Feb. 3, 1970 C. C. GERDING 3,492,782

PACKAGING OF FIBERS

Filed Jan. 18, 1968 2 Sheets-Sheet 1

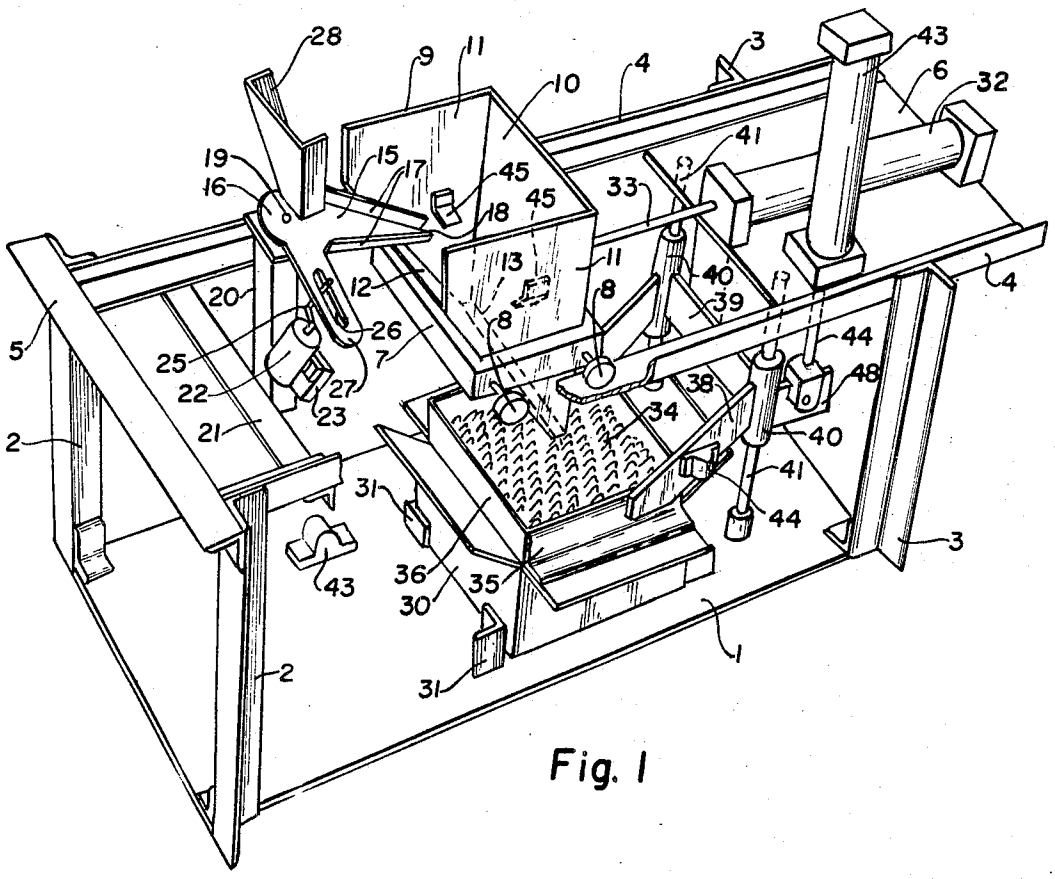


Fig. 1

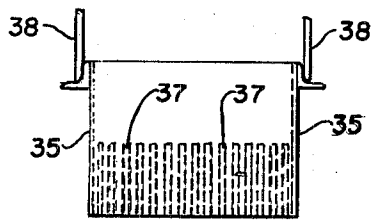


Fig. 4

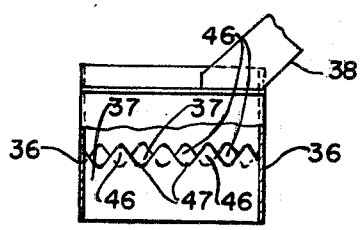


Fig. 3

INVENTOR
CHARLES C. GERDING
BY
J. R. Harris
ATTORNEY

Feb. 3, 1970 C. C. GERDING 3,492,782

PACKAGING OF FIBERS

Filed Jan. 18, 1968 2 Sheets-Sheet 2

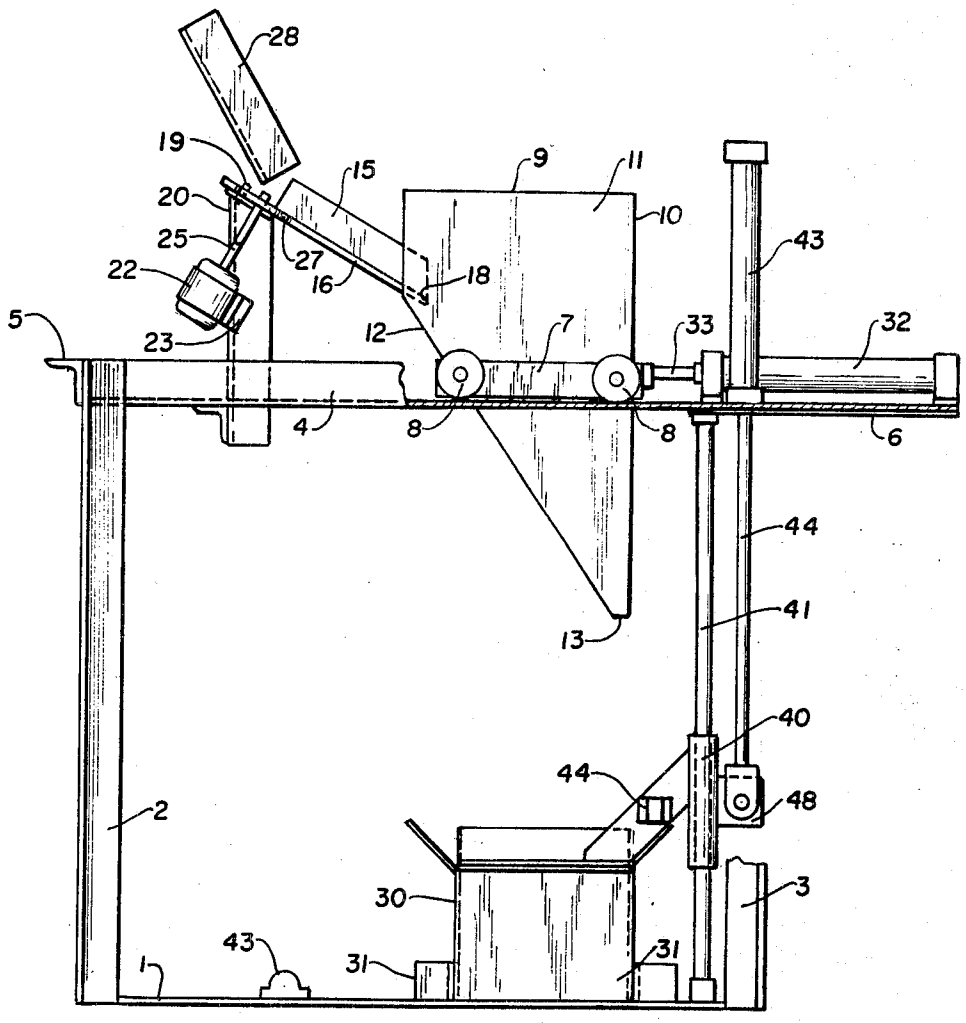


Fig. 2

INVENTOR
CHARLES C. GERDING
BY
GK Harris
ATTORNEY

United States Patent Office 3,492,782
Patented Feb. 3, 1970

3,492,782

PACKAGING OF FIBERS

Charles Christian Gerding, Pittsburgh, Pa., assignor to Jones & Laughlin Steel Corporation, Pittsburgh, Pa., a corporation of Pennsylvania

Filed Jan. 18, 1968, Ser. No. 703,215
Int. Cl. B65b 1/06, 35/56, 37/04
U.S. Cl. 53—126 7 Claims

ABSTRACT OF THE DISCLOSURE

Randomly oriented fibers are formed into a stream of axially aligned fibers which is swept back and forth across a container and simultaneously caused to reciprocate in the direction of fiber alignment. The apparatus comprises a converging scanning chute, a lower end of which is caused to reciprocate across a converging hopper which terminates at the bottom in a horizontal slot extending across the width of the container. Inside the container is positioned a comb comprising parallel vertical plates positioned lengthwise of the container. Means are provided for reciprocating the hopper lengthwise of the container and the comb vertically.

