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SYSTEM FOR SORTING AND GRADING BAGS

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2 Sheets-Sheet 1

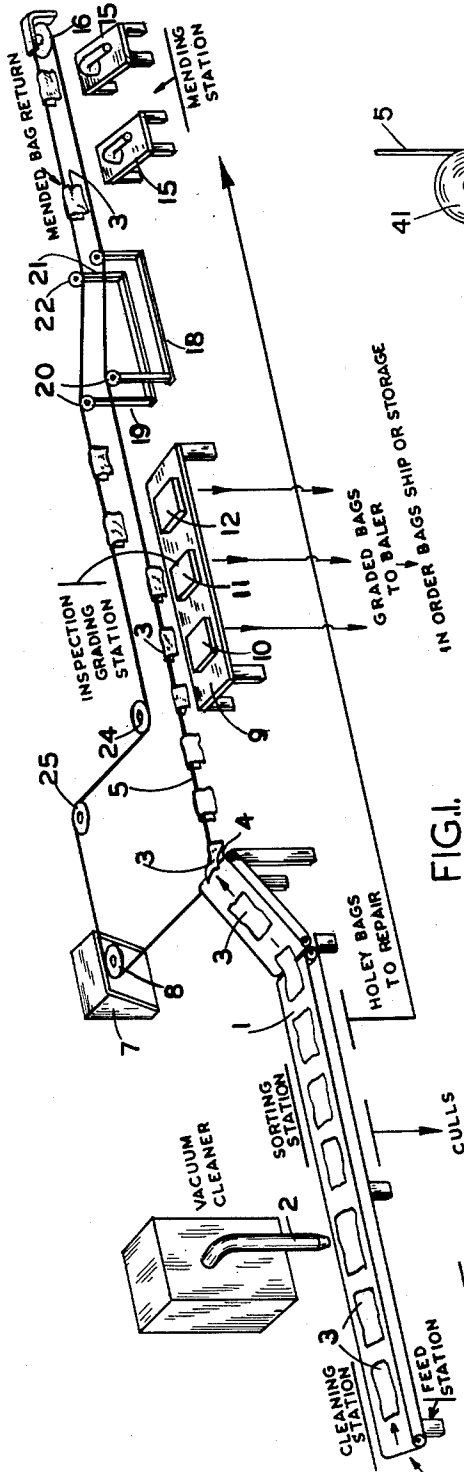


FIG. 1.

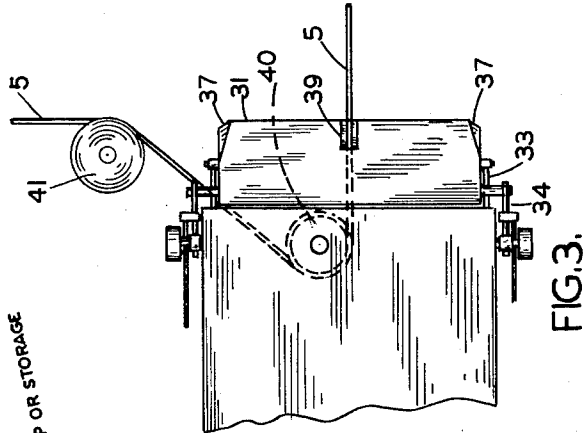


FIG. 3.

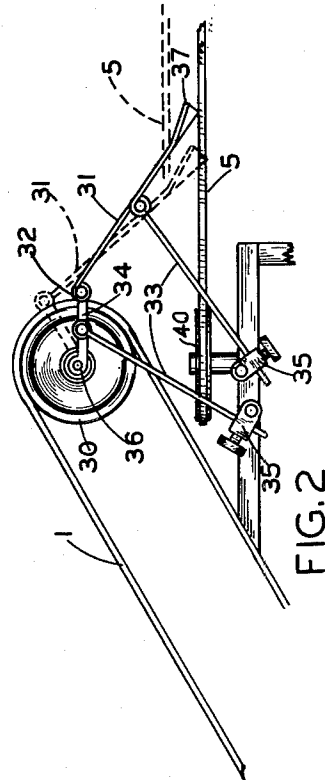


FIG. 2

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SYSTEM FOR SORTING AND GRADING BAGS

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4 Claims. (Cl. 209—125)

This invention relates to a system and apparatus for the substantially continuous reconditioning or processing of used textile bags which includes a substantially continuous production line process involving straightening, cleaning, sorting and grading textile bags for subsequent baling, and the system, also, includes an effective repair circuit whereby damaged bags may be withdrawn and mended bags re-introduced into the system without disrupting the same.

