roller having bristle means extending therefrom and including bristles which are relatively limited in their flexing movement in the axial direction of the roller with respect to their flexing movement in the radial direction; and a cambered roller disposed above said brush roller and mounted on the same shaft.

10. A stacking device for flat material to be conveyed, especially mail shipments, comprising, in combination: means forming a conveying path for shipments; a stationary wall disposed laterally of said path and against which the leading edges of shipments abut by being delivered from said conveying path; and a rotating stacking member at the delivery end of said path for aiding the stacking of shipments being delivered from said path against said wall by engaging the lower portions of shipments being delivered, said stacking member being a brush roller having bristle means extending therefrom and including bristles which are relatively limited in their flexing movement in the axial direction of the roller with respect to their flexing movement in the radial direction, said path forming means including a roller disposed above and coaxial with the brush roller, and a belt guided around said coaxial roller.

11. A stacking device for flat material to be conveyed, especially mail shipments, comprising, in combination: means forming a conveying path for shipments; a stationwall disposed laterally of said path and against which the leading edges of shipments abut by being delivered from said conveying path; and a rotating stacking member at the delivery end of said path for aiding the stacking of shipments being delivered from said path against said wall by engaging the lower portions of shipments being delivered, said stacking member being a brush roller having bristle means extending therefrom and including bristles which are relatively limited in their flexing movement in the axial direction of the roller with respect to their flexing movement in the radial direction, the bristles being inclined with respect to radial planes of the brush roller in a direction toward the lower portions of the shipments.

12. A stacking device as defined in claim 11, comprising a conical element disposed immediately above the bristles and sloping in the same direction as the bristles, the largest radius of said element being smaller than the length of the bristles.

13. A stacking device as defined in claim 8, comprising a resiliently supported brake yoke above the brush roller for braking the movement of the shipments in their upper portions.

14. A stacking device for flat material to be conveyed, especially mail shipments, comprising, in combination: means forming a conveying path for shipments; a stationary wall disposed laterally of said path and against which the leading edges of shipments abut by being delivered from said conveying path; a rotating stacking member at the delivery end of said path for aiding the stacking of shipments being delivered from said path against said wall by engaging the lower portions of shipments being delivered, said stacking member being a brush roller having bristle means extending therefrom and including bristles which are relatively limited in their flexing movement in the axial direction of the roller with respect to their flexing movement in the radial direction; a resiliently supported brake yoke above the brush roller for braking the movement of the shipments in their upper portions; and a rotating cambered roller between the brush roller and the stationary wall for engaging the shipments in their upper portions and moving them towards said stationary wall.

15. A stacking device for flat material to be conveyed, especially mail shipments, comprising, in combination: means forming a conveying path for shipments; a horizontally disposed stationary wall below said path and against which the leading edges of shipments abut by being delivered from said conveying path; and a stacking member rotatable about a horizontal axis at the delivery end of said path for aiding the upright stacking of shipments being delivered from said path against said wall by contact with the shipments, said stacking member being a brush roller having bristle means extending therefrom and including bristles which are relatively limited in their flexing movement in the axial direction of the roller with respect to their flexing movement in the radial direction.

16. A stacking device as defined in claim 15, wherein said brush roller is arranged so its bristles engage the shipments approximately along their central portions in the direction of conveying.

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