This invention relates to the packaging of fibers. It is more particularly concerned with method and apparatus for filling a container of rectangular plan with aligned dense packed fibers.

My invention is described hereinafter with reference to the packaging of thin steel fibers on the order of 1" in length, but my invention is useful for packaging fibers of other materials of varying lengths.

Thin steel fibers are used in considerable quantities for reinforcing concrete and the like. These fibers are produced by automatic machines at a high rate and are most conveniently packed into cartons directly from the automatic machines. Although the fibers are generally aligned with each other at the instant of formation, they usually fall more or less randomly onto a conveyor belt or the like and are not aligned when they leave that belt. It is not economical of space to allow them to fall randomly into a container. When thin steel fibers as above described are so packed, the density of the resulting package is about 3.5% of that of solid steel. It is, of course, impossible to pack such fibers to a density approximating that of the solid metal, but fibers packaged by my invention as described hereinafter have a density about 3½ times that of randomly packed fibers.

It is an object of my invention to provide method and apparatus for economically packing thin elongated fibers into a carton of rectangular plan. It is another object of my invention to provide method and apparatus for accepting a stream of randomly oriented fibers and packaging them in alignment in a rectagular container. Other objects of my invention will appear in the course of the following description thereof.

My invention will best be understood by reference to the attached figures which illustrate an embodiment thereof presently preferred by me.

FIGURE 1 is an isometric sketch, broken away in part, of the apparatus of my invention.

FIGURE 2 is a side elevation of the apparatus of my invention.

FIGURE 3 is a broken away side elevation of the comb portion of the apparatus of my invention.

FIGURE 4 is an end view of the comb portion of the apparatus of my invention.

My apparatus is contained within a frame comprising a solid bottom plate **1**, vertical front corner angles **2—2**, vertical rear corner angles **3—3** and parallel top horizontal angles **4—4**, each affixed with vertical flange upturned to the upper ends of front angle **2** and rear angle **3** on each side. These angles **4—4** are braced at the front end by horizontal upper angle **5** and at the rear end by horizontal plate **6**.

A horizontal rectangular frame **7** of a dimension crosswise of my apparatus slightly less than the distance between the upright flanges of angles **4—4** is provided at each end with two rollers **8—8** which rest on the horizontal flanges of angles **4—4**. On these rollers **8—8**, frame **7** is adapted to move along angles **4—4**. Frame **7** supports a hopper **9** comprising a vertical back **10**, a pair of oppositely disposed vertical side plates **11—11** and a front plate **12** which slopes downwardly toward back **10**. The bottom of hopper **9** is a slot **13** disposed transversely of my apparatus. The upper end of hopper **9** is open. Fibers from a conveyor or other loading means not shown are discharged into hopper **9** by a scanning chute **15** to be described.

Scannig chute **15** is an open channel having a flat bottom **16** which inclines downwardly toward hopper **9**. Chute **15** has low upright sides **17—17** which converge toward its end adjacent hopper **9** to form a narrow outlet **18**. Scanning chute **15** is mounted on a pivot **19** affixed to its bottom plate **16** near its end remote from hopper **9**. Pivot **19** turns in a bearing journaled in upright member **20** carried by cross member **21**, which in turn is attached at each end to angles **4—4** adjacent front angle **5**. An electric motor **22** is mounted on bracket **23** attached to upright member **20** and turns a cranked shaft **25**. The crank end of shaft **25** fits into a slot **26** in arm **27** which arm extends from chute bottom **16** at an angle thereto and parallel to the plane thereof. A receiving chute **28** is positioned to discharge fibers from a conveyor belt or other delivery means not shown onto the upper end of scanning chute **15**.

