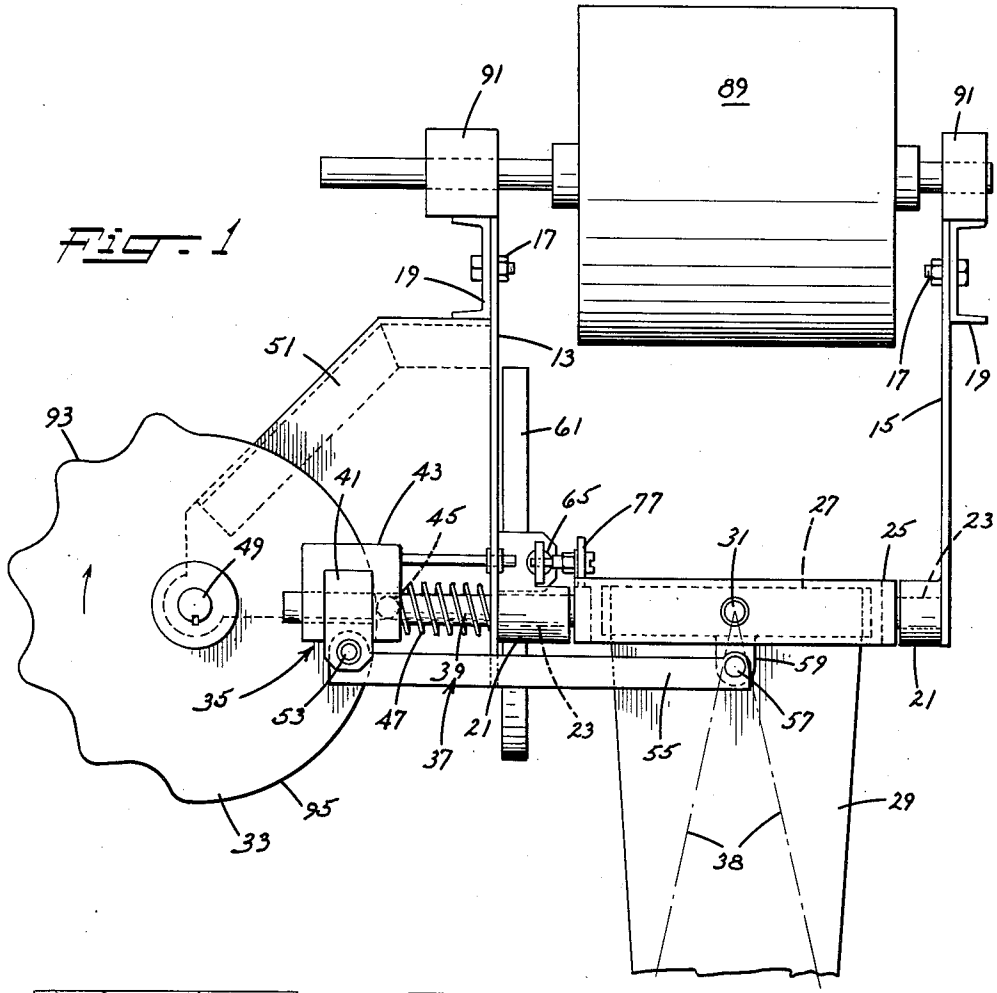
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TOW PACKAGING PLAITER

