March 6, 1973 E. A. KOEHNEN 3,719,268

FOLDING AUGER FOR PORTABLE FEED MILL AND MIXER

Filed June 28, 1971 2 Sheets-Sheet 1

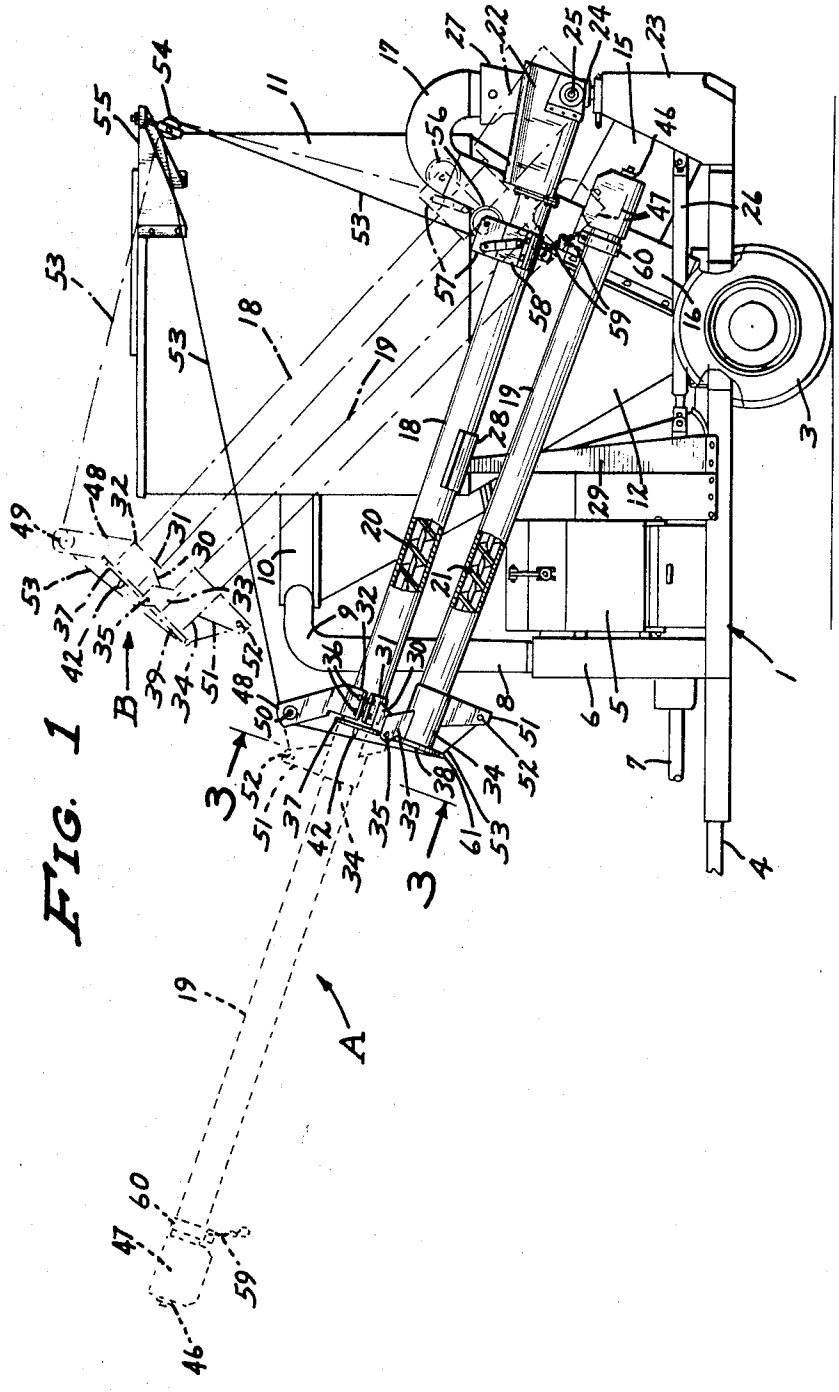

FIG. 1

INVENTOR.
EARL A. KOEHNEN
BY
MERCHANT & GOULD
