July 2, 1957 A. J. BURKE 2,797,792

BAG HANDLING APPARATUS

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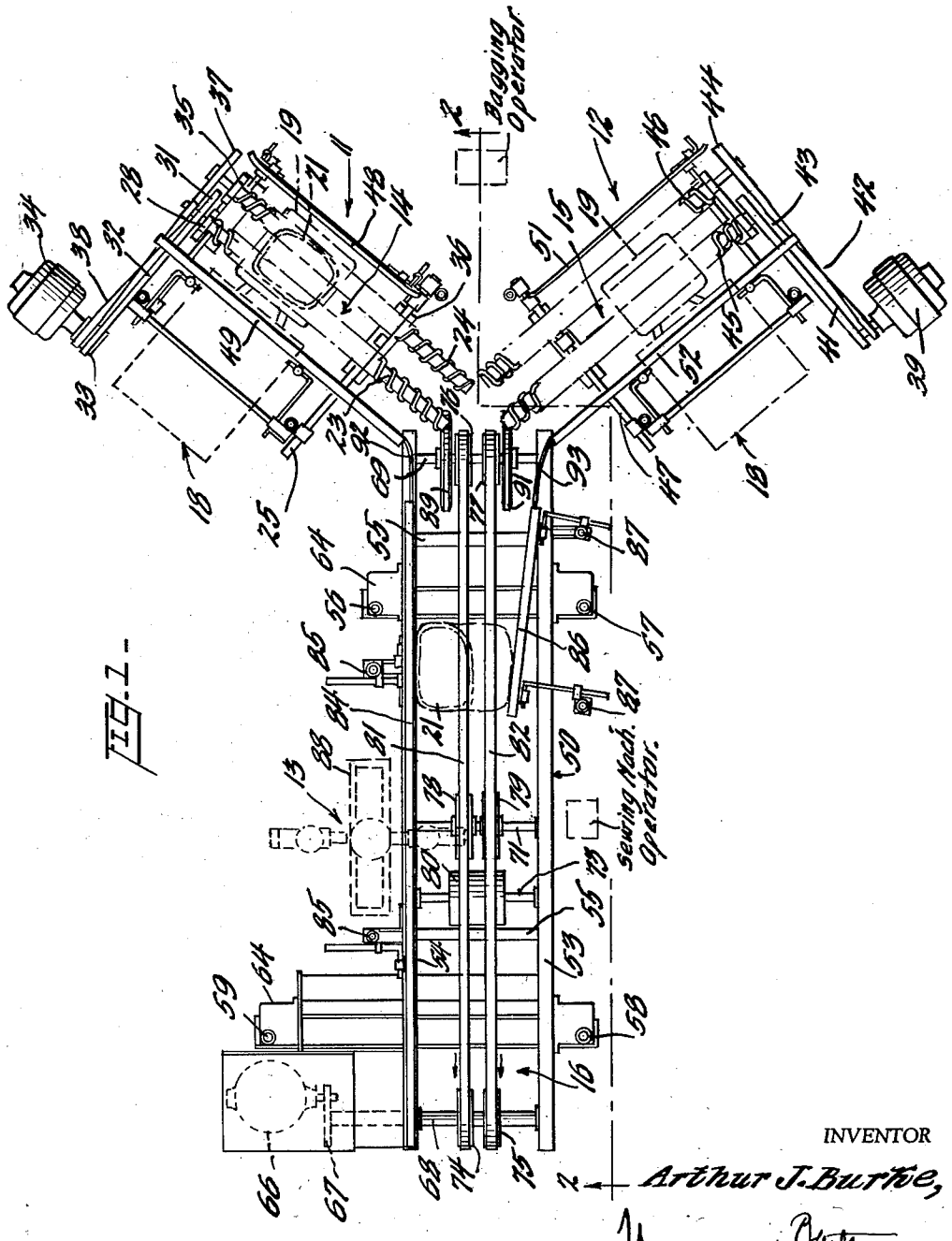


FIG. 1.

