July 28, 1953 E. C. STOVER 2,646,899

ICE STORAGE BIN HAVING RAKES FOR MOVING THE SURFACE ICE

Filed Sept. 8, 1948 2 Sheets-Sheet 1

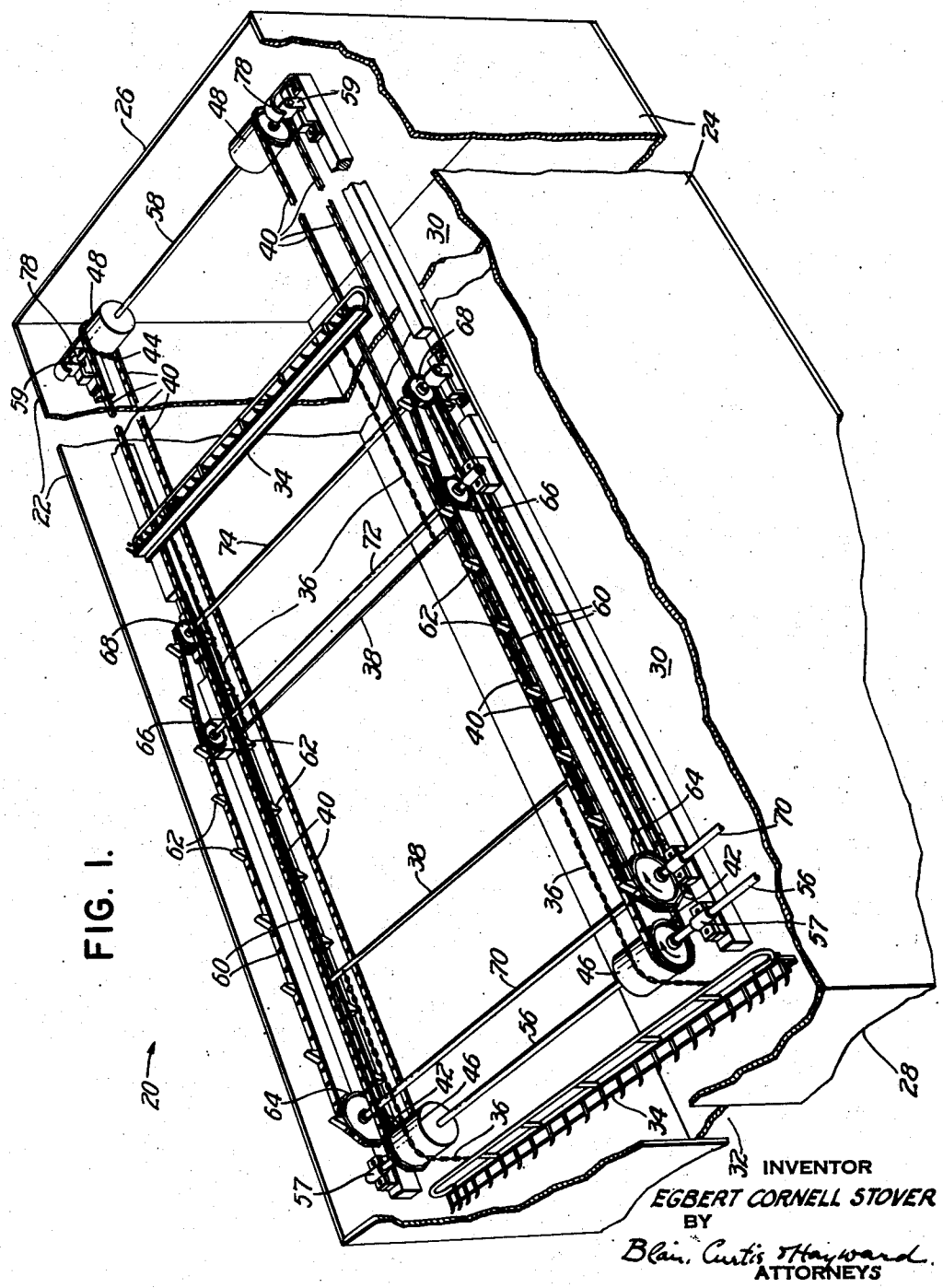


FIG. 1.