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Fig. 1



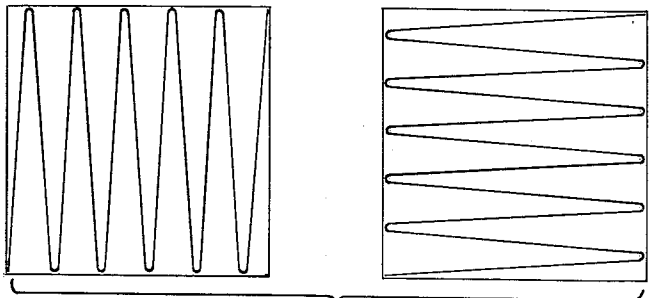


Fig. 5

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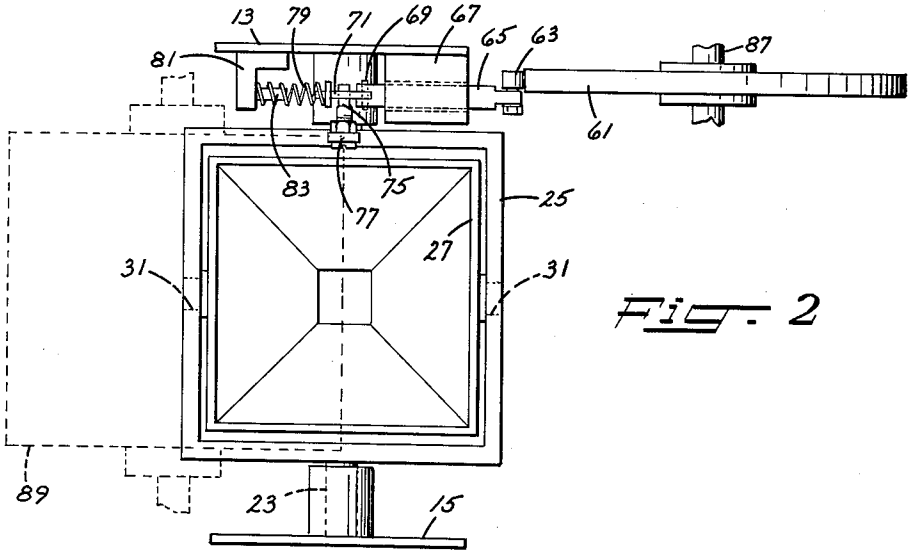


Fig. 2

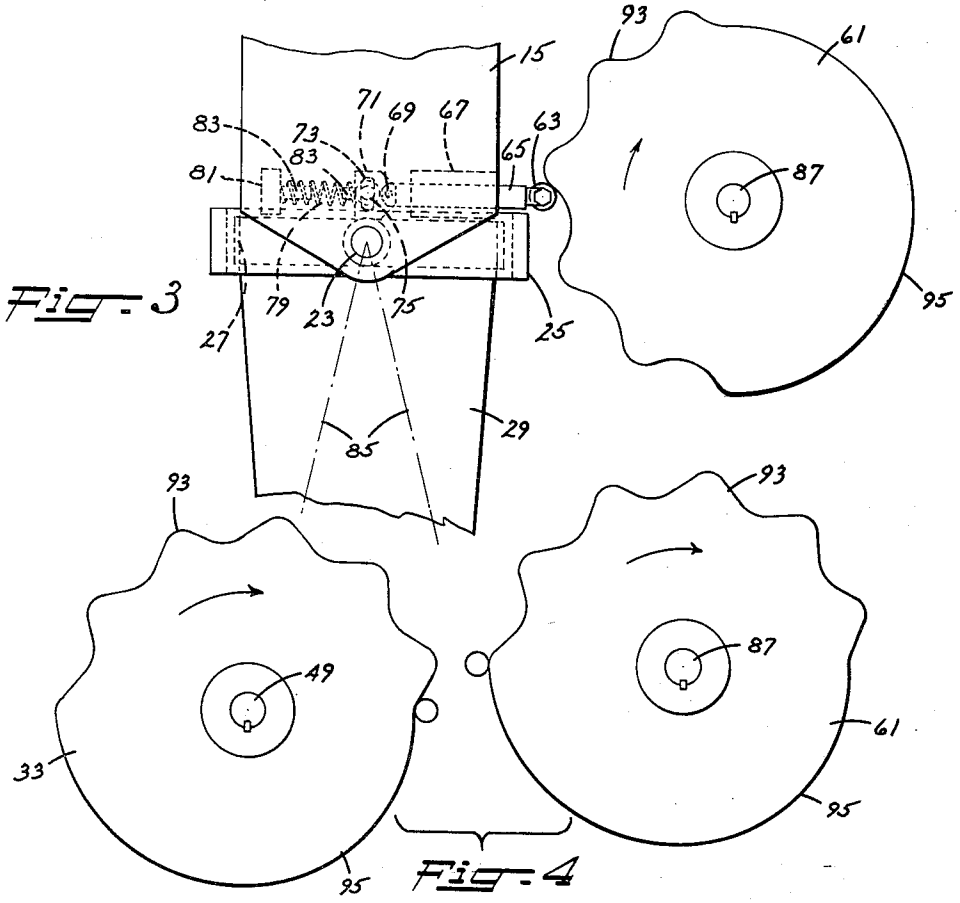


Fig. 3

Fig. 4

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TOW PACKAGING PLAITER

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7 Claims. (Cl. 28—21)

