

- [54] PART ORIENTING DEVICE
- [75] Inventors: **Elmer E. Willson, Clawson; Thomas M. Pouch, Farmington, both of Mich.**
- [73] Assignee: **Multifastener Corporation, Livonia, Mich.**
- [22] Filed: **June 11, 1971**
- [21] Appl. No.: **152,284**

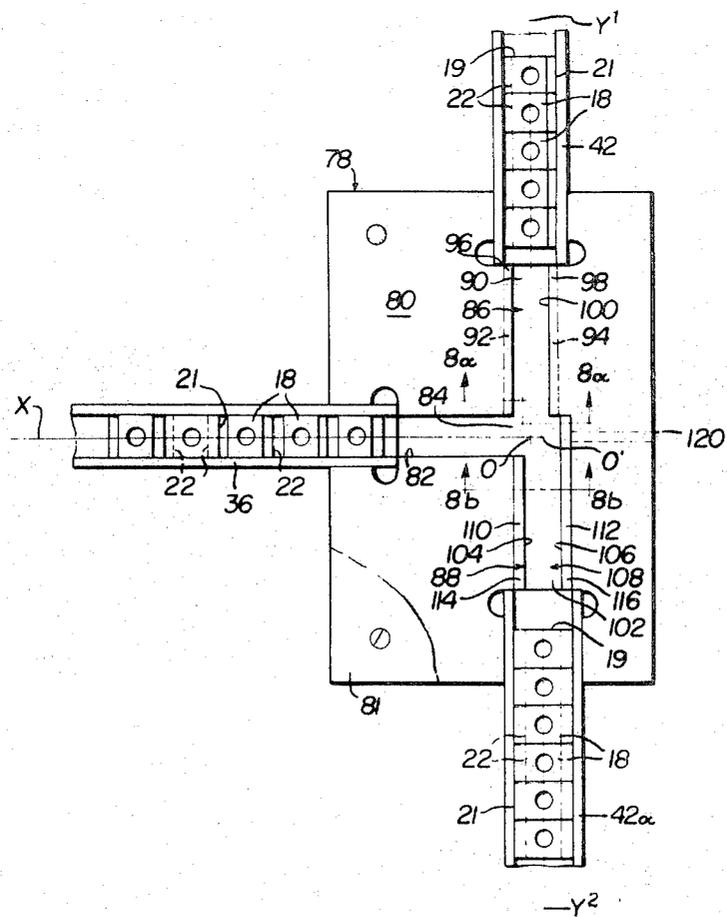
- [52] U.S. Cl. **221/157, 198/31 R**
- [51] Int. Cl. **B23q 7/00**
- [58] Field of Search **198/33 AA, 33 AB, 198/31 R, 33 R; 193/31 R, 31 A, 43 D; 302/11; 221/278, 157, 158, 159, 160, 161, 162**

- [56] **References Cited**
UNITED STATES PATENTS
 3,357,537 12/1967 Ring 193/31 R
 3,185,277 5/1965 Agnew 193/31

Primary Examiner—Richard E. Aegerter
 Assistant Examiner—Douglas D. Watts
 Attorney—Daniel G. Cullen et al.

[57] **ABSTRACT**
 In an article handling and transfer system, a parts orienting device is provided in which parts are fed in random orientation from a parts source for travel along a first path and subsequent transfer for travel along a second and third path, normal to said first path; at the intersection of the first path with the second and third path, fluid power actuated sensing and direction changing means are provided which automatically are responsive upon the presence of a part in the intersection to change the direction of travel of the part from the first path into the second or third path; in a further embodiment, the fluid power actuated sensing and direction changing means are effective to orient randomly fed parts for transfer of parts disposed in one position along the second path and for transfer of parts disposed in another position along the third path.