ATTORNEYS

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2 Sheets-Sheet 2

FIG. 2

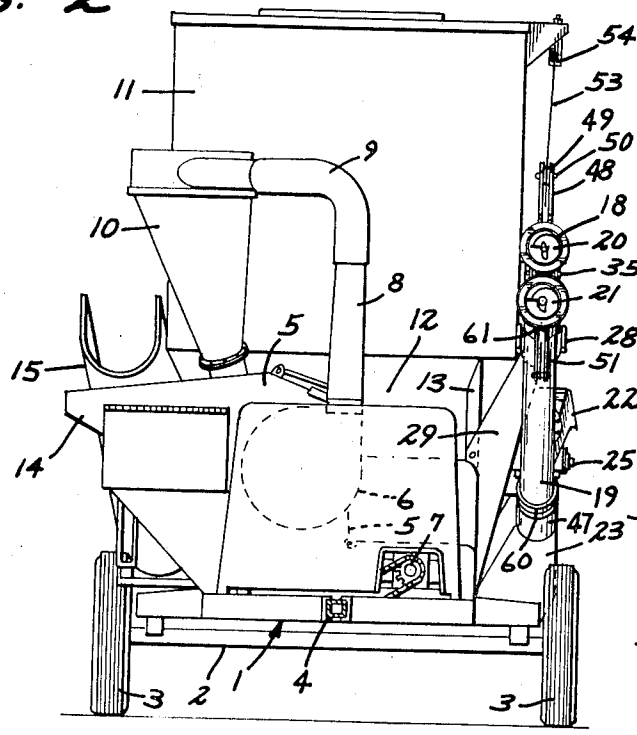


FIG. 3

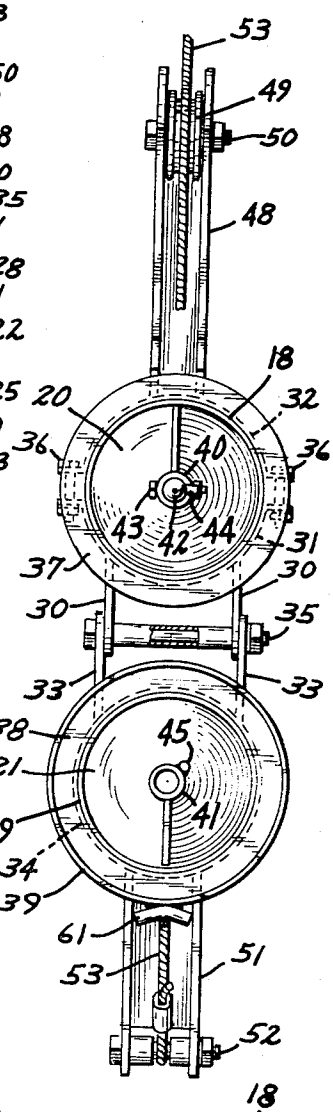
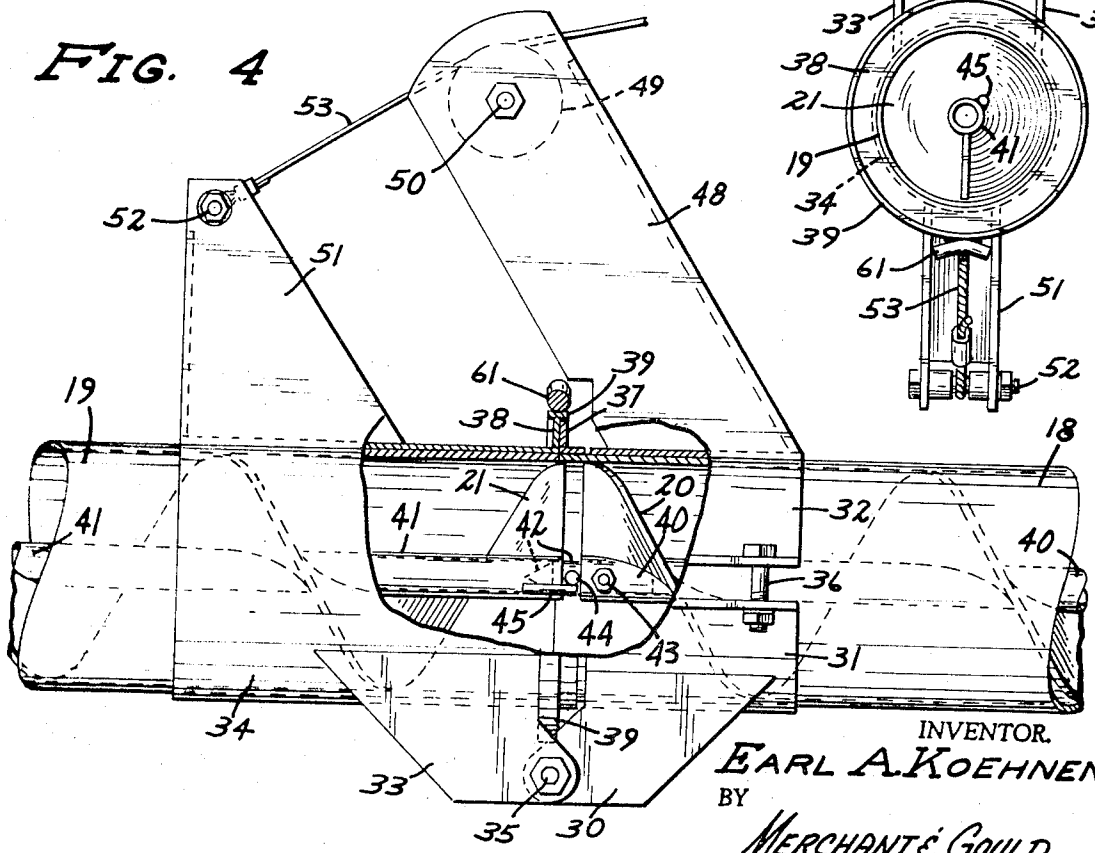