The present invention relates to improved apparatus for depositing filamentary material in an orderly arrangement to permit the same to be withdrawn in a uniform manner and without entanglement.

In general, the mode of collecting strand or filamentary materials, either as a self-supporting package or in cartons for transport, is dependent upon two primary considerations; namely, the provision of a compact package, and one which permits the filamentary material to be withdrawn uniformly and without entanglement. While various proposals have been made for attaining both of the above-mentioned objects, complete satisfaction has not been achieved from the standpoint of the resulting package formation or the simplicity of the apparatus required. For example, folding the filamentary material into neat and uniform overlapping layers often results in a loose package formation in which the filamentary material becomes packed and tangled during transit. Alternatively, employing conventional equipment to secure a compact bundling of the filamentary material most usually is achieved at a sacrifice in the ease with which the material may be subsequently withdrawn. Accordingly, a primary object of this invention is to provide an improved apparatus for collecting filamentary material as a compact package from which the filamentary material may be easily and uniformly withdrawn.

Another object of the invention is the provision of a simple and improved apparatus for progressively arranging filamentary material into a series of superposed layers, with the filamentary material of each layer extending along a sinuous path.

A still further object is to provide an apparatus for folding filamentary material into a series of superposed layers, with the material of each layer disposed in lapped arrangement, and with the laps of adjacent layers extending at substantially right angles to each other.

These and other objects and advantages of the invention will be apparent from the following description and accompanying drawing in which:

FIGURE 1 is a front view of a portion of the apparatus of the present invention;

FIGURE 2 is a top view of the apparatus shown in FIGURE 1;

FIGURE 3 is a right side view of the structure shown in FIGURE 1;

FIGURE 4 is a diagrammatic view illustrating cooperating cams for effecting concomitant oscillation of a filamentary material guide means in accordance with a desired pattern; and

FIGURE 5 is a plan view of adjacent layers from a finished package showing the lap arrangement of the filamentary material.

In general, the apparatus of the present invention is designed to progressively arrange filamentary material into a series of superposed layers, with the filamentary material of each layer being lapped or plaited and with the laps of adjacent layers extending at substantially

right angles to each other. Depositing the filamentary material along this predetermined pattern is achieved by passing the same through a guide means which is pivotally mounted within a support frame for movement about a horizontal axis. The support frame is in turn mounted for pivotal movement about a horizontal axis disposed at substantially right angles to the pivot axis of the guide means. A pair of rotatable plate cams are operatively connected with the guide means and support frame for alternately oscillating the same at high and low frequencies during substantially equal portions of each revolution of the cams. The plate cams are substantially identical in size and shape but are disposed 180° out of phase so that both the guide means and support frame are simultaneously oscillated at different frequencies.

The teachings of the present invention are adapted for use with materials in a variety of forms, such as yarns, threads, and tows, which are included within the terms "strand" and "filamentary material" used throughout the description and claims.

With reference to the drawing, the apparatus of the present invention is disposed over a collection conveyor or receptacle packaging station by a suitable supporting framework including side plates 13 and 15 which are bolted at 17 to structural channel sections 19. Bearings 21 are fixed to the lower ends of the side plates 13 and 15 and pivotally receive trunnions 23 which project from opposite sides of rectangular support frame 25. A strand guide member 27, which includes a downwardly extending elongated funnel 29, is pivotally mounted within the frame 25 by trunnions 31 which extend along an axis at substantially right angles to the axis of trunnions 23.