4 Claims, 13 Drawing Figures



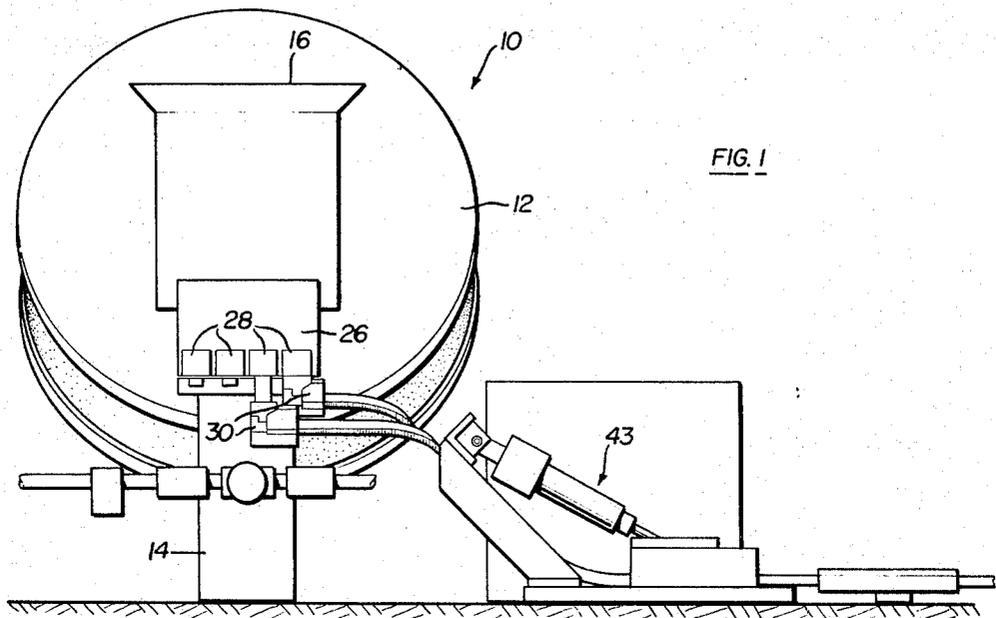


FIG. 1

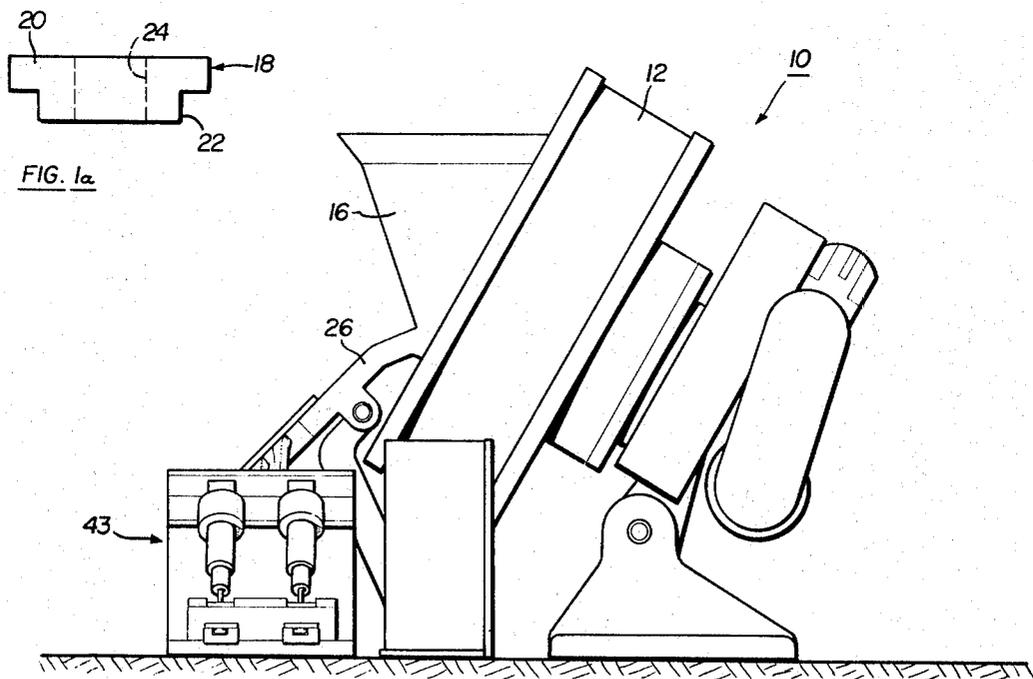


FIG. 1a

FIG. 2

INVENTORS
ELMER E. WILLSON.
THOMAS M. POUCH.
BY
CULLEN, SETTLE, SLOMAN & CANTOR.
ATT'YS.