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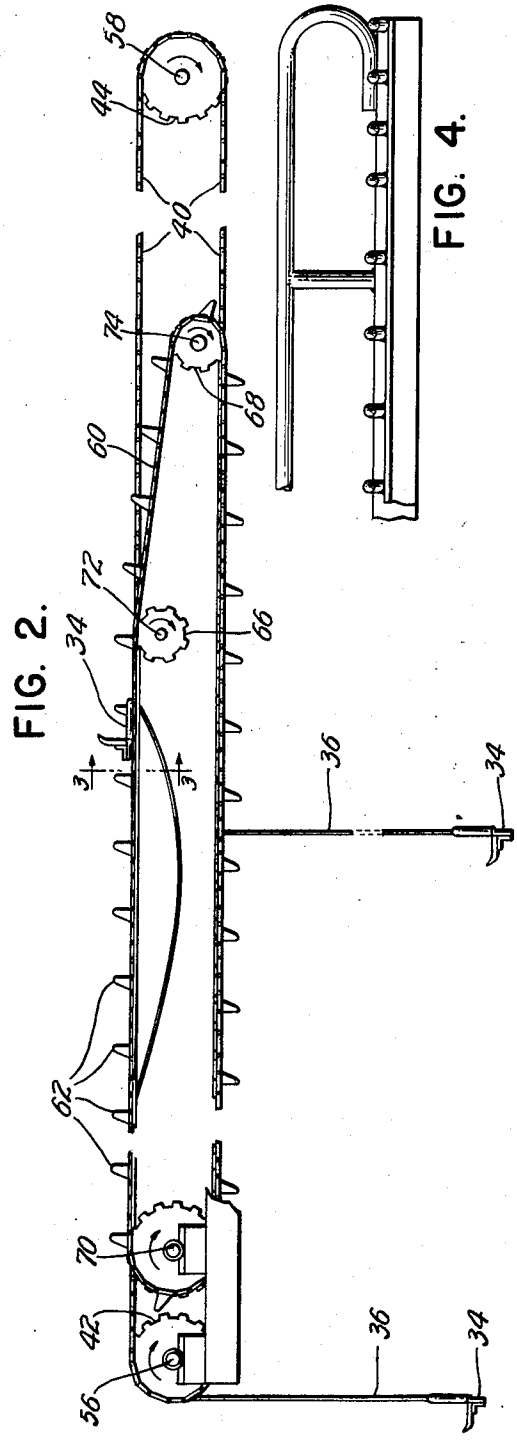


FIG. 2.

FIG. 4.

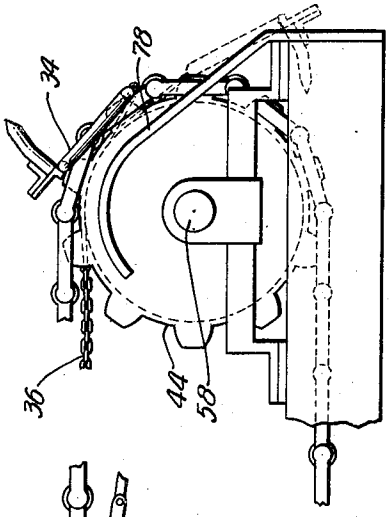


FIG. 6.

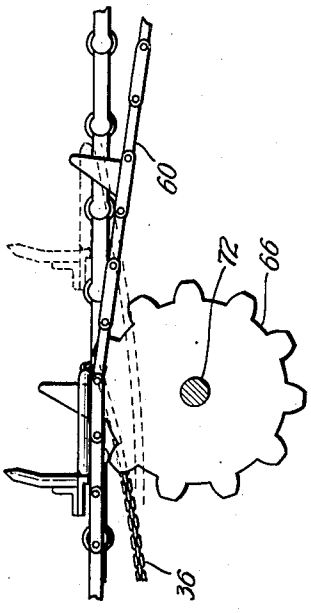


FIG. 5.