A rotatable plate cam 33, acting through a translating slide mechanism, indicated generally at 35, and a link 37, serves to oscillate the strand guide member 27 about the trunnions 31 and thus move the center line of the funnel 29 between positions as indicated by broken lines 38 in FIGURE 1. The slide mechanism 35 is movably mounted on a rod 39 projecting from the slide plate 13 and includes a slide block 41 disposed between the bifurcated arms of a slide yoke 43. A follower roll 45 is carried by the slide yoke 43 and is resiliently urged into engagement with the periphery of the cam 33 by a compression spring 47 which is interposed between the side plate 13 and the slide yoke 43. The cam 33 is keyed to a drive shaft 49 which is carried by a bracket 51 and, as more fully described hereafter, is provided with a peripheral contour which will effect oscillation of the strand guide member at desired frequencies. The link 37 is connected at one end to the slide block 41 by a pivot pin 53, and is in the form of a yoke having arms 55 which are in turn pivoted at 57 to lugs 59 formed integrally with and depending from strand guide member 27.

Concomitantly with the movement of the funnel 29, as described above, a rotatable plate cam 61 serves to oscillate the support frame 25 about its trunnions 23. The cam 61 is identical to the cam 33 in size and shape and is engaged at its periphery by a follower roll 63 which is carried at one end of a push or follower rod 65. The follower rod 65 is slidably mounted within bearings 67 which are fixed to the side plate 13, and is pivotally connected at 69 to a pivot block 71. An elongated slot 73 is formed in the pivot block 71 and receives a pin 75 which projects from an upstanding lug 77 fixed to the frame 25. A spring 79 is interposed between the pivot

block 71 and an abutment 81 which is preferably adjustably carried by the side plate 13 to permit the spring 79 to be compressed or loaded to a desired degree. The pivot block 71 and the abutment 81 are each provided with guide pins 83 to retain the spring 79 in desired position.

From the structure described, it will be apparent that movement of the push rod 65 and the pivot block 71 to the left, as viewed in FIGURE 3, causes the eccentric pin 75 and support frame 25 to pivot in a counterclockwise direction about the trunnions 23. During this movement, the spring 79 is compressed and thus serves to urge the pivot block 71 and push rod 65 to the right when the follower roll 63 rides along a notched or valley portion of the plate cam 61. With this latter movement of the pivot block 71, the pin 75 and the support frame 25 are urged in a clockwise direction about the trunnions 23 and thus the center line of the funnel 29 oscillates between extreme positions as indicated in FIGURE 3 by broken lines 85.

A shaft 87 carries the plate cam 61 and is operatively connected to the shaft 49, with conventional drive means, not shown, being provided for rotating both of these shafts at substantially the same speed. A strand feed roll 89 is also connected to the drive means and is rotatably supported above the funnel 29 by bearings 91 which are fixed to the structural channel sections 19. As shown by broken lines in FIGURE 2, the periphery of the feed roll 89 lies along a plane passing through the axis of the trunnions 23 and thus a strand passing over the roll 89 will be delivered substantially centrally of the funnel 29.

As heretofore mentioned, the plate cams 33 and 61 are of identical size and shape, with their peripheries each having a sinuated portion 93 and a smooth arcuate portion 95 which extends eccentrically with respect to the axis of the individual cams. The sinuated portions 93 of the respective cams 33 and 61 are each designed to impart a relatively high frequency oscillation to the strand guide member 27 and support frame 25, respectively. On the other hand, the smooth arcuate portions 95 of the cams 33 and 61 serve to move the respective guide member 27 and support frame 25 at a low frequency; namely, through one half of an oscillation cycle or a single stroke.

The cams 33 and 61 are disposed 180° out of phase, as shown in FIGURES 1, 3 and 4, so as to oscillate the support frame 25 and the strand guide member 27 alternately at a high and low frequency. Thus, upon rotation of the cams 33 and 61, the support frame 25 is oscillated at a high frequency by the sinuated portion of the cam 61, while the smooth arcuate portion 95 of the cam 33 permits the strand-guide member 27 to simultaneously move through a single stroke. With this concomitant movement of the support frame 25 and the strand guide member 27, a strand delivered to the funnel 29 will be deposited in a sinuous pattern as illustrated at the left side of FIGURE 5. As the sinuated portion 93 of the cam 33 moves into engagement with the slide mechanism 35, the smooth arcuate portion 95 of the cam 61 simultaneously engages with the follower roll 63 and thus the movements of the support frame 25 and strand-guide member 27 are reversed from that described above. With the strand guide member 27 now being oscillated at a high frequency, the funnel 29 deposits the strand material in a sinuous pattern as illustrated at the right side of FIGURE 5. Since the sinuous strand patterns of the adjacent package layers extend at substantially right angles to each other, it will be apparent that the finished package has good stability, yet permits strand withdrawal without entanglement.