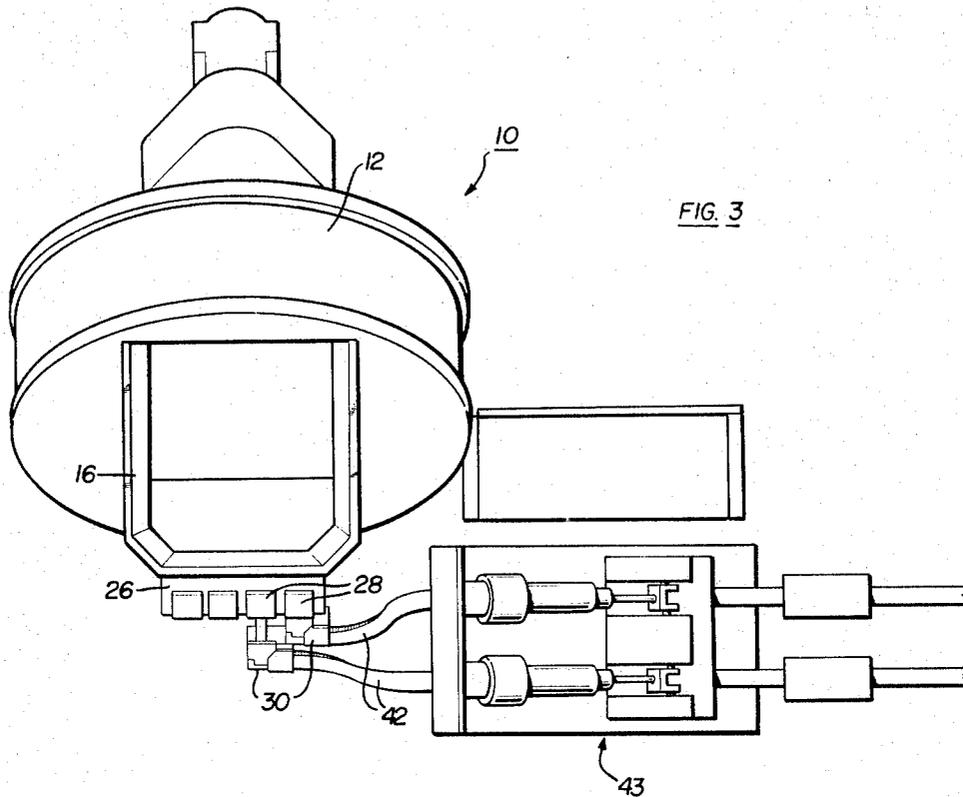


FIG. 3

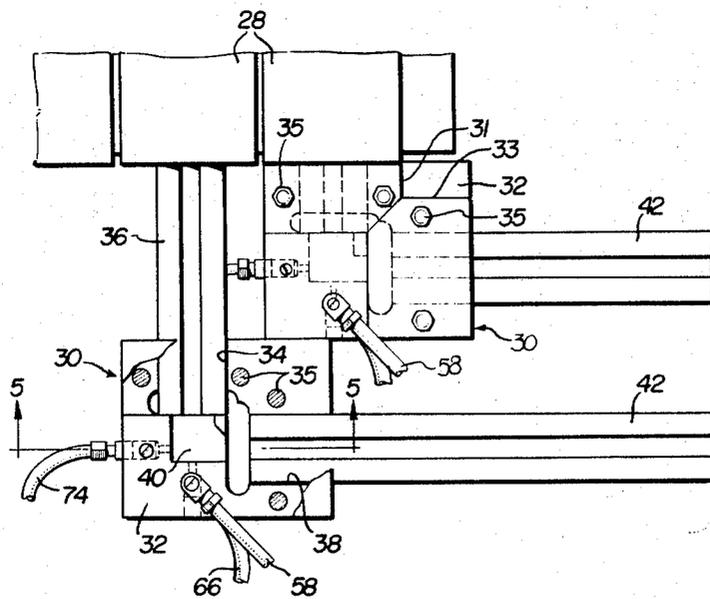


FIG. 4

INVENTORS
ELMER E. WILLSON.
BY THOMAS M. POUCH.
CULLEN, SETTLE, SLOMAN & CANTOR.
ATT'YS.

FIG. 6

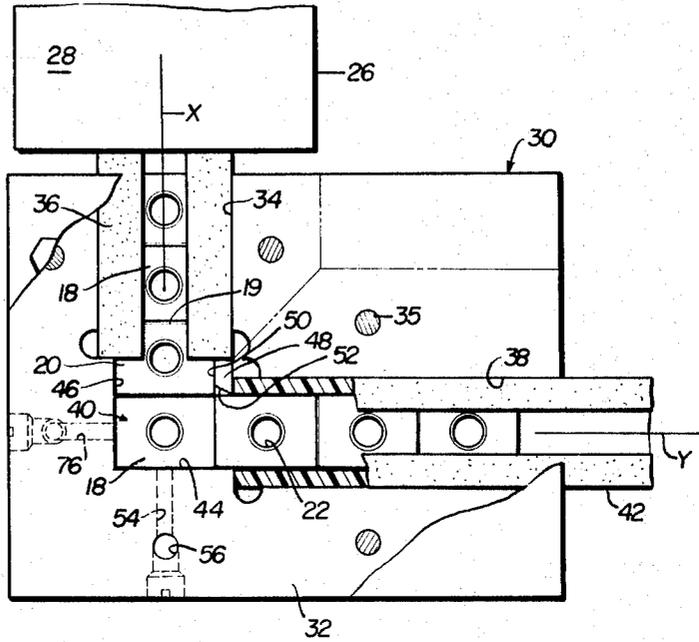
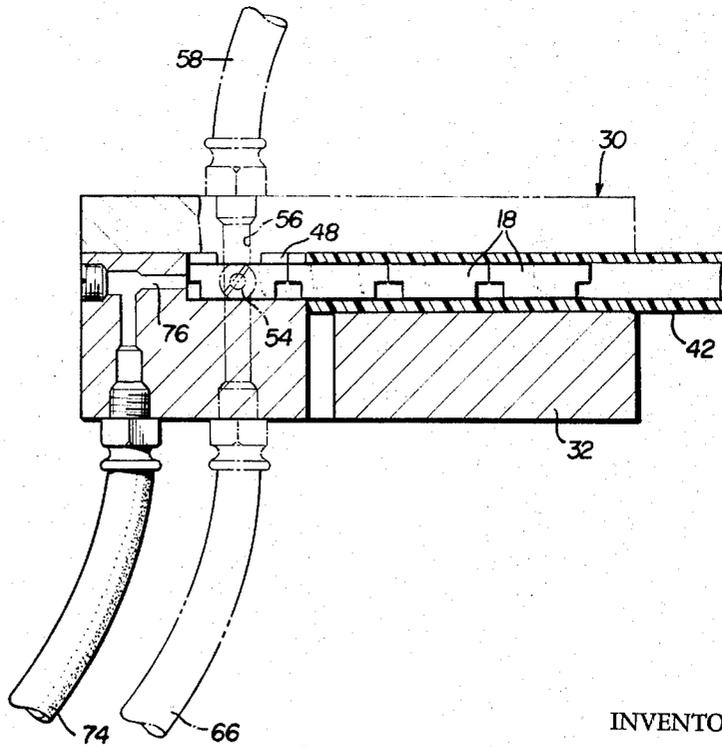


FIG. 5



INVENTORS
ELMER E. WILLSON.
BY THOMAS M. FOUCH.
CULLEN, SETTLE, SLOMAN & CANTOR.
ATT'YS.