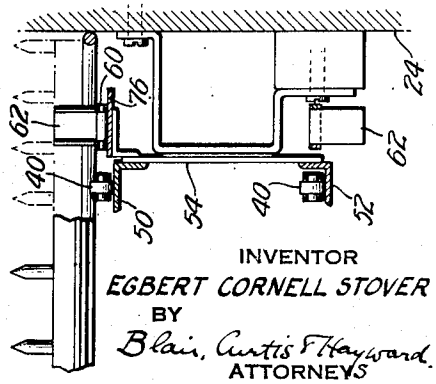


FIG. 3.

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ICE STORAGE BIN HAVING RAKES FOR MOVING THE SURFACE ICE

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Application September 8, 1948, Serial No. 48,239

15 Claims. (Cl. 214—17)

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This invention relates to bins for storing small pieces of ice, or the like, and to apparatus for handling such pieces in the bin. By way of example the invention will be described as applied to a construction intended for use with ice pieces but other applications of the invention will be readily apparent to those skilled in the art.

In recent years apparatus has been developed for manufacturing ice in small pieces such as crushed block ice, ice in ribbon form, briquettes of compressed slush, ice cubes, etc. The introduction of such apparatus has given rise to the problem of storing quantities of such small pieces of ice in their original form for a considerable time without appreciable loss. A satisfactory solution to this problem was difficult to find because of the tendency of the smaller pieces to freeze together into a more or less solid mass which prevented their ready removal from the storage compartment for distribution and use. This difficulty was first satisfactorily overcome in accordance with the invention disclosed and claimed in Patent No. 2,222,024 to Crosby Field, wherein the small ice pieces are placed in a refrigerated bin as soon as they are produced, and are there maintained at a temperature below their melting point and away from moisture which might cause them to freeze together.

The ice is usually drawn off from such bins through an opening provided in the front wall, and to aid in drawing all of the ice out of the bin the floor may be sloped toward the opening. But sloping the floor for this purpose, of course, decreases the capacity of the bin.

It is an object of my invention to provide an improved storage system for such ice pieces, and the like, and to provide means for automatically removing the ice from a bin having either a flat or sloping floor. A further objective resides in the provision of an improved storage bin construction which overcomes certain disadvantages inherent in the constructions of the prior art. Other objects will in part be pointed out as the description proceeds and will in part become apparent therefrom.

The invention accordingly consists in the features of construction, combination of elements, methods of operation and arrangements of parts as will be exemplified in the structure and sequences and groups of related steps to be hereinafter described and the scope of the application of which will be set forth in the accompanying claims.

In this specification and the accompanying drawings I have shown and described a preferred embodiment of my invention and suggested various modifications thereof; but it is to be understood that these are not intended to be exhaustive nor limiting of the invention but, on the

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contrary, are given for purposes of illustration in order that others skilled in the art may fully understand the invention and the principles thereof and the manner of applying it in various forms, each as may be best suited to the conditions of a particular use.

In the drawings:

Figure 1 is a perspective view of a storage bin construction embodying my invention but with certain parts of the related wall structures omitted for clarity and with certain parts broken away;

Figure 2 is a side elevation of a conveyer assembly incorporated in the bin;

Figure 3 is a sectional view taken on an enlarged scale along the line 3—3 of Figure 2;

Figure 4 is a fragmentary view on an enlarged scale of a part of one of the rakes used in the illustrative form;

Figure 5 is a fragmentary view on an enlarged scale of one subassembly in the conveyer system; and

Figure 6 is a fragmentary view on an enlarged scale of another subassembly in the conveyer system.

In Figure 1 a storage bin is generally indicated at 20. This bin, for present purposes, may be considered as generally similar to that disclosed in Field Patent No. 2,222,024. The bin includes interior side walls 22 and 24, rear end wall 26, front end wall 28, and bottom wall 30. End wall 28 is fitted with an end delivery opening 32 through which ice in the bin may be withdrawn. It will be understood that ice may be supplied to the bin from above, for example in the manner described in the above-mentioned Field patent. One type of ice machine satisfactory for this purpose is disclosed in Patent No. 2,005,734 to Crosby Field.