FIG. 4



INVENTOR.
EARL A. KOEHNEN
BY
MERCHANT & GOULD
ATTORNEYS

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FOLDING AUGER FOR PORTABLE FEED MILL AND MIXER

Earl A. Koehnen, Chaska, Minn., assignor to Farmhand, Inc., Hopkins, Minn.

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Int. Cl. B65g 21/12
U.S. Cl. 198—115 6 Claims

ABSTRACT OF THE DISCLOSURE

An auger conveyer for portable feed mills and mixers, including a pair of cooperating longitudinally inner and outer tubular members each having a conveyor auger section extending longitudinally therein. The inner tubular member is pivotally mounted at one end for swinging movements relative to the mixer on a generally horizontal axis extending transversely of the conveyor. The outer tubular member is pivotally connected at one end to the other end of the inner tubular member on a hinge axis parallel to the axis of swinging movement of the inner member for movements between an operative position in axial alignment with the inner member, and an inoperative storage position in underlying generally parallel relation to the inner member. An elevating cable is disposed to move the outer member from its storage position to its operative position.

SUMMARY OF THE INVENTION

An important object of this invention is the provision of a conveyor which can be unfolded for use and refolded and moved to an inoperative storage position on an implement with a minimum of exertion and in a minimum of time.

Another object of this invention is the provision of a conveyor which, when unfolded for use, is capable of delivering material to remote points and, when folded to a storage position, occupies a minimum of space.

To the above ends, a conveyor is provided comprising a pair of cooperating longitudinally inner and outer tubular members hingedly connected at adjacent ends, on a generally horizontal transverse axis, for swinging movements of the outer member between an inoperative folded position in underlying relation to the inner member, and an operative position in axially aligned end to end abutting relation with the inner member.

The inner member is supported by and pivotally connected to a supporting structure for swinging movements on a generally horizontal axis parallel to said transverse axis. The pivotally connected adjacent ends of the tubular members are each provided with a radially outwardly projecting arm, the arms being disposed in generally side-by-side upwardly projecting relationship when the tubular members are in their operative end to end relationship. A flexible cable, connected to a winch, is entrained over a pulley mounted on the supporting structure, and over a guide element on the arm of the inner tubular member, the free end of the cable being connected to the radically outer end of the arm of the outer tubular member. Each tubular member has journaled therein a conveying auger section, the sections having interengaging portions whereby one of the sections is rotated responsive to rotation of the other thereof. The above objectives will become further apparent from the following detailed description and accompanying drawings.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a view in side elevation of a conventional feed mill and mixer, with the conveyor of this invention being

mounted thereon, some parts being broken away and some parts being shown in section;

FIG. 2 is a view in front elevation;

FIG. 3 is an enlarged fragmentary view corresponding to a portion of FIG. 2, as seen from the line 3—3 of FIG. 1; and