The container **30** to be filled is positioned on bottom plate **1** below hopper **9** by four corner guide angles **31**. Hopper **9** is constructed so that slot **13** extends across the full width of container **30**. Hopper **9** is positioned so that it can travel horizontally along angles **4—4** the full length of container **30**. The length of travel of hopper **9** is less than the overhang of scanning chute **15**, however. This horizontal movement of hopper **9** is effected by horizontal air cylinder **32** which is mounted on plate **6**. The piston rod **33** of air cylinder **32** is attached to frame **7**.

Within container **30** is positioned a comb **34**. This comb comprises vertical side walls **35—35** and vertical end walls **36—36** dimensioned to fit within container **30** with sufficient clearance to allow vertical movement therein. Within that structure comb **34** is completed by a plurality of parallel vertical plate members **37—37** affixed to end walls **36—36** so that they are parallel to side walls **35—35**. Each plate **37** has a serrated upper edge of projections **46—46** separated by depressions **47—47**. The projections **46—46** of alternate plates are opposite the depressions **47—47** of their adjoining plates. Side walls **35—35** of comb **34** are supported by upwardly and rearwardly extending brackets **38—38** which are fastened to vertically moveable frame **39**. Frame **39** includes vertically positioned sleeves **40—40** which are free to move on vertically positioned rods **41—41**, the lower ends of which are attached to plate **1** rearwardly of container **30** and the upper ends of which are attached to plate **6**. Vertical reciprocating movement of frame **39** is effected by vertical air cylinder **43** which is mounted on plate **6**. Piston rod **44** from air cylinder **43** extends vertically downward through plate **6** and is attached to bracket **48** which extends rearwardly from frame **39**.

A mechanical vibrator **43** is fastened to bottom plate **1** intermediate container **30** and the front end of my ap-

paratus. A similar mechanical vibrator 44 is attached to bracket 38.

On the inside of each end plate 11 of hopper 9 is positioned a downwardly and inwardly sloping angle bracket 45 for a purpose which will be described.

The process of my invention and the operation of my apparatus will be explained with reference to the attached figures. Randomly oriented fibers are continuously discharged from a conveyor or the like into delivery chute 28 which deposits them on bottom 16 of scanning chute 15. As the side walls 17—17 of this chute converge toward the lower end of the chute, the fibers tend to align themselves as they move down the chute and leave therefrom as a stream through its narrow open end 18. Motor 22 rotates crank 25 which causes scanning chute 15 to oscillate about pivot 19 in such fashion that its lower end 18 sweeps across the width of hopper 9. The stream of partially aligned fibers from scanning chute 15 falls into hopper 9 and is discharged from the bottom of hopper 9 through slot 13 into container 30. Thus a stream of fibers is discharged through slot 13 of hopper 9 into container 30, this stream being of much less width than the length of slot 13 and being swept back and forth across the width of container 30. Hopper 9 is reciprocated in a horizontal plane in the direction of the length of container 30 by air cylinder 32 which has been described. The stream of fibers emerging from slot 13 is therefore caused to move along the length of container 30 in the same way. It is desirable that the time period of one of these periodic motions be much greater than the time period of the other.

This stream of fibers is collimated, so to speak, by comb 34. The parallel plates 37—37 which are arranged longitudinally of container 30 accept fibers which are aligned in that direction and allow them to fall into container 30. Fibers which are not properly aligned are urged into alignment by the serrated upper edges of the comb plates 37—37. The pitch of the serrations and the spacing of the comb plates are of such combined magnitude as to discourage spanning of the gap between adjacent comb plates by unaligned fibers. Vibrator 43 on bottom plate 1 vibrates the whole of my apparatus, and this shaking action assists in alignment of the fibers. Vibrator 44 vibrates comb 34 crosswise of container 30 and likewise assists in the alignment of fibers. This vibration permits comb 34 to be withdrawn without difficulty from the fibers packed around it. Air cylinder 43 causes comb structure 34 to reciprocate vertically as fibers are discharged into it. This vertical reciprocation of the comb plates 37—37 allows the fibers below comb 34 to fill the spaces formerly occupied by comb 34 and causes the lower edges of plates 37—37 to tamp the fibers below so as to form them into a relatively compact mass.