In order to maintain the supply of ice in the bin readily available at end delivery opening 32 I provide in the illustrative form a series of rakes 34, each of a width sufficient to extend substantially across the bin between walls 22 and 24. These rakes (see also Figure 2) are caused to move lengthwise of the bin toward end opening 32 by suspenders 36. Each rake 34 is shown to be provided with a pair of suspenders, one suspender of each pair being connected to an upper portion of the rake near one end of the rake and the other suspender being connected to an upper portion of the rake near the other end of the rake. The suspenders are each connected at their other ends to a drag rod 38. For each rake 34 there is a drag rod 38 and the drag rods are mounted in and carried by a pair of rod conveyer chains 40. These chains are of the endless-belt-type and are horizontally disposed substantially parallel to each other and running approximately the length of

the storage bin with one chain adjacent side wall 22 and the other chain adjacent side wall 24.

The rod conveyer chains extend around and between a pair of rod sprockets 42 adjacent end wall 28 and rod sprockets 44 adjacent end wall 26. Sprockets 42 are provided with sprocket drums 46 and sprockets 44 are provided with sprocket drums 48. The sprocket drums serve as supports for suspenders 36 as the rakes are drawn upwardly from the lower portions of the bin upon reaching end wall 28.

As shown in Figure 3 the upper flights of chains 40 are supported along their horizontal paths by conveyer flanges 50; the lower flights of the conveyer chains are supported along their horizontal paths by conveyer flanges 52. Flanges 50 and 52 are rigidly carried on flange supports 54. Flange supports 54 in turn are suitably mounted upon adjacent portions of the side superstructure of the storage bin.

Rod sprockets 42 are driven by a drive shaft 56 supplied from a convenient source of power. The direction of rotation, as shown in Figures 1 and 2, is, of course, clockwise so as to propel the upper flights of the conveyer chains toward end wall 26 along flanges 50 and the lower flights of the conveyer chains toward end wall 28 along conveyer flanges 52. Shaft 56, carrying sprockets 42 and drums 46, is shown in Figure 1 to be rotatably mounted in bearings 57, supported at each side of the storage bin on suitable parts of the bin superstructure; sprockets 44 and drums 48 are carried upon an idler shaft 58 mounted in bearings 59. Bearings 59 also are suitably supported by permanent parts of the bin superstructure.

In the construction described in Field Patent No. 2,222,024, rakes are caused to move by suspenders attached to a conveyer system generally similar to the one described above and when each rake reaches the delivery end of the storage bin it is raised to the level of the upper flight of the conveyer chains by its suspenders as the suspenders are moved by the chain upper flights toward the rear end of the bin. The rakes are returned to the rear end of the bin while resting on the top portions of the upper flights of the conveyer chains and when the rakes reach the rear end of the storage bin they pass over the ends of the conveyer chains and fall downwardly in free flight until they hit the ice below. In order to avoid this dropping of the rakes from the level of the upper flights of the conveyer to the surface of ice in the bin I have devised a structure whereby the rakes are guided and gently lowered from the rearward end of the conveyer system downwardly to the surface of the ice.

As shown in Figures 1 and 2 I incorporate in the construction a pair of rake conveyers 60. In the illustrative form each conveyer is of the endless-belt-type and the conveyers are arranged side by side with respect to the rod conveyer chains 40, the upper flight of the rake conveyers lying in substantially the same horizontal plane as the upper flights of the rod conveyer chains. For reasons which will become apparent the rake conveyers are driven at a higher linear conveying speed than the rod conveyer chains.

The rake conveyers are provided with a series of mutually aligned pushers 62. These pushers are for the purpose of engaging the rakes from behind as they lie transversely across the upper flight portions of the rod conveyer chains and for pushing the rakes rearwardly of the bin until each rake has been displaced with respect to the drag rod 38 to which its suspenders 36 are attached by an amount substantially equal to the length of the suspenders.