FIG. 4 is an enlarged fragmentary view in side elevation of the adjacent ends of the tubular conveyor members of this invention in their operative relationship, some parts being broken away and some parts being shown in section.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIGS. 1 and 2, a commercially available feed mill and mixer is shown as comprising a generally horizontal frame **1** that is supported on an axle **2**, to the opposite ends of which is journaled a pair of tire equipped ground engaging wheels **3**. A hitch bar **4** extends forwardly of the frame **1**, and is fragmentarily shown, the same being adapted to be attached to the draw bar of a tractor or other towing vehicle, not shown. A conventional hammer mill **5** is mounted on the frame **1** forwardly of the wheels **3**, and is provided at its front end with a conventional blower **6**, the hammer mill **5** and blower **6** being connected to a drive shaft **7** that extends forwardly and which may be assumed to be connected to a source of power, such as the power take-off of the towing vehicle, not shown. The blower **6** has a discharge portion **8** that is connected to one end of a conduit **9** that is attached to a dust separator **10** of the type generally known as a cyclone separator.

A mixing tank **11** includes a hopper bottom **12**, and is mounted on the rear end portion of the frame **1** by supporting legs or the like **13**, one of which is shown. The implement is provided with the usual inlet **14** to the hammer mill **5**, and a delivery chute **15**, by means of which material to be ground may be fed to the inlet **14**. A discharge conveyor, not shown, is disposed within a housing portion **16** for discharge of materials from the bottom portion of the tank **11** and outwardly through a goose-neck conduit element **17**.

The portable feed mill and mixer thus far described is generally of the type disclosed in the United States Letters Patent No. 3,199,796 and, in and of itself, does not comprise the instant invention. Hence, in the interest of brevity, further detailed showing and description thereof is omitted.

For the purpose of the present example, the above-described feed mill and mixer forms a part of the supporting structure for the auger conveyor of this invention, the conveyor comprising longitudinally inner and outer tubular members **18** and **19** respectively having journaled therein respective ones of a pair of axially extending feeding screws or augers **20** and **21**. One end of the tubular member **18** is rigidly secured to an input hopper **22** that is supported from the frame **1** by an upstanding leg **23** for pivotal movements on a generally vertical axis. The hopper **22** is pivotally mounted on the mounting **24** by means of a horizontally disposed transverse shaft **25** by means of which the inner tubular member **18** is capable of upward and downward swinging movements. Rotary movement is imparted to the auger or screw section **20** by power transmission mechanism including the drive shaft **7**, other shaft means **26**, the mounting device **24**, shaft **25** and other gearing not shown but contained within the leg **23** and hopper **22**. It will be noted that the hopper **22** underlies the discharge end portion **27** of the goose-neck **17**, for reception of mixed feed material from the tank **11**. In the inoperative storage position of the conveyor of this invention, and as shown in full lines FIGS. 1 and 2, the inner tubular member **18** is supported intermediate its ends on a cradle **28**

on the upper end of a supporting leg 29 bolted or otherwise rigidly secured to the frame 1 and the adjacent one of the legs 13.

The longitudinally inner end of the outer tubular member 19 is pivotally connected to the adjacent outer end of the inner tubular member 18 by a hinge connection including a pair of laterally spaced hinge leaf elements 30 mounted on a pair of opposed clamping saddles 31 and 32, a cooperating pair of hinge leaf elements 33 welded or otherwise rigidly secured to a collar 34, and a hinge pintle in the nature of a nut-equipped bolt 35 extending through aligned openings in the hinge leaf elements 30 and 33, the pintle bolt 35 being disposed on a generally horizontal axis parallel to the axis of the pivot shaft 25. As shown, the clamping saddles 31 and 32 are clamped to the outer end of the tubular member 18 by nut-equipped clamping screws 36, the collar 34 encompassing the inner end portion of the outer tubular member 19 and being welded thereto. With reference particularly to FIGS. 3 and 4, it will be seen that the hinge pintle bolt 35 is disposed in radially outwardly spaced relation to the tubular members 18 and 19, so that the tubular members 18 and 19 are moveable relative to each other between operative positions wherein the tubular members 18 and 19 are disposed in axial alignment (see dotted line position of FIG. 1), and inoperative storage positions wherein the outer tubular member 19 is folded into underlying spaced generally parallel relationship to the tubular member 18, as shown by full lines in FIG. 1. A radially outwardly projecting flange 37 is welded to the extreme outer end of the tubular member 18 and is adapted to have abutting engagement with a radially outwardly projecting circumferential flange 38 on the collar 34 when the tubular members 18 and 19 are disposed in their axially aligned operative position, see particularly FIG. 4. As therein shown, the flange 38 is provided with a circumferential rim 39.