I have mentioned that scanning chute 15 sweeps the stream of partially aligned fibers across hopper 9. There is a tendency of the fibers to pile up at the sides 35—35 of container 30 because of the momentary dwell of the scanning chute 15 at each end of its sweep. I minimize this tendency by the use of brackets 45—45, each of which is affixed on one of the side plates 11 of hopper 9. As the stream of fibers from discharge end 18 of scanning chute 15 approaches the side wall 11 of my hopper 9, a portion of that stream impinges on bracket 45 which is positioned in its path. This portion of the stream is deflected toward the center of hopper 9 by the inclined face of bracket 45. This action of brackets 45—45 smooths out the distribution of fibers across container 30 which is effected by my apparatus. I find that it is not necessary to elongate brackets 45—45 to the full width of side plates 11—11. It is sufficient if the stream of fibers strikes these brackets during a portion of the reciprocation of hopper 9.

Although the fibers are partially aligned by contacting the several chutes and surfaces in their fall through the machine, it is the primary function of all parts of the machine which contact the fibers prior to their final contact with the comb to distribute fibers uniformly over the plan of the container 30. Likewise, it is the function of the vertically oscillating comb, assisted by the vibrators 43 and 44, to force the falling fibers into reasonably parallel alignment with the plane of the comb plates and the plane of the base plate 1.

I claim:

1. Apparatus for packaging fibers in a container comprising a hopper positioned above the container having an enlarged open upper end and tapering to a lower end terminating in a narrow slot extending across the width of the container, an inclined scanning chute having a lower end of much less width than the length of the slot positioned to discharge a stream of partially axially aligned fibers into the upper end of the hopper and an upper end much wider than its lower end positioned to receive randomly oriented fibers in bulk, means causing the lower end of the scanning chute to traverse the hopper in the direction of the slot, and means for horizontally reciprocating the hopper with respect to the container a distance equal to the length of the container.

2. Apparatus of claim 1 in which the scanning chute is pivotally mounted with respect to the hopper, the pivot being positioned intermediate the ends of the scanning chute nearer its upper end and the means for causing the lower end of the scanning chute to traverse the hopper comprise means for oscillating the chute about its pivot.

3. Apparatus of claim 1 in which the hopper is provided with downwardly and inwardly inclined deflecting plates on each side positioned to direct fibers impinging thereon toward the center of the slot.

4. Apparatus of claim 1 including a comb removably positioned within the container, the comb comprising a plurality of vertical plates spaced apart from one another a distance less than the length of the fibers of the slot, the plates extending longitudinally of the container at right angles to the slot and means for vibrating the comb transversely of the container while fibers are being discharged into the container.

5. Apparatus of claim 2 in which the frequency of traverse of the lower end of the scanning chute is many times that of reciprocation of the hopper.

6. Apparatus of claim 4 in which the upper edges of the plates are serrated.

7. Apparatus of claim 6 in which projecting serrations of a plate are opposite indented serrations of its adjoining plates.

References Cited

UNITED STATES PATENTS

3,420,038	1/1969	Crabb	53—248
1,080,435	12/1913	Gamper	53—236
2,236,890	4/1941	Bower	53—126
2,256,215	9/1941	Orth	52—236 X
2,710,712	6/1955	Friedman	53—236 X
2,752,743	7/1956	Friedli	53—236
2,983,088	5/1961	Stoeckel	53—126 X
3,221,471	12/1965	Wolever	53—236 X

FOREIGN PATENTS

1,144,641	2/1963	Germany.
830,528	3/1960	Great Britain.

WAYNE A. MORSE, JR., Primary Examiner

U.S. Cl. X.R.

53—148, 236, 248