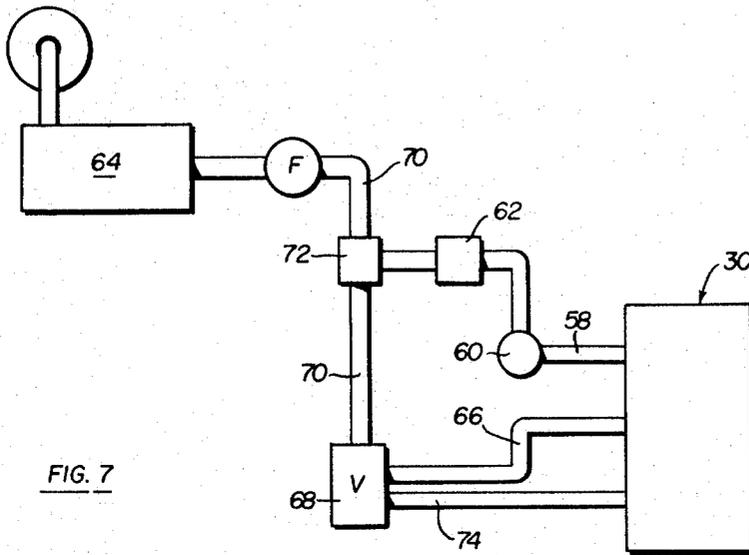


FIG. 7

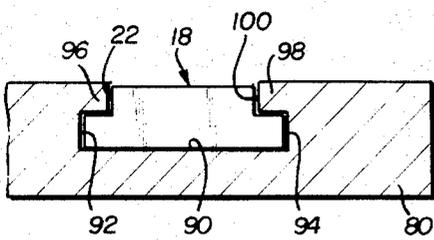


FIG. 8a

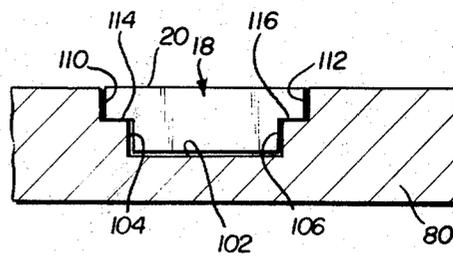


FIG. 8b

INVENTORS
ELMER E. WILLSON.
BY THOMAS M. POUCH.
CULLEN, SETTLE, SLOMAN & CANTOR.
ATT'YS.