Textile bags are commonly used, have many uses and in certain instances are actually preferred to paper or other containers. The initial cost of textile bags normally is higher than paper bags used for substantially the same purpose. The use of such textile bags, therefore, becomes limited unless used bags are economically reclaimed for subsequent reuse. Heretofore, the reclaiming and reconditioning of used bags has been haphazard at best, and has been mostly carried on by the users of the bags. This procedure, however, has certain inconveniences due to the fact that the bags must be handled and rehandled by intermediaries in collection, sorting, and ultimately returning the bags to the user, who usually will only accept his own bags. These bags must then be cleaned, sorted, mended and transported to their point of use.

Included among the objects and advantages of the present invention is a system and apparatus for the centralization of reclamation or reconditioning used textile bags. The invention provides a substantially continuous and effective means for cleaning and sorting the bags prior to passing them to grading and bundling. The invention, also, contemplates the inclusion in the system of a repair center for the repair of the bags and the return of repaired bags to the system without disruption of the system. Novel conveyor means are provided for passing the bags along the several processing steps of the system and there is provided novel transfer means of the bags from one conveyor system to another. The invention provides a complete unit which is highly flexible and which is readily adaptable for either an operational setup on a one-plane or horizontal system, or on a multi-plane generally vertical system. The invention provides a novel and highly efficient conveyor for bags from which bags may be readily removed and on which such bags may be conveyed around a circulatory course.

These and other objects and advantages of the invention may be readily ascertained by referring to the following description and illustrations in which:

Fig. 1 is a schematic perspective view of major units of the bag reconditioning system including a diagrammatic system for the flow of the bags during processing;

Fig. 2 is a side elevational view of a transfer system for continuously passing bags from a belt conveyor to a wire conveyor;

Fig. 3 is a top plan view of the bag transfer system of Fig. 2;

Fig. 4 is a perspective view of a bag elevating device

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for a flat, continuous belt conveyor including an upper transfer station;

Fig. 5 is a sectional view taken through section lines 5—5 of the device of Fig. 4;

Fig. 6 is a perspective view of a modified bag elevator system for a wire conveyor; and,

Fig. 7 is a detailed section of the elevator of the wire conveyor of Fig. 6 taken along section lines 7—7.

The reconditioning of used textile bags at a central collection point generally involves receiving bundled, used bags, called "as rise" bags, from a plurality of sources, and storing the bundles of bags on pallets and in racks for ready movement of the bags to the processing line. In this connection, to have a substantially continuous processing assembly line, sufficient storage must be maintained to keep the line operating at full capacity. The "as rise" bags from storage are moved to the feed end of a reconditioning line where the bags are spread, cleaned, sorted and then passed to grading. The graded bags are passed to a baler, and the finished, or "in order," bags when baled are ready for shipment or storage in preparation for shipment. During the sorting of the bags the completely unusable bags or "culls" are placed in the reject line so that they may be eventually baled and sold. The bags which are holey and need repairing are passed to the sewing machines or repair station where the bags are sewn and repaired. The mended bags are then passed to the inspectors and graders and hence back into the system.

In a typical installation, illustrated in Fig. 1, the "as rise" storage, which may be a series of racks for holding rolled bundles of the bags on pallets, provides sufficient storage for substantially continuous running of the recovery line. Pallets of the "as rise" bags are moved to the feed station at the lower end of a belt conveyor 1, and a worker at the feed station spreads out the bags and lays them flat on the belt conveyor 1. The spread out belts travel along the belt to the cleaning station where the bags are pulled over the end of a suction tube 2. The vacuum cleaner provides suction to thoroughly clean the bags. Generally, for efficiency two workers are required to manipulate the bags over the tube for cleaning, and lay the bags back on the conveyor. The vacuum cleaner is a large suction pump having adequate filters and air flow capacity to thoroughly clean the bags. After the bags 3 are cleaned, they are again spread out substantially centerwise on the belt conveyor which travels along to the sorting station just beyond the cleaning station. At the sorting station one or more workers sort the bags, removing the culls which are placed on racks or wagons for subsequent passing to a baler. The sorters, also, remove the holey bags which are placed on holey bag trucks. These trucks are moved to the mending and repair station at the opposite end of the line.