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BAG HANDLING APPARATUS

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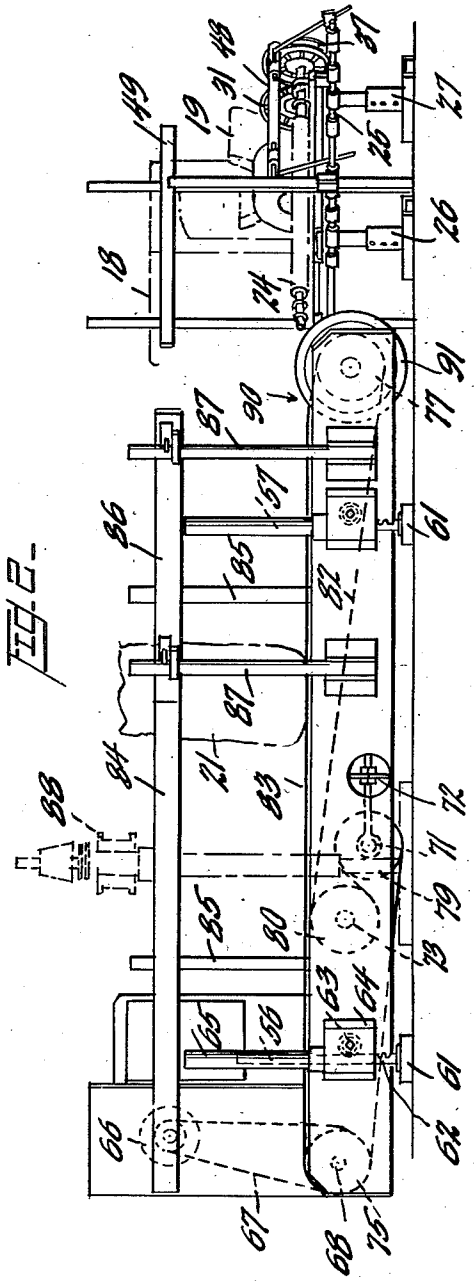


FIG. 2.

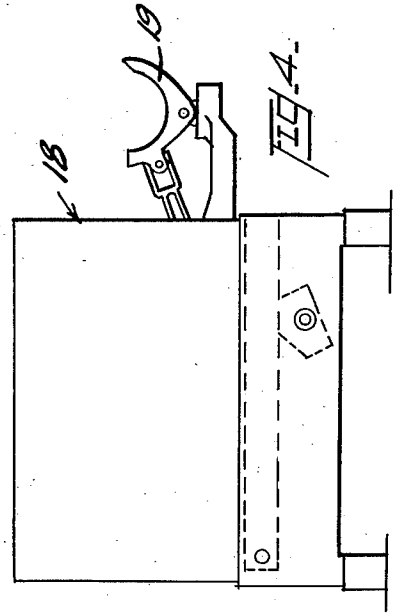


FIG. 4.

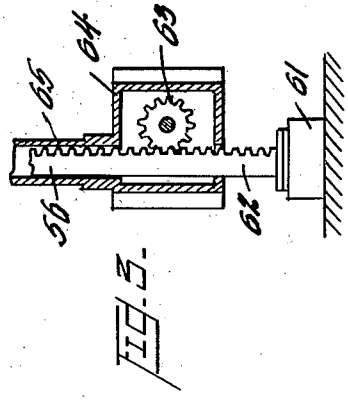


FIG. 3.

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FIG. 6.

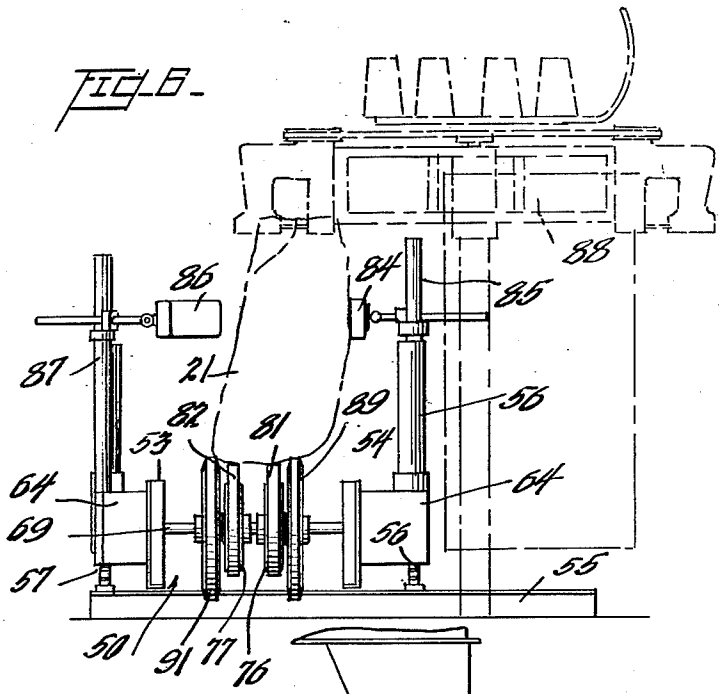
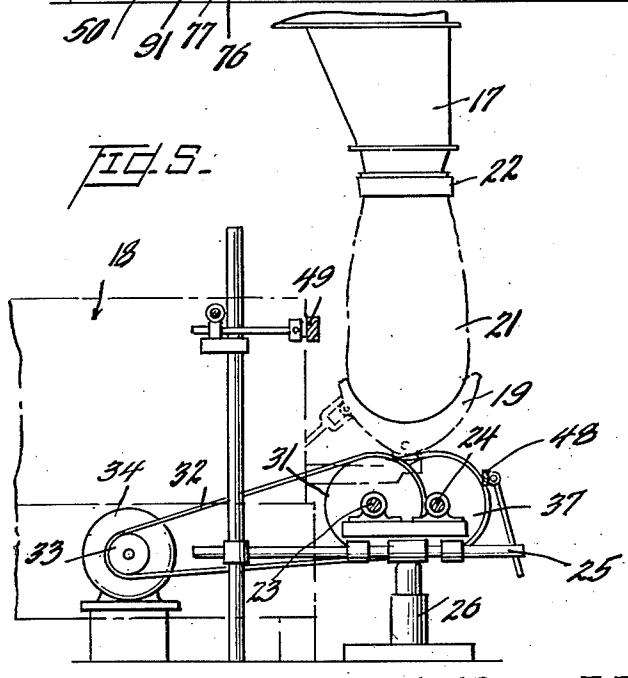