The auger sections 20 and 21 include central hollow shafts 40 and 41 respectively, the former of which is provided at its outer end with a guide pin or the like 42 that is adapted to be received in the adjacent end of the hollow shaft 41 when the tubular member 19 is moved into its operative end to end relationship with the tubular member 18, as shown in FIG. 4. The guide pin 42 is secured in the outer end of the shaft 40 by means of a nut-equipped screw 43. Intermediate the shafts 40 and 41, the guide pin 42 is provided with a radially outwardly projecting drive pin 44 that is adapted to be engaged by a longitudinally extending pin 45 welded or otherwise rigidly secured to the inner end of the outer shaft 41, whereby rotation of the auger section 20 is imparted to the auger section 21. The outer end of the auger shaft 41 is journaled in a suitable bearing 46 in a discharge head 47 that is rigidly secured to the outer end of the tubular member 19.

A rigid arm 48 extends generally radially from the clamping saddle 32 in a generally upward direction, and has journaled in its outer end portion a guide roller or pulley 49 on a shaft in the nature of a nut-equipped screw 50. In a similar manner a rigid arm 51 extends radially outwardly from the collar 34 on the tubular member 19, and at its outer end is provided an anchoring pin or screw 52. With reference particularly to FIGS. 1 and 4, it will be seen that the arms 48 and 51 both project generally upwardly and in generally side-by-side relationship when the tubular member 19 is disposed in its operative axially aligned relationship with the tubular member 18. An elongated flexible member in the nature of a flexible cable 53 has its free end anchored to the anchoring pin 52 and is entrained over a pulley 49. The cable 53 is further entrained over the roller or pulley 54 that is carried by the outer end of a support arm 55 that is secured to and projects radially outwardly from the upper end portion of the mixing tank 11. At its opposite end the cable 53 is wound on a winding spool or reel 56 which forms a portion of a conventional crank-equipped winch 57. The winch 57 is mounted on the tubular member 18 adjacent the hopper 22, and is held in place in a conventional manner, by means of a clamping saddle or the like 58. A pair of cooperating hook-equipped chains 59 are carried, one by the clamping saddle 58 and the other by a clamping collar 60 mounted on the tubular member 19 adjacent the discharge head 47, to releasably hold the tubular member 19 in its inoperative storage position in underlying relationship to the tubular member 18, as shown by full lines in FIG. 1. A generally V-shaped guide member 61 is rigidly secured to the flange member 39 and engages the cable 53 to guide and hold the same in a generally central position relative to the adjacent ends of the tubular members 18 and 19, when the tubular member 19 is moved to its inoperative folded storage position.

When it is desired to move the tubular members 18 and 19 and their respective auger sections 20 and 21 into aligned operative relationship with each other, as indicated at A in FIG. 1, the winch 57 is operated to first move the tubular members 18 and 19 together to an elevated position as indicated at B in FIG. 1. The chains 59 are then unhooked from each other, leaving the tubular member 19 free to swing forwardly, or to the left with respect to FIG. 1, about the axis of the hinge pintle 35. During the forward and upward swinging movement of the tubular member 19, the weight thereof and that of the tubular member 18 cause the adjacent ends of the tubular members 18 and 19 to swing slightly downwardly due to the shortening of the portion of the cable 53 between the forwardly and upwardly swinging anchoring pin 52 and the roller 49. As the outer tubular member 19 swings upwardly, the anchoring pin 52 moves above a line extending between the pulley 54 and the axis of the hinge pintle 35, whereupon the combined weight of the tubular members 18 and 19 and parts carried thereby causes the tubular member 19 to swing to its position indicated at A in FIG. 1, in axial alignment with the tubular member 18. The members 18 and 19 will remain in this position regardless of weight of material being delivered from the hopper 22 through the discharge head 47.