As shown in the drawing, the use of identical plate cams 33 and 61 permits the formation of a strand package of substantially rectangular cross-section. It will be understood, however, that the peripheral shape of the plate cams may be changed from that illustrated to vary either the sinuous pattern of the strand or the cross-sectional shape of the package, or both. For example, the strand laps may be disposed closer or further apart merely by varying the spacing between the projections on the sinuated portion 93 of one or both cams. Further, by providing one cam with a smooth arcuate portion 95 of increased length over that illustrated on the drawing, and the other cam with a sinuated portion 93 of corresponding length, the strand may be deposited into a package of rectangular cross-section.

While preferred embodiments of the invention have been shown and described, it is to be understood that changes and variations may be made without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. Apparatus for depositing a strand along a predetermined pattern including a fixed supporting structure, a frame mounted on the supporting structure for pivotal movement about a first axis, strand-guide means mounted on the frame for pivotal movement about a second axis, means for oscillating said frame and strand-guide means in alternating relation at different frequencies, said last-mentioned means including a cam, means for rotating said cam whereby said frame is oscillated at a high frequency during part of each revolution of the cam and at a low frequency during the remainder of such cam revolution, a second cam operatively connected with said strand-guide means, and means for rotating said cams at a substantially uniform rate.

2. Apparatus as defined in claim 1 wherein said cams each include an eccentric peripheral portion for effecting oscillation of said frame and strand-guide means at a high frequency during part of each revolution and at a low frequency during the remainder of such revolution, said cams being mounted in out of phase relationship whereby said high and low frequency oscillation of said frame and strand-guide means is effected in alternating relation.

3. Apparatus for depositing a strand along a predetermined pattern including a fixed supporting structure, a frame mounted on the supporting structure for pivotal movement about a first axis, strand-guide means mounted on the frame for pivotal movement about a second axis, a pair of substantially identical plate cams for oscillating said frame and strand-guide means alternately at a high frequency during one-half revolution of said cams and at a low frequency during the remainder of such revolution, means for rotating said cams at a substantially uniform rate, cam follower means engaging with the periphery of one of said cams and connected to said frame, second cam follower means engaging with the other of said cams and connected to said strand-guide means, said cams being mounted in 180° out of phase relationship whereby said high and low frequency oscillation of said frame and strand-guide means is effected in alternating relation.

4. Apparatus as defined in claim 3 wherein the peripheries of said plate cams are shaped to oscillate one of said frame and strand-guide means through a single stroke while the other of said frame and strand-guide means is oscillated through a plurality of strokes whereby the strand is deposited along a sinuous path.

5. Apparatus as defined in claim 3 wherein said first-mentioned follower means includes a follower rod mounted for slidable movement relative to said fixed supporting structure and having one end engaging with the periphery of one of said cams, a pivot block connected to the opposite end of said follower rod, a slot disposed along a vertical plane passing through said first axis, a pin fixed to said frame and projecting into said pivot block slot, and resilient means acting on said follower rod for maintaining the same engaged with said one cam.

6. Apparatus as defined in claim 3 wherein said second follower means includes a block mounted for movement relative to said fixed supporting structure, a follower roll

operatively connected with said block and engaging with the periphery of said other cam, and a yoke connected at one end to said slide block and pivotally mounted to said strand-guide means.

7. Apparatus as defined in claim 3 wherein said plate cams are each formed with a peripheral portion shaped to reciprocate the respective follower means through a series of uniform strokes during substantially one-half revolution of the cams, and a smooth peripheral portion extending eccentrically of the respective cam axis for

reciprocating said follower means through a single stroke during the remaining portion of each cam revolution.

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