FIG. 5.



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BAG HANDLING APPARATUS

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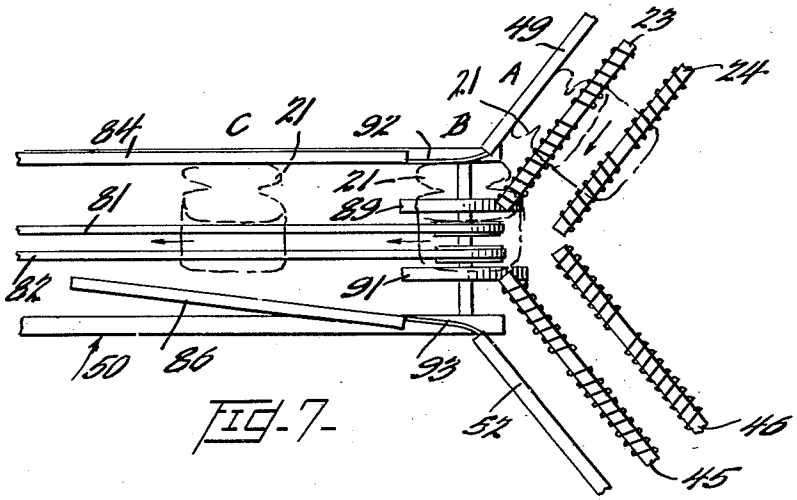


FIG. 7.

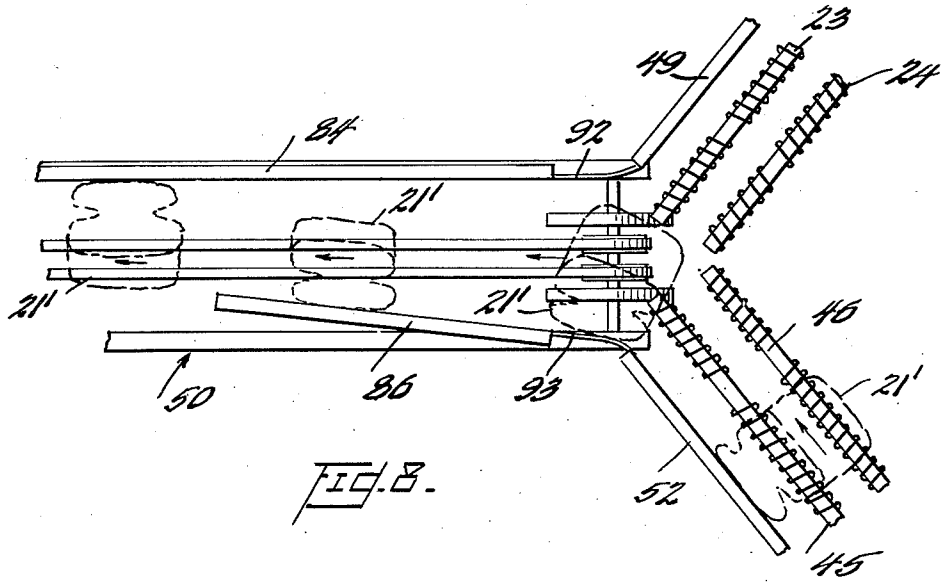


FIG. 8.