The bags which pass the sorting station remain on the belt conveyor and travel up an inclined section. At the top of the belt conveyor a transfer station 4 provides means for transferring the bags to a wire conveyor 5. The conveyor 5 is a continuous wire conveyor extending around a circuit which is propelled by a motor, not shown, mounted in a housing 7 rotating a drive pulley 8. The transfer point 4 is so arranged that the bags discharging from the belt conveyor 1 pass onto and drape over the wire 5. The wire 5 is suspended above a table 9 which is the inspection and grading station. A plurality of workers, where necessary, are positioned along the table, and as the bags pass over the table the workers pull the bags off the wire grading them and laying them in a number of piles, such as those indicated by 10, 11 and 12 on the table 9. Generally, there will be three or more grades or piles of the bags. Normally, the bags are temporarily stored in short piles on the table to speed

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up the operation so that the operator does not have to pull the bags off the wire, inspect it and then turn around and place the bag on a truck or pallet behind him. The inspection and grading is, of course, a visual matter, and is readily and efficiently accomplished by having each of the workers select a particular grade or grades of bags from the line. For example, by having three workers operating at the inspection and grading station, each of the workers would be assigned specific grades to pull from the line. The first inspector would only take those bags from the line which correspond to his grade. For example, he may be assigned the duty of grading and inspecting 98 pound cement bags. All other bags are permitted to pass his station. The second man may be assigned the duty of inspecting and grading 100 pound grain bags, and perhaps to subgrade them into one or more specific companies. This worker removes from the wire conveyor all grain bags and places such bags into specific piles. The last man would then be required to withdraw all remaining bags from the line and grade and pile these bags. For efficiency the workers pull the bags from the line temporarily placing them on one of the short piles. When the pile is sufficiently high, this pile is then removed from the table and placed onto a pallet. When the piles on the pallets are sufficiently high, they are moved to a baler where they are baled and tied, and these "in order" bags are then moved from the baler to storage or shipment as required.

The holey bags which have been removed from the line at the sorting station are placed on trucks or pallets which are moved when full to the mending and repair station at the opposite end of the line. A plurality of operators at sewing machines 15 are used to sew up the holes and mend the bags. As these operators repair a bag, it is draped over the wire 5 which runs above the sewing machines. The wire passes around a bull wheel or return pulley 16 substantially parallel with the stretch along inspection and grading station. This return wire stretch is in close proximity to the stretch over the inspection table so that the operators may easily watch both lines to pull the bags for their particular classification. Under the normal circumstances, the workers operating along the table 9 are more effective in standing position, while the workers along the feed, cleaning and sorting stations are more effective with a low conveyor. To move the belts from the low belt conveyor to the wire conveyor, an elevator section is required. On the other hand, the sewing machine operators normally sit at the sewing machine, so a means is provided for lowering the line 5 into the reach of the mending and repair station operators while they remain seated. For this purpose a stand 18 is provided which includes a pair of legs 19 each having a vertically mounted sheave 20 over which the wire 5 passes, and two shorter legs 21 having sheaves 22 mounted thereon and under which the wire rope 5 passes. The sheaves and legs are narrow so that the folded and draped bags readily pass over the sheaves 20 and under sheaves 22 without catching. In a similar manner the bags draped over the line 5 readily pass around the large pulley 16. As indicated at bull wheel 16, the pulleys may be suspended from above or they may be mounted on a stand from below. In this manner the pulleys 24 and 25, which provide bending of the conveyor rope around turns and subsequently over the drive system, may be suspended from above or mounted on a stand from below. In any event, the pulleys 16 and 24, 25 and 8 are horizontally mounted pulleys, while the elevator pulleys 20 and 22 are vertically mounted. The return stretch of the cable 5 may run parallel to and very closely to the other stretch since the bags when draped over the wire do not extend much beyond the width of the wire.

In many instances, the operators of such a system are paid on a piece work basis as where all of the workers are paid by the number of bags passing their station.

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The system of the present invention provides a ready means for counting the bags which pass any point in the system. For example, a mechanical or electrical counter may be placed above the belt conveyor just prior to the cleaning station so that all bags laid on the belt may be counted. For mechanical counters, a tickler arm extending to a point just above the belt will be tripped by a bag on the belt and an accurate count of the number of bags placed on the belt may be had. An electric eye may be used for electric counters. Since each of the bags placed on the conveyor must be cleaned, the counter provides a means for measuring the number placed on the belt conveyor and the number of bags actually cleaned. A counter may, also, be placed above the belt conveyor following the sorting station so that the number of bags passing to the inspection and grading station may be accurately known. Where the individual worker at the inspection and grading station is required to keep a separate count, a counter may be placed between each of the workers so that the actual number of bags withdrawn from the wire may be determined for each of the workers at the grading station. Also, a counter may be placed on the return line of the mended bag station so that the number of mended bags may be accurately known. Counters may be positioned along various stations at the inspection and grading station on the return line of the wire conveyor.