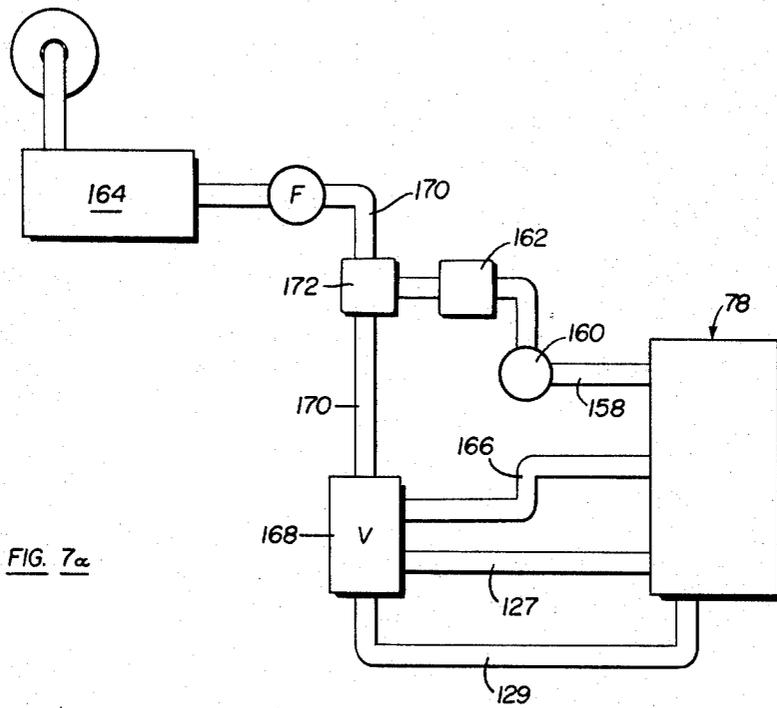


FIG. 7α

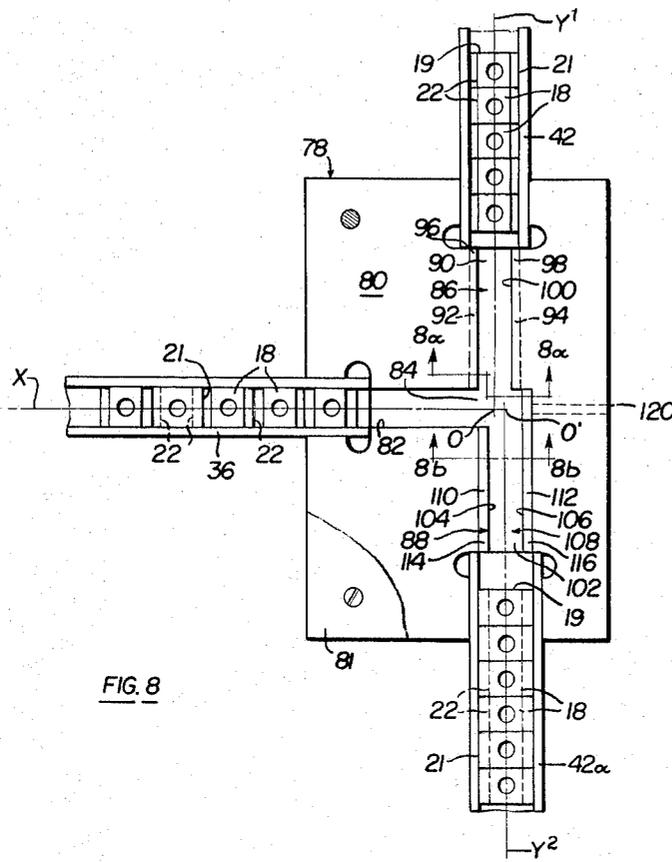


FIG. 8

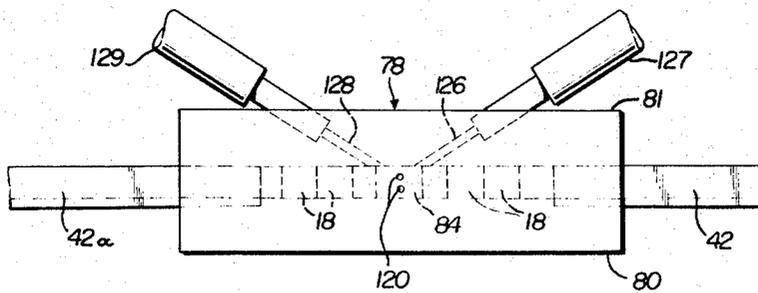


FIG. 9

INVENTORS
 ELMER E. WILLSON.
 BY THOMAS M. POUCH.
 CULLEN, SETTLE, SLOMAN & CANTOR.
 ATT'YS.

PART ORIENTING DEVICE

BACKGROUND AND SUMMARY OF THE INVENTION

The present invention refers to article handling systems in general and more in particular to a parts orienting device adapted to automatically change travel of parts from one direction to another direction at 90° angle to the first direction and additionally to orient parts for travel in opposite directions in accordance to their relative position in which they are received at the transfer station.

Article handling and parts transfer systems are known and widely employed in industry in order to move articles or other parts, such as work pieces, from one station to another station in continuous succession and at a desired speed. Often, the direction of travel of the parts must be changed due to the particular arrangements and positions of the apparatuses which supply or, respectively, receive the parts.

Conventionally, mechanical conveying or pusher means are employed to continuously move the parts along a defined path extending in various directions.

Mechanical conveying or pusher means to move the parts along a defined path require considerable mechanical structure and moving mechanisms with inherent disadvantages of wear and high cost of installation and maintenance. In many installations, complex mechanical parts transfer mechanisms are not economically feasible to be employed or cannot be incorporated because of structural limitations.

The present invention provides an improved parts transfer and parts orienting device which is completely devoid of any mechanical mechanism to move the parts along a defined path in at least two different directions intersecting at a 90° angle. The present improved device utilizes a gravity-feed arrangement from the parts supply source in conjunction with fluid power means to move the parts in the desired direction along a defined path from one station to another station in a quick, efficient and substantially noiseless manner.

In general, the parts, articles or other work pieces, are gravity-fed from a supply source, such as a hopper or the like, into a channel in one-by-one succession. From there, the parts drop into a transfer device which has a direction changing station to which is connected at least another channel intersecting the gravity-feed channel at a 90° angle. The transfer station is connected by means of conduits to a source of fluid under pressure which, however, is normally closed. A normally open sensing port and a pilot fluid conduit port are provided at the transfer station interconnected by suitable valving arrangement with the fluid pressure port. The improved device functions such that, when a part drops into the transfer station, it closes off the sensing port, causing back pressure through the pilot line which actuates the valve to open the fluid pressure conduit releasing a short blast of fluid pressure against the part in the transfer station in a direction coincidental with the second channel to thereby move the part through the second channel. This operation is continuously repeated in rapid succession with every succeeding part conveyed through the gravity channel into the transfer station.

In a further embodiment, the transfer station is connected to two channels positioned in opposite direction and both intersecting the gravity-feed channel at a 90°

angle. This arrangement is provided to alternately move parts into the first or second channel in response to the relative position of the part as they are fed through the gravity channel into the transfer station. Thus, for instance, parts received at the transfer station in a normal position will be caused to move through the one channel whereas the parts received in the transfer station in reverse, upsidedown or any other position, will be automatically moved through the other channel so that, at the receiving station the parts are being delivered in properly oriented position. This arrangement is accomplished by the present improved fluid power system as hereinafter described.

The present improved parts orienting and transfer device is particularly adaptable to transfer relatively small parts of similar configurations, particularly nuts, and more particularly nuts which have a head portion and a pilot portion of reduced diameter requiring proper orientation of the nuts for delivery at the receiving station which may be a tapper or other machine tool adapted to perform a certain work operation on the parts.

Specific advantages and novel features of the present improved parts orienting and transfer device will become apparent by reference to the following detailed description in conjunction with the appended drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings illustrate preferred embodiments of the invention in several detailed and schematic views in which:

FIG. 1 is a front view of a representative parts supply and feeding apparatus in which the present invention may be embodied;

FIG. 1a is a side view of a nut blank;

FIG. 2 is a side view of the apparatus in FIG. 1;

FIG. 3 is a top plan view of the apparatus in FIG. 1;

FIG. 4 is an enlarged top plan view of a twin assembly of the present improved transfer device;

FIG. 5 is a further enlarged plan view of a single one of the transfer devices of the present invention with the top cover being removed;

FIG. 6 is a cross-section through the device of FIG. 5;

FIG. 7 is a schematic diagram of the fluid power circuit associated with the present improved transfer device;

FIG. 7a is a schematic diagram of a modified fluid power circuit;

FIG. 8 is a top plan view of an alternate embodiment of the present improved transfer device for transfer of parts in opposite directions;

FIG. 8a is a partial cross-section through the transfer device of FIG. 8 as seen along line 8a-8a thereof;

FIG. 8b is another partial cross-section through the transfer device of FIG. 8 as seen along line 8b-8b thereof; and

FIG. 9 is a front view of the transfer device shown in FIG. 8.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

With continuous reference to the drawings, particularly FIGS. 1 to 4, the present improved parts orienting and transfer device is being shown in conjunction with a parts supply source, such as a hopper assembly 10, of

any conventional structure which, per se, forms no part of the present invention.