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United States Patent Office

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Patented July 2, 1957

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BAG HANDLING APPARATUS

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Application July 14, 1954, Serial No. 443,269

14 Claims. (Cl. 198—32)

This invention relates to bag handling conveyor apparatus and more particularly to apparatus for conveying upright filled but not closed bags from two separate bag filling stations to a single station where a further operation such as closing the bag by sewing is accomplished.

The invention in its preferred embodiment provides the solution of a problem of correlating bag filling and filled bag sewing operations which has evaded the industry for over twenty years. The bags under consideration are chiefly heavy paper or cloth bags usually taller than they are wide. Each is usually filled with a required amount of fluent material, such as one hundred pounds of feed, by attaching the open mouth of the bag to the discharge spout of an automatic weighing assembly until it receives the proper charge of material and then dropping the filled bag upright onto a conveyor which takes it to a sewing or other station where the top of the bag is sewed shut by a second man. Since the bags are heavy a minimum amount of manual handling is always desirable.

The conventional automatic weighing mechanism in usual assemblies today can accurately weigh and discharge about eight one hundred pound charges per minute whereas the sewing machine operator can readily sew shut sixteen bags per minute if they come to him properly, so that in practice, where the bags are not subject to a packing operation intermediate the filling and sewing operations, it is usual to discharge from two automatic weighing mechanisms alternately into a hopper having two bag holding spouts from which the first operator can readily fill and drop sixteen bags per minute on a single conveyor that takes them directly to a single sewing station.

However, in many cases the bags must be subjected to a packing operation as by oscillation or bouncing during or after filling in order to settle the contents and to provide enough free bag material at the open mouth to facilitate the closing sewing operation. This packing operation, however, cannot be efficiently carried out at a rate of more than eight bags per minute so that the output of the automatic weighing assembly is too slow to efficiently engage the time of one sewing machine operator and it has been found impractical to provide a separate sewing machine on adjacent sections each of two such conveyors each carrying eight filled and packed bags per minute with an operator between them because a single operator cannot physically handle two sewing machines at an overall speed of sixteen bags per minute. As a result it has been customary to accept such inefficient operation as inevitable for bag filling apparatus utilizing packers.

The problem is solved in the present invention by providing a conveyor train whereby two independent conveyors from two separate bag filling and packing stations alternately serviced by a single operator merge to a single conveyor that delivers the bags in spaced alternate succession to a single sewing machine station. By this arrangement, the eight bag per minute output of each automatic weighing and bag filling and packing assembly is delivered to a single sewing machine conveyor which presents sixteen bags per minute to the sewing machine operator. Since the filled bags are dropped first on one of the independent conveyors and then on the other by the single operator servicing them they arrive at the merger point properly synchronized as to spacing, and the merger point is of special construction as will appear for properly transferring the filled bags into proper orientation on the sewing machine conveyor.

It is therefore a major object of the invention to provide a filled bag handling conveyor apparatus wherein two independent conveyors merge in a novel manner to transfer filled bags therefrom into desired orientation upon a single conveyor for serial presentation at a bag handling station.

It is a further object of the invention to provide a novel bag filling and sewing apparatus wherein two independent conveyors of filled bags merge and automatically transfer the bags onto a single sewing machine conveyor.

A further object of the invention is to provide a bag handling conveyor apparatus wherein two converging lines of spaced filled bags merge into a single line by means of a novel bag transfer device at the intersection of three independent conveyors.

Further objects of the invention will appear as the description proceeds in connection with the appended claims and the annexed drawings wherein:

Figure 1 is a top plan view illustrating a conveyor apparatus according to a preferred embodiment of the invention wherein converging screw conveyors from two separate automatic weighing and bag filling stations merge to automatically deposit their bags upon a sewing machine conveyor;

Figure 2 is a side elevation of the conveyor apparatus of Figure 1;

Figure 3 illustrates in section an elevator device for leveling the sewing machine conveyor;

Figure 4 illustrates in side elevation a packer for the filled bags;

Figure 5 illustrates in side elevation the packer action in the apparatus as it jostles the bag clamped to the discharge spout of an automatic weighing assembly;

Figure 6 is an end elevation partly in section showing a bag at the sewing station; and

Figures 7 and 8 are diagrammatic views showing the transfer action between the conveyors.

Referring to Figure 1, the apparatus comprises a first automatic weighing and bag filling station **11**, a second automatic weighing and bag filling station **12** and a sewing machine station **13**. The bag filling stations have similar independent continuous conveyor units **14** and **15**, respectively, arranged at an angle and so that their ends remote from the weighing mechanism enter a transfer region that also contains one end of a continuous sewing machine conveyor unit **16**. In a preferred embodiment the bag filling conveyor units **14** and **15** have their longitudinal axes include an angle of 100° and they intersect the longitudinal axis of the sewing machine conveyor at 50° at the same point.