In handling such bags, initially cleaning, sorting, etc., requires that the bags be flat, readily and easily available for manipulation. The belt conveyor provides an effective and highly efficient feeder for bags so spread out. In the present case, the worker at the feed station opens the bags and lays them flat on the belt conveyor so that subsequent workers may readily and quickly grab the bags, place them over the suction tube, remove the same and put them back flat on the belt conveyor. The sorters may then easily turn the bag over to see if it needs repairing or should be discarded as a cull. Once past the sorting station, however, the bag is more readily accessible if it is draped over a thin conveyor, for example a wire conveyor. On the wire conveyor the bags may be conveyed around curves, up and down grades, taking up a minimum of space. The bags are thus manipulated without falling off the wire or slipping around. On the other hand, while draped over the wire the bags are very easily handled, pulled off and are sufficiently spread out for necessary inspection and grading.

The transfer station 4 provides an effective means for transferring the bags from a flat belt conveyor onto the wire conveyor. The transfer mechanism is shown in detail in Figs. 2 and 3 wherein a belt 70 passes over a belt pulley 30 at the upper end. On the down side of the pulley, a tray or feed chute 31 is mounted with its upper end 32 closely adjacent to the surface of the belt. The tray is mounted on adjusting rods 33 and 34 which are adjustably mounted in thumb screw locks 35 mounted on the support. By having one end of the adjusting rod 34 journaled on the shaft 36 of the pulley 30, the upper end 32 may be maintained in relative position in respect to the axis of rotation of the pulley during adjustment of the tray 31. Each of the outer ends 37 of the tray are turned upwardly so as to guide bags back toward the center in the event they are placed askew on the belt. A narrow slot 39 is provided centrally in the tray in position to fit over the wire rope 5 and provide minimum of clearance therebetween. The rope 5 is mounted on operating pulleys 40 and 41, the pulley 40 being placed under the pulley 30 so that the rope 5 is centerwise of the belt and the tray 31. As illustrated in Fig. 2, the tray 31 is mounted on the adjustable rods so that it may be moved into position to fit the position of the rope, as for example the two rope positions indicated in solid and dashed lines and the tray positions in solid and dashed lines.

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The transfer is accomplished with both the belt 1 and the wire rope conveyor 5 running. Bags lying on the belt 1 pass over the pulley 30 down onto the tray 31 and then onto the wire rope 5. As the leading edge of a bag passes over the edge of the tray 31, it immediately starts draping since such textile bags are limp and flexible. Once on the wire 5, the bag drapes over the wires, as illustrated in Fig. 1. For normal conditions, the belt 1 and the wire 5 should operate at substantially the same speed.

The system of the present invention is useful for installations on a horizontal assembly line, as illustrated in Fig. 1, and it is equally adaptable to a generally vertical assembly line or at least a multiplane assembly line. In some instances the space on a particular floor of the factory, in which the reconditioning system is to be installed, will not permit the installation of a horizontal system. In this case, the system may be extended onto various floors with very slight modifications. Since the "as rise" bags are received from trucks and the like, the "as rise" storage is normally on or substantially at ground level, and for convenience the feed station for the belt conveyor should be in close proximity to the "as rise" storage. This provides ready access to the large supplies to keep the line running substantially continuously. It is most generally preferable to have the cleaning and sorting stations adjacent to the feed station and since these take up relatively little horizontal space, they may normally be accommodated next to each other on the same plane. These stations may, however, be vertically separated. An elevator device is utilized to pass the bags from the horizontal belt conveyor up to the floor above. This elevator may be a belt or a wire conveyor. Two systems for this purpose are illustrated in Figs. 4 and 6.

In Fig. 4, a generally horizontally disposed belt conveyor 45 is mounted with its end pulley 47 in close proximity to an elevating belt conveyor 46. The pulley 47 of the belt conveyor 45 is mounted as closely as possible for efficient operation to the pulley 48 of the belt conveyor 46 so that bags readily pass from one conveyor to the next. If the steepness of the belt conveyor 46 is increased a holding system must be provided to keep the bags from slipping down the belt. For such holding, a plurality of narrow holding belts reeved on a plurality of lower pulleys 50 and a plurality of upper pulleys 51, are mounted with a stretch 49 in close proximity to the belt 46 and generally running parallel therewith. As shown in Fig. 5, the running stretch 46 of the belt is closely adjacent to the running stretches 49 of the holding belts, and these two belts generally run at the same linear speed. The return stretches 46a and 49a obviously follow around the respective pulleys for the operation of the belt. The bags lying on belt 46 pass up between the running stretches of the two of the belts, with the holding belts 49 preventing relative movement of the bags. To aid the transfer of the bags onto elevator belt 46 from the horizontal belt 45, the lower pulleys 50 may be mounted closely adjacent to the belt 45 to catch the bags as they approach the end of that belt and insure transfer to belt 46. At the upper end of the elevator belt 46, a transfer tray 31 provides means for transferring the bags onto the wire rope conveyor 5 as described above. The hole in the floor 53 may be any shape to permit ready accommodation of the elevator therethrough. From this system the wire rope may extend through the inspection and grading station, through the mending and repair station and back to the top of the elevator station.