The rake conveyers extend around a pair of rake drive sprockets 64 at one end, an intermediate pair of rake idler sprockets 66, and a second pair of rake idler sprockets 68 at the other end. A rake conveyer drive shaft 70 supplies power to drive sprockets 64 in conventional manner. Idler sprockets 66 are carried on an idler shaft 72 and idler sprockets 68 are carried on an idler shaft 74. The upper flight portions of rake conveyers 60 (see Figure 3) are supported throughout their horizontal paths by conveyer flanges 76 adjacent to flanges 50 and carried by supports 54.

As shown in Figures 1 and 6 a rake guide 78 is provided at the end of the conveyer system adjacent end wall 26 for the purpose of supporting and guiding the rakes as they proceed downwardly over the end of conveyer chains 40. It will be observed that the series of rakes, during normal operation, follow an endless path consisting essentially of a raking portion, wherein the rakes are dragged forwardly from end wall 26 to end wall 28, and an overlying return path portion wherein the rakes are supported by the conveyer system and moved rearwardly from end wall 28 to end wall 26. As the rakes are drawn onto the top side of the conveyer system each rake assumes a position lying on its back with its top toward rear end wall 26. On reaching the end of the return path each rake in turn as it starts downwardly tends to pivot about its top portion, where it is connected to suspenders 36, and as it turns over toward its normal raking position it is caught by the rake guides 78 and thereafter directed rearwardly and downwardly as the rakes are lowered by their suspenders.

When a rake has been drawn upwardly adjacent end wall 28 and passes over drums 46 it assumes a position on its back supported by the conveyer system. Almost immediately it is engaged by a pair of pushers 62 carried by the rake conveyer 60 and is pushed rearwardly by the pushers until it has been advanced with respect to its associated drag rod 38 by an amount approximately equal to the length of its suspenders. The linear speed at which the rake conveyer travels will be understood to be coordinated with the linear speed of the conveyer chains so that the rakes complete the desired rearward displacement just as pushers 62 are withdrawn from engagement with the rakes by downward movement of rake conveyer 60 (see Figure 2) in passing from idler sprockets 66 to idler sprockets 68.

From the foregoing it will be seen that a storage bin constructed in accordance with the present invention is well adapted to attain the ends and objects hereinbefore set forth and to be economically manufactured since both the assembled construction and the methods of making it are suited to common production methods and are susceptible to a wide latitude of variations as may be desirable in adapting the invention to different applications.

As various embodiments may be made of the above invention and as changes might be made in the embodiment above set forth, it is to be understood that all matter hereinbefore set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. In combination with a bin adapted to the storage of small ice pieces and having an opening near one end thereof, mechanical means for disturbing the surface ice in the bin to cause it to move toward said opening; said means including: rakes flexibly suspennded from points above the surface ice, a forwardly operating conveyer structure arranged to drag said rakes successively over the surface ice and toward said opening from points remote from said opening, and a reversely operating conveyer structure disposed adjacent said first conveyer structure and arranged to move said rakes away from said opening, whereby said rakes are caused to move alternately first by one conveyor structure and then by the other conveyor structure.

2. In combination with a bin adapted to the storage of small ice pieces and having an opening near one end thereof, mechanical means for disturbing the surface ice in the bin to cause it to move toward said opening; said means including: rakes flexibly suspended from points above the surface ice, a lower speed forwardly operating conveyer structure arranged to drag said rakes successively over the surface ice and toward said opening from points remote from said opening, and a higher speed reversely operating conveyer structure disposed adjacent said first conveyer structure and arranged to move said rakes in a direction away from said opening, whereby said rakes are caused to move alternately first by one conveyor structure and then by the other conveyor structure.

3. In combination with a bin adapted to the storage of small ice pieces and having an opening near one end thereof, mechanical means for disturbing the surface ice in the bin to cause it to move toward said opening; said means including: rakes flexibly suspended from points above the surface ice, a low speed conveyer structure arranged to drag said rakes successively at a relatively low level over the surface ice and toward said opening from points remote from said opening, and a higher speed conveyer structure disposed adjacent said low speed conveyer structure and arranged to move said rakes independently of said first conveyer structure away from said opening at a relatively higher level.