In the invention an operator stands in the angular space between the weighing and filling stations **11** and **12**, devoting his attention to first one and then the other, so that filled bags are deposited in staggered series on the respective conveyor units **14** and **15**. As each filled bag enters the merger or transfer region at the juncture of the three conveyor units, it is properly automatically transferred from its screw conveyor to the sewing machine conveyor by a special association of parts to be herein described in more detail. Thus the series of spaced bags of both screw conveyor units mesh and become a single line of properly spaced filled bags entering

sewing station 13 where a second operator sews them shut.

Each of the weighing and filling stations 11 and 12 comprises above the respective conveyor units an automatic weighing assembly only the spout of which is shown and indicated at 17 in Figure 5. The remainder of each such weighing assembly wherein the material to be bagged is weighed and the weighed charges delivered to spout 17 may be of any well known type and since the details of construction of such are not essential to an understanding of the invention none will be described.

At each weighing and filling station is disposed a bag packing device 18 having a bag receiving cradle 19 located above the conveyor unit (Figure 5) to receive the bottom of a bag 21 clamped as at 22 to the lower end of spout 17. The clamping arrangement is preferably the quick gripping and releasing device disclosed in United States Letters Patent to Hilton No. 1,449,285 although any conventional securing means may be employed.

Within each packing device 18 is a self-contained motor driven mechanism connected by support and motion transmitting linkage to cradle 19 for oscillating the cradle during the bag filling operation and permitting the bottom of the bag to descend toward the conveyor unit as the bag becomes heavier. This same mechanism is effective after the bag has been filled to retract the cradle 19 laterally of the conveyor unit and allow the filled compacted bag to be lowered directly onto the conveyor unit therebeneath. Any further details of construction and operation of such a packing device necessary to the present invention are herein incorporated by reference to United States Letters Patent to Richardson No. 2,376,810. A suitable vertical adjustment is provided in the packer for locating the cradle properly with respect to the screw conveyor over which it extends.

Conveyor unit 14 comprises two parallel screws or worms 23 and 24 of relatively opposite pitch journaled on parallel axes on a suitable support frame 25 atop vertically adjustable legs 26 and 27. Screw 23 is mounted in spaced bearings 28 and 29 that also prevent axial displacement of the screw which extends through bearing 28 to mount a pulley 31 connected by belt 32 to pulley 33 on the shaft of electric motor 34. Screw 24 is similarly mounted in spaced bearings 35 and 36 and carries a pulley 37 connected to motor pulley 33 by belt 38 which is crossed as shown in Fig. 1. By this arrangement screws 23 and 24 are simultaneously rotated in opposite directions at the same speed whereby, due to the relatively opposite pitch of these screws, a filled bag of particulate material resting thereon will be constantly advanced toward the sewing machine conveyor junction.

Similarly at the other filling station a separate electric motor 39 is connected by belts 41 and 42, the belt 42 being crossed, to driving pulleys 43 and 44 respectively on the ends of screws 45 and 46 to rotate these screws simultaneously in opposite directions, these screws being of relatively opposite pitch and mounted on frame 47 in the same manner that screws 23 and 24 are mounted on frame 25. All of screws 23, 24, 45 and 46 are preferably identical except in length and relatively opposite pitch of the screws of each pair and are driven at the same speed but with the screws of each pair rotating in relatively opposite directions. Screws 24 and 46 are of equal length and shorter than the screws 23 and 45 and terminate adjacent each other substantially on the longitudinal centerline of conveyor unit 16. Screws 45 and 23 are of equal length and terminate at points equally spaced from that centerline for a purpose to appear.

At station 11 parallel side guide rails 48 and 49 are mounted on uprights from frame 25 well above the conveyor unit level so that a filled bag deposited upon the conveyor 14 is slidingly supported on one side or the other during its travel along the conveyor should the bag tilt in either direction from an upright position. Similarly at station 12 parallel side guide rails 51 and 52 slidably support tilted bags during their travel along conveyor unit 15.

The sewing machine conveyor unit comprises a frame 50 having parallel side sills 53 and 54 secured together by cross members 55 and provided at the respective corners with vertically adjustable identical legs 56, 57, 58 and 59. As illustrated in Figure 3 each leg, 56 being there shown, comprises a foot 61 and a vertically extending toothed rack 62 constantly meshed with a gear 63 journaled on sill 53 and a bracket 64. Bracket 64 has a tubular shield portion 65 surrounding the rack and rising above the frame. When gear 63 is rotated by a suitable tool, the frame is adjusted upwardly or downwardly.