The hopper assembly 10 is provided with a parts containing drum 12 supported for rotation on a stand 14. The drum 12 has an open funnel 16 through which the drum is normally supplied with parts which, for illustrating purposes, are herein identified as nut blanks 18 having a head portion 20 and a pilot portion 22 of reduced dimension and which may have a central bore 24. For illustrating purpose, the nut blanks 18 are presumed to be fed from the hopper assembly 10 to a receiving station such as a tapper (not shown) for threading of the bore 24 in the nut blanks.

The tapper or other machine defining the receiving station for the parts or nuts 18, may be disposed adjacent to the hopper assembly 10 in such position as to require the parts being fed from the hopper assembly 10 along paths located in different directions relative to each other.

The parts containing drum 12 of the hopper assembly 10 is provided with an inclined gravity feed manifold 26 which may have several flow paths defining gravity feed channels 28 to accommodate several identical transfer devices in accordance with the present invention and which are generally indicated by the reference numeral 30, for simultaneous supply of nut blanks to a number of tappers or other machines.

The present improved transfer and part orienting device 30 comprises a body portion 32 having a first recess 34 therein which is in alignment with the channel 28 of the hopper manifold 26 and connected thereto, for instance, by a parts conveying chute 36. The body portion 32 is provided with a second longitudinal recess 38 disposed at a 90° angle relative to the first recess 34 and intersecting the first recess 34 at a transfer station 40. The recess 38 is adapted to be connected by means of a flexible chute 42 to the tapper, feeder mechanism or any other machine (not shown) via a power feed mechanism 43. Normally, the recesses 34, 38 and 40 are covered by cover plates 31, 33 secured to the body 32 by means of machine screws 35. For clarity, the covers have been omitted from the illustrations in FIGS. 5 and 6.

With more particular reference to FIGS. 5 and 6, the intersection or transfer station 40 has a bottom surface slightly elevated from the bottom surfaces of the intersecting longitudinal recesses 34 and 38 so as to be in planar alignment with the bottom surfaces of the respective flexible chutes and 42. The transfer station 40 is further defined by vertical side walls 44 and 46 disposed at a right angle to each other and in which the side wall 44 is opposite the inner end of the recess 34 and the side wall 46 is opposite the inner end of the recess 38. At the corner diagonally opposite the adjoining side walls 44 and 46, the transfer station 40 is provided with an abutment portion 48 which has a first vertical surface 50 parallel to the center line "X" of the recess 34 and gravity-feed channel 28 and an adjoining vertical surface 52 which is disposed at a slight angle relative to the center line "Y" of the recess 38 and chute 42, for a purpose to appear.

The side wall 44 is intersected by a fluid inlet port 54 disposed in axial alignment with the center line "X" of the recess 34, chute 36 and gravity feed channel 28. The fluid inlet port 54 intersects within the body portion 32 with a transverse passage 56 extending through the body portion to the top and bottom surface thereof.

With additional reference to FIG. 7, one end of the vertical passage 56 is connected by a conduit 58 to a flow control valve 60 which is connected by means of a regulator 62 to a source of fluid under pressure 64. The other end of the vertical passage 56 is connected by means of a conduit 66 to the pilot port of a normally closed fluid pressure valve 68. The valve 68 has an inlet port connected by conduit 70 to the source of fluid under pressure 64 and includes a regulator 72 in conduit 70. The normally closed outlet of the valve 68 is connected by means of conduit 74 to a second inlet port 76 in the body portion 32 of the transfer device extending through the side wall 46 of the transfer station 40 along an axis coincidental with the center line "Y" of the recess 38 and chute 42 thus, intersecting the center line of the fluid inlet port 54 at a right angle substantially at the center of the transfer station 40 defined by the side walls 44 and 46 and abutment portion 48.

With particular reference to FIGS. 5 and 6, parts such as nuts 18 having a head portion 20 and a pilot portion 22 of reduced diameter are fed through the channel 28 and chute 36 into the transfer station 40. As shown, the head portion 20 of the nuts 18, may be of rectangular configuration and thus providing a long side 19 and a short side. As illustrated, the nuts 18 are moved through the gravity channel 28 into the transfer station 40, with the long side 19 disposed transverse to the direction of travel. However, at the receiving station of the nut blanks which may be a tapper or other machine tool or feeding apparatus of any kind, it is often required that the nut blanks 18 be received in a different position due to the particular tool design of the respective machine or other similar requirements. Thus, as seen, the nut blanks 18 are to be delivered to the receiving station in a position in which the short side 21 is disposed transverse to the direction of travel. Thus, the nut blanks 18 must either be rotated 90°, or, conversely the direction of travel must be changed 90°. This is accomplished by means of the present transfer device 30 so far described and which functions as follows:

Nuts 18 are fed from the hopper 12 by means of gravity through the hopper manifold 26 along channel 28 into the chute 36 in the position as illustrated in FIG. 5 and in succession, one-after-another, so as to permit only one nut at a time to enter the transfer area 40 in the body 32. The nuts enter between the side wall 46 and the side wall 50 of the abutment 48. In the lower portion of the transfer station 40, the foremost nut 18 abuts against the side wall 44 in which position the body of the nut, that is, either the head portion 20 or shank portion 22 whichever way the nut may be positioned, closes off the sensing port 54. The (relatively low) pressure from the sensing fluid conduit 58 is now prevented from exit through the sensing port 54. This creates a back pressure in reverse through the pilot conduit 66 which is interconnected with the sensing conduit by means of the vertical passage 56. The back pressure through the pilot conduit 66 causes the valve 68 to shift to an open position permitting fluid pressure to be conveyed through the fluid pressure conduit 74 and through fluid outlet port or blow-off port 76 into the transfer station 40. The blast of fluid pressure from port 76 moves the nut 18 in transverse direction (towards the right in FIGS. 5 and 6) along the surface 44 of the transfer station 40 and into the chute 42, with the nut now being disposed in a 90° rotated position from

its original feeding position. The inclined surface 52 of the abutment 48, opposite the transfer station surface 44, serves as a guide for the nut 18, permitting slight pivoting of the nut, due to the sudden blast of fluid, and then effectively guides the nut 18 into the chute 42. As soon as the nut 18 is removed from the sensing port 54, fluid pressure through the sensing conduit 58 and pilot conduit 66 is again reversed causing immediate closure of the valve 68 by means of reduced pilot pressure. As soon as one nut 18 is removed out of the transfer station 40 by means of the fluid blast through the port 76, almost immediately the next following nut moves into position. However, this does not occur before the valve 68 is completely closed, to interrupt fluid pressure through port 76. Thereafter, the foregoing operation is repeated with the next following nut 18 closing sensing port 54 causing back pressure through pilot conduit 66 which again shifts the valve 68 to an open position causing a blast of fluid pressure to exit from the port 76 and moving that nut into the chute 42, and so on, in rapid succession, the valve 68 alternately opening and closing in fast sequence.

With reference to the modified embodiment illustrated in FIGS. 8 and 9, this construction provides transfer of parts in opposite directions of travel normal to the direction of feeding for sorting parts in accordance with their orientation.

As briefly mentioned before, certain parts, such as nut blanks with which the present invention is particularly concerned, have to be fed to machining stations, such as tapper units or the like, in a certain position for further finishing or machining. Previously, in order to do this, intricate parts orienting or rotating devices had to be employed to feed the parts in proper orientation into the machining units from the bulk storage area.

In the example herein illustrated, the parts to be transferred from one station to another are defined as nut blanks 18 which have a large diameter head portion 20 and a smaller diameter pilot portion 22. The nut blanks 18 normally are cut from rolled stock or press forged and are adapted to receive a central bore 24 to be threaded in the final finishing process.

Thus, to move nut blanks 18 from a storage area (not shown) to a machining station or the like, the blanks are transferred to the hopper assembly 10 and into the hopper drum 12 from which they are fed along the gravity feeder assembly or hopper manifold 26 into the respective transfer chute leading to the machining station.

Obviously, the nut blanks in the hopper drum 12 are not oriented in any way regarding the head and pilot portions of the nut blanks. Thus, the nut blanks are fed one-by-one in random position through a respective gravity channel 28 in the hopper manifold, the pilot portion 22 either facing up or down. Thus, in order to feed nut blanks 18 into the machining station in proper orientation, certain of the nut blanks must be rotated around which, of course, since all of the nut blanks are fed through a single chute to the machining station, is difficult to accomplish since the particular position of certain of the nut blanks as they are fed from the hopper assembly 10, normally can not be detected.

The present improved parts transfer and orienting device as illustrated in the embodiment in FIGS. 8 and 9, provides a simple parts orientation and transfer means to direct nut blanks as they are fed from the hopper assembly 10 in two different directions according

to the particular position of the pilot portion 22 of the nut blank, i.e. facing upwardly or downwardly. At the same time the nut is being rotated 90°.

The transfer device 78 of the modified embodiment is composed of a body or housing 80 and cover assembly 81 (FIG. 9), which has been removed from FIG. 8 for clarity.

The body portion 80 is provided with a first channel 82 connected to the gravity-feed channel 28. The first channel 82 and the gravity-feed channel 28 of the hopper manifold 26 are interconnected linearly by means of a feeding chute 36 along a common longitudinal axis "X".

The first channel 82 terminates at a transfer station 84 within the body 80 from which extend opposite transfer channels 86 and 88 also provided in the body portion 80. The transfer channels 86 and 88 extend in linearly opposite directions from the transfer station 84 along respective parallel axes 'Y1' and 'Y2' disposed in normal intersecting direction to the axis "X" of the first channel 82. Each of the transfer channels 86 and 88 is connected to a parts transfer chute 42 and 42a, respectively, which leads to the particular parts receiving station (not shown). The transfer chutes 42, 42a conventionally, as is known, are flexible so as to permit bending of the chutes around obstacles and similarly permitting twisting or looping of the chutes to rotate the particular parts conveyed through the chute into the right position for feeding into the receiving station.

As is shown, the axis 'Y1' and 'Y2' of the opposite direction transfer channels 86 and 88, although parallel to each other, are offset from each other in longitudinal direction along the axis "X" of the first channel 82 to intersect the axis "X" substantially at the center of the transfer station 84 at offset points "0" and "0" respectively.

The transfer channel 86, as seen in the cross-section of FIG. 8a, comprised of a bottom surface 90 coplanar with the bottom surface of the transfer station 84, and longitudinal sides 92 and 94 which terminate in opposite inwardly directed longitudinal flanges 96 and 98 respectively. The flanges 96 and 98 lie partially over the bottom surface 90 so as to form a longitudinal slot 100 along the transfer channel 86.