4. In combination with a bin adapted to the storage of small ice pieces and having an opening near one end thereof, mechanical means for disturbing the surface ice in the bin to cause it to move toward said opening; said means including: rakes flexibly suspended from points above the surface ice, a first conveyer structure connected to said rakes to drag them successively at a relatively low level over the surface ice and toward said opening from points remote from said opening, and a second conveyer structure disposed adjacent said first conveyer structure to engage and support said rakes at a relatively higher level and to move them independently of said first conveyer structure away from said opening, whereby said rakes are caused to move alternately first by one conveyor structure and then by the other conveyor structure.

5. In combination with a bin adapted to the storage of small ice pieces and having an opening near one end thereof, mechanical means for disturbing the surface ice in the bin to cause it to move toward said opening; said means including: a series of rakes, a first conveyer structure arranged to move said rakes successively over the surface ice at a relatively low level and toward said opening from points remote from said opening, and a second conveyer structure disposed adjacent said first conveyer structure and above the surface ice and arranged to carry said rakes at a higher level above the surface ice to points remote from said opening, whereby said rakes are caused to move alternately first by one conveyor structure and then by the other conveyor structure.

6. Apparatus of the character described including: rakes movable through an endless path, suspenders for said rakes by which said rakes are caused to move through a portion of said path, a conveyor system to which said suspenders are attached providing said suspenders with the moving force by which said rakes are moved through said path portion, a pulley-like guide assembly at the end of said path portion over which said suspenders and rakes are drawn, and a second conveyer system disposed adjacent said first-mentioned conveyer system and arranged to move said rakes from said guide assembly and toward the beginning of said path portion, whereby said rakes are caused to move alternately first by one conveyor system and then by the other conveyor system.

7. Apparatus of the character described including: rakes movable through an endless path, suspenders for said rakes by which said rakes are caused to move through a portion of said path, a low speed conveyer system to which said suspenders are attached providing said suspenders with the moving force by which said rakes are moved through said path portion, a pulley-like guide assembly at the end of said path portion over which said suspenders and rakes are drawn, and a higher speed conveyer system disposed adjacent said low speed conveyer system and arranged to move said rakes from said guide assembly toward the beginning of said path portion at a rate in excess of the rate at which said rakes are caused to move through said path portion.

8. Apparatus of the character described including: rakes movable through an endless path, suspenders operatively associated with said rakes, a pair of parallelly disposed forwardly operating conveyers with which said suspenders are coupled providing the moving force by which said rakes are moved through a portion of said path and a pair of reversely operating conveyers disposed parallel and adjacent said first-mentioned conveyers and arranged to move said rakes through another portion of said path, the reversely operating conveyers being operable at a higher rate of speed than the forwardly operating conveyers.

9. Apparatus of the character described including: rakes movable through an endless path, suspenders for said rakes by which said rakes are caused to move through a portion of said path, a horizontally disposed, endless-belt-type conveyer system to which said suspenders are attached providing said suspenders with the moving force by which said rakes are moved through said path portion, a pulley-like guide assembly at the end of said path portion over which said suspenders and rakes are drawn, and a second horizontally disposed, endless-belt-type conveyer system disposed adjacent said first-mentioned conveyer system and arranged to move said rakes from said guide assembly toward the beginning of said path portion at a rate in excess of the rate at which said rakes are caused to move through said path portion.

10. Apparatus of the character described in-

cluding: rakes movable through an endless path, suspenders for said rakes by which said rakes are caused to move through a portion of said path, a horizontally disposed endless-belt-type conveyer to which each rake is attached by said suspenders and by which said suspenders are provided with the moving force by which said rakes are moved through said path portion, a pulley-like guide assembly at the end of said path portion over which said suspenders and rakes are drawn, and a second horizontally disposed endless-belt-type conveyer adjacent and substantially parallel to said first-mentioned conveyer and positioned to receive said rakes from said guide assembly; said second conveyer being geared to move at a higher speed than said first-mentioned conveyer, whereby to move said rakes forwardly with respect to the points of attachment of said suspenders with said first-mentioned conveyer.