It will be noted that leg 59 is spaced outwardly of the sill 54 and the purpose of this is to support that part of the frame carrying the electric motor assembly 66 which through chain 67 drives a transverse shaft 68 journaled on sills 53 and 54.

At the other end of frame 50 a transverse shaft 69 is journaled at opposite ends in sills 53 and 54. An intermediate cross shaft 71 is journaled on the sills in spaced brackets (not shown) which are adjustable longitudinally of frame 50 as indicated at 72, and a transverse idler shaft 73 is journaled at opposite ends of the side sills of the frame. Pulleys 74 and 75 on shaft 68 are longitudinally aligned with pulleys 76 and 77 on shaft 69. Shaft 71 which is below the level of the common horizontal plane containing the other transverse shaft carries pulleys 78 and 79 longitudinally aligned with the other pulleys on frame 50. Shaft 73 is provided with an idler drum pulley 80.

Parallel conveyor belts 81 and 82 pass over the respective pulleys to move the filled bags along conveyor unit 16 to the sewing machine station. Belt 82 passes in a straight horizontal run 83 between pulleys 75 and 77 and this is the moving conveyor surface that supports the bags. Belt 82 returns to pass over drum 80 and then around pulley 79 and to the bottom of pulley 75. Proper adjustment at 72 insures taut belts properly driven by pulleys 74 and 75. Belt 81 similarly passes over its pulleys.

If desired the belt conveyor could be a single belt on single pulleys instead of the above described dual belt and dual pulley arrangement.

A side guide rail 84 extends the length of frame 50 above frame 50 on standards 85. Rail 84 is parallel to belts 81, 82 and is angularly related to guide rail 49 to which it is connected by a smoothly curved rail section 92 so that substantially a continuous guide rail is provided at that side of the assembly.

On the opposite side of conveyor unit 16 a short guide rail 86 is mounted on upright frame standards 87. As shown in Figure 1, the adjacent ends of guide rails 52 and 86 are connected by a smoothly curved section 93 so that they are effectively continuous. It will also be noted in Figure 1 that rail 86 is inclined with respect to the longitudinal centerline of conveyor unit 16 and extends toward rail 84 to form a narrowed throat region that insures the bag will be leaning against rail 84 when it enters the sewing station 13 where the sewing machine 88 is mounted to partly overhang the conveyor, the operator standing on the other side and not being obstructed by any guide rail (Figure 6). The sewing machine may be of any suitable type conventionally used in bag filling apparatus.

Referring again to Figure 1, shaft 69 carries axially outwardly of pulleys 76 and 77 two friction wheels or rollers 89 and 91 of the same diameter and larger than pulleys 76 and 77. The converging screw pairs 23, 24 and 45, 56 have their axes substantially in a common horizontal plane above the level of the horizontal bag carrying flight of conveyor belts 81, 82. It will be noted in Figure 1 that the ends of longer screws 23 and 24 extend above portions of the corresponding friction wheels 89 and 91 and in Figure 2 that the level of the

upper surfaces of the conveyor screws indicated at **90** is slightly above the top of the friction wheels. Friction wheels **89** and **91** in practice are preferably rubber tired wheels one foot in diameter, while pulleys **76**, **77** are about nine inches in diameter, so that the peripheral speed of wheels **89** and **91** is greater than the linear speed of belts **81**, **82**.

Operation

During operation the bagging operator, starting with station **11**, unclamps a filled bag that has been compacted by packer **18** and, with cradle **19** retracted from beneath the bag, permits the bag **21** to drop gently onto screw conveyor unit **14**, at the same time only if necessary sidewise pushing the upper part of the bag to insure that it rests against rail **49** and slides therealong as the conveyor unit moves the bag to the left in Figure 1. Preferably the longer side of the bag is parallel to its direction of travel. This condition is represented diagrammatically at A in Figure 7.

As the bag **21** approaches the juncture of conveyor units **14** and **16** it is moving at a predetermined linear speed that preferably equals that of belts **81**, **82**. When the bag reaches the juncture, the bottom bag portion supported on the screw conveyor contacts and is forced against the friction wheels **89** and **91** which are rotating counterclockwise in Figure 2. By the time the bag has been urged tightly enough against the friction wheels for the latter to pick up and start to move the bag in a direction longitudinally of the sewing machine conveyor **16** the bag is in a position bridging the conveyors **14** and **16** resting on the friction wheels at its leading end and on the screws at its trailing end. Since these two ends of the bag are thus at the time being moved in angularly related directions so that a component of the force acting on the trailing end of the bag acts at right angles to the direction of the friction wheels the bag is caused to turn, clockwise in Figure 7, until it aligns with the sewing machine conveyor **16** assuming the position B in Figure 7. Then the bag moves off the rollers **89**, **91** to drop about an inch onto the belt conveyor **81**, **82** which advance the bag toward the sewing machine station as at C in Figure 7. As the bag makes the turn between the conveyors its upper end slidably rests on rail section **92** and slides along rail **84** while moving along the belt conveyor.