When it is desired to refold the conveyor to its inoperative storage position, it is only necessary to manually raise or swing the inner tubular member 18 upwardly by pushing the same upwardly rearwardly of the outer tubular section 19. By thus relieving the cable 53 of the weight of the inner tubular member 18, the outer tubular member 19 will swing downwardly about the axis of the hingle pintle 35 toward a depending vertical position, whereupon the operator may grasp the same and swing it rearwardly towards its full line position shown in FIG. 1, after which the chains 59 can be recoupled and the winch 57 manipulated to bring the tubular member 18 into its storage position on the cradle 28. The arrangement is such that, when the tubular member 18 is initially swung upwardly in the folding operation, the distance between the pulley 54 and anchoring pin 52 becomes effectively shortened, permitting the outer tubular member 19 to swing downwardly. When the operator then grasps the tubular member 19 and exerts downward swinging movement thereto, the tubular member 18 will continue to swing upwardly until the tubular member 19 is swung into generally parallel relationship to the tubular member 18, after which the winch 57 may be operated to raise or lower the tubular members 18 and 19, as required, to position the member 18 for movement into the cradle 28.

It will be appreciated that, by loosening the clamping screws 36, the saddles 31 and 34, together with the collar 34 and tubular member 19, may be rotated in either direction on the axis of the tubular members 18 and 19, to a limited extent. By thus rotating the above elements, the discharge head 47 may be disposed to deliver material in directions angularly displaced from a vertical plane ex-

tending longitudinally of the tubular members 18 and 19.

Although a commercial embodiment of the folding auger has been shown and described, it will be appreciated that the same is capable of modification, and that modification may be made without departure from the spirit and scope of the invention, as defined in the claims.

I claim:

1. An auger conveyor comprising:

(a) a supporting structure;

(b) a pair of longitudinally inner and outer tubular members having adjacent ends pivotally connected together on a generally horizontal hinge axis extending transversely of said tubular members for swinging movements of said outer member between an inoperative folded position in generally underlying relationship to said inner member and an operative position in end to end axial alignment with said inner member;

(c) means pivotally mounting the opposite end of said inner tubular member on said supporting structure for swinging movements on an axis parallel to said hinge axis;

(d) a pair of conveyor sections one each mounted in a different one of said tubular members and having driving connections at said adjacent ends of the tubular members for operative engagement with each other when said outer member is moved to its operative position;

(e) an elongated flexible member operatively connected at one end to said outer tubular member adjacent the hinged end thereof;

(f) and elevating means for moving said flexible member in a direction to impart swinging movements to said tubular members between said operative and storage positions;

(g) said flexible member and elevating means being disposed to support both said tubular members in various positions of pivotal movement relative to each other and in different positions of swinging movement of said tubular members about the axis of said means pivotally mounting said opposite end of said inner member on said supporting structure.

2. The auger conveyor defined in claim 1 in which said supporting structure includes a support arm remote from said adjacent ends of the tubular members, and pulley means on said support arm, said flexible member comprising a cable entrained over said pulley means.

3. The auger conveyor defined in claim 1, characterized by a pair of rigid arms each projecting radially from a different one of said tubular members at said adjacent ends thereof, both of said arms being disposed in substantially side-by-side relationship and extending in a generally upward direction when said outer tubular member is moved to its operative position, said flexible member being connected at one end to the arm of said outer tubular member at the radially outer end thereof and disposed to operatively engage the radially outer end of the arm on said inner tubular member.

4. The auger conveyor defined in claim 3 in which said supporting structure includes a support arm remote from said adjacent ends of the tubular members, and pulley means carried by said support arm, characterized by a guide roller on the radially outer end of the arm on said inner tubular member, said flexible member comprising a flexible cable entrained over said pulley and guide roller, said elevating means comprising a winch including a winding reel for said cable.

5. The auger conveyor defined in claim 1 in which said supporting structure includes a cradle disposed in underlying supporting relationship to said inner tubular member, characterized by releasable holding means for supporting said outer tubular member in underlying generally parallel relationship with said inner tubular member in said inoperative folded position of the outer tubular member.

6. The auger conveyor defined in claim 5 in which said releasable holding means comprises a flexible tie member connected at one end to one of the tubular members, the other one of the tubular members having means for releasable connection to said tie member.

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EDWARD A. SROKA, Primary Examiner

U.S. Cl. X.R.

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