11. In a raking assembly of the character described: a series of rakes movable through an endless path, said path having a horizontally extending raking portion and a horizontally extending return portion spaced above and parallel to said raking portion; a substantially horizontally disposed endless-belt-type conveyer having a lower flight adjacent to said raking path portion and an upper flight adjacent to said return path portion; a plurality of flexible suspenders, each rake being attached to said conveyer by a suspender; and a conveyer system disposed adjacent to said return path portion and including a series of rake pusher members.

12. In a raking assembly of the character described: a series of rakes movable through an endless path, said path having a horizontally extending raking portion and a horizontally extending return portion spaced above and parallel to said raking portion; a pair of substantially parallel horizontally disposed endless-belt-type conveyors each having a lower flight adjacent to said raking path portion and an upper flight adjacent to said return path portion, said conveyers being spaced apart a distance on the order of slightly less than the length of said rakes; a plurality of flexible suspenders, each rake being attached near one end to one of said conveyers by a suspender and near the other end to the other conveyer by another suspender; and a conveyer system disposed adjacent to said return path portion and including a series of rake pusher members.

13. In a raking assembly of the character described: a series of rakes movable through an endless path, said path having a horizontally extending raking portion and a horizontally extending return portion spaced above and parallel to said raking portion; a pair of substantially parallel horizontally disposed endless-belt-type conveyers each having a lower flight adjacent to said raking path portion and an upper flight adjacent to said return path portion, said conveyers being spaced apart a distance on the order of slightly less than the length of said rakes; a plurality of flexible suspenders, each rake being attached near one end to one of said conveyers by a suspender and near the other end to the other conveyer by another suspender; and a conveyer system disposed adjacent to said return path portion and including a series of pusher members, said system being geared to operate at a higher speed than said conveyers whereby to move said rakes with respect to said conveyers as said rakes traverse said return path portion.

14. In a raking assembly of the character described: a series of rakes movable through an endless path, said path having a horizontally extending raking portion and a horizontally extending return portion spaced above and parallel to said raking portion; a pair of substantially parallel horizontally disposed endless-belt-type conveyers each having a lower flight adjacent to said raking path portion and an upper flight adjacent to said return path portion, said conveyers being spaced apart a distance on the order of slightly less than the length of said rakes; a plurality of flexible suspenders, each rake being attached near one end to one of said conveyers by a suspender and near the other end to the other conveyer by another suspender; said conveyers including rake supporting surfaces along the upper flight thereof upon which the rakes ride while traversing said return path portion; and a conveyer system disposed adjacent to said return path portion and including a series of pusher members, said system being geared to operate at a higher linear conveying speed than said conveyers whereby to move said rakes along said supporting surfaces at a rate in excess of the rate at which said suspenders would move said rakes.

15. In a raking assembly of the character described: a series of rakes each having a front, a back, a top, and a bottom, said rakes being movable through an endless path, said path having a horizontally extending raking portion and a horizontally extending return portion spaced above and parallel to said raking portion; a pair of substantially parallel horizontally disposed endless-belt-type conveyers each having a lower flight adjacent to said raking path portion and an upper flight adjacent to said return path portion, said conveyers being spaced apart a distance on the order of slightly less than the length of said rakes; a plurality of flexible suspenders, each rake being attached at its top near one end to one of said conveyers by a suspender and at its top near the other end to the other conveyer by another suspender; a conveyer system disposed adjacent to said return path portion and including a series of pusher members, said system being geared to operate at a higher speed than said conveyers whereby to move each rake with respect to said conveyers to a point forwardly of the points of attachment of its suspenders to said conveyers; said rakes being moved through said raking path portion each with its front forward and its bottom down and through said return path portion with its top forward and its back down; and a rake guiding structure associated with said conveyers at the end of said return path portion and disposed to engage the front side of each rake and to direct the bottom portions thereof downwardly from said return path portion toward said raking path portion as each rake is lowered from said conveyers by said suspenders.

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