The bagging operator, after dropping the bag **21** onto conveyor **14** attaches a new bag to spout **17** and then turns about to remove the filled and packed bag from the weighing station **12** and drop it onto worm conveyor **15**. This bag **21'** advances to the juncture of conveyors **15** and **16** and is turned onto and in alignment with conveyor **16** by the combined action of the friction wheels and the screws just as above described in the transfer of the first bag from conveyor **14** to conveyor **16**. The only difference in action is that the upper part of bag **21'** slides along rail sections **52** and **93** until the bag rounds the turn, but since rail **86** is inclined toward rail **84** the upper part of bag **21'** during passage along the conveyor belt **81**, **82** is caused to tilt toward and eventually slidably lean against rail **84** exactly in the same relative position as bag **21** which preceded it to the sewing machine station.

Thus as the bagging operator alternates his attention between weighing and filling stations **11** and **12**, filled bags move along both conveyors **14** and **15** toward the adjacent end of conveyor **16**. Since these bags are relatively staggered along the two screw conveyors there is no possibility of conflict at the juncture of the three conveyors and the bags **21** and **21'** arrive in alternate succession on conveyor **16** where they are spaced longitudinally of the conveyor sufficiently to enable the sewing machine operator to handle the combined output of both weighing and filling stations. In practice one bagging operator here handles sixteen filled and packed bags per minute which arrive in adequately spaced linear succession at the sewing machine station for the sewing machine operator to efficiently sew the tops closed, an efficiency of operation never before attained in this art.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. In combination, two independent conveyor units converging into a transfer region for supporting and advancing thereon relatively spaced articles, a single take-away conveyor extending from said transfer region for receiving articles from said conveyor units and advancing them, and means on the adjacent portions of said take-away conveyor and each of said two converging conveyors and cooperative respectively with laterally spaced portions of the respective articles for automatically transferring to and turning into alignment with said take-away conveyor relatively spaced articles entering said transfer region on said two converging conveyors.

2. In combination, two independent converging continuous article supporting and advancing conveyor units terminating relatively closely at adjacent ends, a continuous take-away conveyor unit having one end disposed adjacent the terminals of said converging conveyor units so that articles moving along said converging conveyor units are delivered to said end of the take-away conveyor unit, and means at the adjacent ends of said conveyor units cooperative respectively with laterally spaced portions of each article for automatically transferring each article moving along a converging conveyor unit to said take-away conveyor unit and at the same time turning the article about its vertical axis into alignment with the take-away conveyor unit.

3. In combination, two independent converging continuous screw conveyor units terminating relatively closely at adjacent ends for supporting filled bags thereon in upright position and advancing them, a continuous take-away belt conveyor unit having one end disposed adjacent the terminals of said converging conveyor units so that filled bags advancing along said converging conveyor units are delivered to said end of the take-away conveyor unit and advanced thereby, and continuously driven means at the adjacent ends of said conveyor units engageable respectively with laterally spaced portions of each bag for automatically transferring each bag advancing along a converging conveyor unit to said take-away conveyor unit and at the same time turning the bag about its upright axis into alignment with the take-away conveyor unit.

4. In combination, two independent converging continuous conveyor units terminating relatively closely at adjacent ends, a continuous take-away conveyor unit having one end disposed adjacent the terminals of said converging conveyor units so that articles moving along said converging conveyor units are delivered to said end of the take-away conveyor unit, and means at the adjacent ends of said conveyor units for automatically transferring each article moving along a converging conveyor unit to said take-away conveyor unit and at the same time turning the article into alignment with the take-away conveyor unit comprising continuously rotating means spaced laterally on and driven by said take-away conveyor unit and engageable respectively with laterally spaced portions of the article.

5. In combination, two independent converging article

supporting screw conveyors terminating relatively closely at adjacent ends within a transfer station, a continuous take-away conveyor unit having one end disposed within said station adjacent the terminals of said converging screw conveyors so that articles moving along said screw conveyors are delivered to said station end of the take-away conveyor unit, and means within said station for automatically transferring each article moving along a screw conveyor to said take-away conveyor unit and at the same time turning the article into alignment with the take-away conveyor unit comprising laterally spaced continuously driven means within said station disposed intermediate the end of the take-away conveyor unit and the adjacent ends of said screw conveyors and engageable respectively with laterally spaced portions of each article.