Where space is very limited, the wire rope is readily elevated to still other floors, or may be similarly lowered to a lower floor. The elevating of the rope conveyor is easily accomplished, as illustrated in Figs. 6 and 7, where the wire rope 5, and contained bags 3, pass under a vertical pulley 60 at an elevation below a floor 61. The rope passes through an opening, up to and over another pulley 62 on the floor above. Where the steepness of

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the rope going up to the upper floor is such that the bags slip down the rope, a holding belt 63 may be juxtaposed above the rope stretch on the elevator. This belt is arranged to operate linearly, or at the same speed with the rope. The holding belt is mounted for operation on a lower pulley 64 and an upper pulley 65, and the tension between the belt 63 and the wire rope 5 provides holding for the bags 3 draped over the rope 5. Where the elevating stretch is short, the tension between the flat belt 63 and the wire 5 may be sufficient to prevent the bags from slipping on the wire. For longer stretches, however, it may be necessary to use back-up blocks 66, which may be merely thin blocks mounted on supports and juxtaposed below the wire 5 in position to hold the wire tightly against the holding belt 63, or they may be idler pulleys, spaced along the rope.

The system, due to the unique conveyor system, is very flexible being readily available to transport to desired elevations, go around corners, and generally fit an existing structure. Such flexibility may be the essential feature for installation of the system, since the process is generally not considered a productive process and an expenditure for a separate and especially designed building may be considered unwarranted. The system is readily expanded or reduced in size to accommodate the needs of a particular user without hampering the efficiency of the system. The system may, also, utilize sheaves on adjustable height pulleys, which provides even greater flexibility.

While the invention has been described by reference to specific details, there is no intent to limit the spirit or scope of the invention to the precise details so set forth, except insofar as defined in the following claims.

We claim:

1. A bag reconditioning system comprising a belt conveyor extending along a substantial stretch and at a low elevation for easy reach of standing operators and arranged to support flat, spread out bags, a vacuum cleaner stationed along said belt conveyor including a cleaning tube above said belt conveyor and intermediate the ends thereof, the conveyor being sufficiently long from the cleaner to the end thereof to provide a sorting station for the removal of culls and bags for repair, belt conveyor means having an upwardly inclined portion extending from the sorting station to an upper transfer point, an endless wire conveyor, a chute for passing spread out bags in straddling relation onto said endless wire conveyor, a grading table mounted along and below said wire conveyor, the wire conveyor being spaced above said table in easy reach of standing operators stationed therealong, an elevator mechanism inclusive of training sheaves mounted in position to reduce the elevation of the wire conveyor from the grading station to a repair station where operators seated at mending machines may easily reach said wire and place mended bags thereon, the wire conveyor extending generally along in a return stretch over said grading station generally parallel to and in close proximity to the forward stretch of said wire conveyor, and means for moving said wire conveyor.

2. In a textile bag reconditioning system a transfer mechanism for transferring flat, spread out bags from a belt conveyor to a wire rope conveyor which comprises, a belt conveyor, a wire rope conveyor, a downwardly sloping feed pan mounted with one edge adjacent an end roller of said belt conveyor on which bags are spread and having the other end mounted adjacent said wire rope conveyor, a slot in said pan straddling said wire rope, means for adjusting the angle of slope of said pan while maintaining its edge in the same relative position to the belt pulley, and means on said pan for guiding bags onto said rope conveyor.

3. In a textile bag reconditioning system a transfer mechanism for transferring flat, spread out bags on a belt conveyor to a wire rope conveyor which comprises, a belt conveyor, a wire rope conveyor, a downwardly

sloping feed pan mounted with its upper edge adjacent an end roller of said belt conveyor on which bags are spread and having the other end mounted adjacent said wire rope conveyor, a slot in said pan straddling said wire rope, means inclusive of adjustable rods secured to each edge for adjusting the angle of slope of said pan while maintaining the upper edge the same relative distance from the axis of the belt end roller, and means on said pan for guiding bags onto said rope conveyor.

4. A transfer mechanism according to claim 3 in which the guide means on said pan includes upturned sides guiding bags centerwise of said feed pan onto said wire rope conveyor.

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