6. In combination, two independent converging article supporting screw conveyors terminating relatively closely at adjacent ends within a transfer station, a continuous take-away conveyor unit having one end disposed adjacent the terminals of said screw conveyors so that articles moving along said screw conveyors are delivered to said end of the take-away conveyor unit, and means comprising a pair of constantly rotating friction wheels within said station driven by the take-away conveyor and engageable respectively with laterally spaced portions of each article for automatically transferring each article moving along a screw conveyor to said take-away conveyor unit and at the same time turning the article about its vertical axis into alignment with the take-away conveyor unit.

7. In combination, two independent converging screw conveyors terminating relatively closely at adjacent ends within a transfer station, a continuous take-away belt conveyor having one end disposed adjacent the terminals of said converging screw conveyors so that articles moving along said screw conveyors are delivered to said end of the belt conveyor unit, means comprising a rotatable pulley supporting said station end of the belt conveyor, and means at the adjacent ends of said conveyors within said station for automatically transferring each article moving along a screw conveyor to said belt conveyor and at the same time turning the article into longitudinal alignment with the belt conveyor comprising a constantly driven friction roller of larger diameter than said pulley.

8. In the combination defined in claim 7, said friction roller being driven by the belt conveyor.

9. In the combination defined in claim 7, a common rotatable shaft on the station end of said belt conveyor, and said pulley and friction roller being fixed to said shaft.

10. In combination, two independent converging screw conveyors terminating relatively closely at adjacent ends and each comprising two parallel continuously driven screws held against axial displacement and adapted to support and longitudinally move therealong a filled upright bag or like article, a continuous belt conveyor unit having one end disposed adjacent the terminals of said converging screw conveyors so that articles moving along said converging conveyors are delivered to said end of the belt conveyor, and means between the adjacent ends of the conveyors for automatically transferring each article moving along a screw conveyor to said belt conveyor unit and at the same time turning the article into alignment with the belt conveyor comprising a constantly driven friction roller the top of which is disposed above the level

of the belt conveyor and substantially level with but slightly lower than the level of each screw conveyor.

11. In combination, two converging screw conveyors terminating relatively closely at adjacent ends within a transfer station and each comprising two parallel continuously driven screws held against axial displacement and adapted to support and longitudinally move therealong a filled upright open mouth bag or like article, a continuous conveyor belt having one end disposed within said station adjacent the terminals of said converging screw conveyors so that articles moving along said screw conveyors are delivered to said station end of the conveyor belt, a rotatable pulley supporting the station end of said conveyor belt, and means at said station for automatically transferring each article moving along a screw conveyor unit to said conveyor belt and at the same time turning the article into alignment with the conveyor belt comprising two constantly driven friction rollers coaxial with said pulley and of greater diameter than said pulley, the outermost of each pair of said screws being longer than the other and projecting over part of the periphery of one of said friction rollers but stopping short of contact therewith, the tops of said screw conveyors being substantially level with the tops of the associated friction roller.

12. In the combination defined in claim 11, a common rotatable shaft upon which said pulley and said rollers are fixed.

13. In a conveyor apparatus, two continuous screw conveyor units mounted in converging relation and terminating at adjacent ends within a transfer region, a single continuous belt conveyor unit having one end supported by pulley means disposed within said region adjacent the ends of said screw conveyor units sufficiently close to receive articles moving into said region along the screw conveyor units, pulley means supporting the end of the belt conveyor within said transfer region and continuously driven means on said end of the belt conveyor unit comprising rollers having peripheries of high friction material driven from said pulley means for picking up articles leaving said screw conveyor ends and turning them into alignment with said belt conveyor which moves said articles out of said transfer region.

14. In a bag filling and handling apparatus, the combination of at least two different bag filling means located at different filling stations for filling upright bags with charges of material, bag closing means located at a single bag closing station, independent conveyors for said bag filling stations for supporting thereon filled bags in upright position and converging into a transfer region, a single-take-away conveyor having an end within said transfer region and extending therefrom to receive and advance the bags to said bag closing station, and coacting means at the adjacent ends of the conveyors within said transfer region and engageable with laterally spaced portions of each bag and operative to transfer each bag from the end of its bag filling station conveyor to the adjacent end of said take-away conveyor, said means automatically turning said bag about its upright axis into alignment with said take-away conveyor at said transfer region.

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