Normally, parts such as nut blanks 18, are fed through the gravity chute 36 from the hopper manifold 26 along the first channel 82 into the transfer station 84 of the transfer device 78. As seen in FIG. 8 for example, the nuts are fed in position having their short side 21 disposed transverse to the axis "X" so that the short side 21 of the nut blanks 18 will enter the transfer station 84 first. From the transfer station 84 the nut blanks 18 are then fed through transfer channel 86 along axis 'Y1', as illustrated, in a 90° rotated position; that is, now having the long side 19 disposed transverse to the axis 'Y1' as shown. It will be understood, of course, that the positioning of the nut blanks 18 could be reversed as shown in the first embodiment in FIG. 5.

As seen more in detail in the cross-section, FIG. 8a, the nut blanks 18 are fed from the transfer station 84 through the transfer channel 86 in a pilot up position, that is, the head 20 of the nut blank rides along the bottom surface 90 between the sides 92 and 94 and the pilot portion 22 is directed upwardly for extension into the longitudinal slot 100 formed by the opposite longitudinal flanges 96 and 98, as shown. Thus, it will be clear that only nut blanks in that position, i.e. in the

pilot up position can be fed through the transfer channel 86.

The opposite transfer channel 88, disposed along the parallel offset axis "Y2", as seen in the cross-section of FIG. 8b, is composed of a longitudinal bottom surface 102 flanked by opposite longitudinal sides 104 and 106 which terminate upwardly into a wide slot 108 formed by opposite longitudinal sides 110 and 112 respectively. The corresponding opposite side surfaces 104 and 110 and 106 and 112 are joined by coplanar horizontal ledge portions 114 and 116 respectively. Thus, it will be seen that the channel 88 is able to receive only nut blanks positioned with the pilot portion 22 facing downwardly, in opposition to the nut blanks in the opposite transfer channel 86. The pilot portion 22 of the nut blank 18 conveyed through transfer channel 88, is received in the bottom portion 102 between the side surfaces 104 and 106 and the head portion 20 of the nut blank 18 is caused to move along the opposite longitudinal ledge portions 114 and 116 in the groove or slot 108 between the side surfaces 110 and 112 as shown. The transfer station 84 defines a junction at which both oppositely directed transfer channels 86 and 88 terminate.

The transfer station 84 is in communication with a sensing port 120 which opens through the side 112 of the slot 108. The sensing port 120 is suitably connected, as shown in the first embodiment, to a source of fluid under pressure. Thus, by means of a suitable regulator fluid pressure of a relatively low magnitude is conveyed through the sensing port 120 into the transfer station 84 at the junction of the channels 86 and 88. The fluid power actuator sensing port 120 as in the prior embodiment previously described is suitably interconnected with a pilot fluid pressure line (not shown) which in turn is connected to a fluid pressure control valve (not shown), in a similar fashion as described previously.

A pair of fluid pressure blow-off ports 126 and 128 are provided in the cover plate 81 of the sensing device 78 (as shown in FIG. 9) for communication with the transfer station 84 in directions opposite to each other. Thus, the blow-off port 126 is positioned along the axis "Y2" of the transfer channel 88 and the blow-off port 128 is positioned along the axis "Y1" of the transfer channel 86.

Each of the blow-off ports 126 and 128 is fluidly connected by respective conduits 127 and 129 to a fluid pressure control valve 168, such as 68 in FIG. 7; the pressure control valve for the blow-off port 128 is normally open and functions to transfer fluid blasts through the blow-off port 128 at pulsed intervals in a direction along transfer channel 86 to move nut blanks, deposited transfer station 85 from first channel 82 in a pilot-up position, through channel 86. The pressure control valve for the blow-off port 126 is normally closed and is controlled for actuation by relative open or closed position of the sensing port 120, as explained hereafter.

In operation, parts such as nuts 18, are fed from the hopper manifold 26 by means of gravity through the chute 36 into channel 82 of the transfer device 78. As illustrated in FIG. 8, the nuts 18 are fed in random position; that is, with their pilot portion 22 facing either up or down, as indicated. Also, in this instance, the nuts are being fed lengthwise; that is having the short side 21 disposed transverse to the axis "X". The nuts could,

of course, also be fed in a 90° rotated position, as illustrated in the previous embodiment in FIG. 5, so that the long side 19 would be disposed transverse to the axis "X".

When a nut blank 18 enters the transfer station 84 in a position having its pilot portion 22 facing upwardly the head portion 21 of the nut blank abuts against the side 106, which is a continuation of the side 94 of channel 86. Thus, the fluid sensing port 120 remains unaffected to permit fluid pressure through open blow-off port 128 to move the nut blank from transfer station 84 by into channel 86.

As soon as this nut blank is removed from the transfer station 84 through the channel 86 the next following nut blank entering the transfer station 84 may be in a position with the pilot portion 22 facing down. In this instance, as shown in FIG. 8b, the head portion 20 of the nut blank abuts against the side 112 thereby closing off the sensing port 120.

Closing off of the sensing port 120 causes a back pressure through a suitable pilot line 166 in FIG. 7a which is effective to close the fluid pressure control valve port for blow-off port 128 and open the second fluid pressure control valve port of valve 168 to cause a blast of fluid pressure through blow-off port 126 in a direction along the axis "Y2" of the other channel 88 to move this nut blank in the opposite direction through channel 88. FIG. 7a is numbered in the same sequence as FIG. 7 to indicate like elements and function.

Thus, it will be seen that nut blanks being fed in random position from the hopper manifold 26 into the transfer device 78, will not only be caused to be moved in separate opposite directions according to their respective orientation, that is, a pilot end facing up or down, but will also be moved in a 90° rotated position relative to their initial feeding position.

It is evident that nut blanks, or other parts, are being fed from the hopper manifold 26 in consecutively alternate orientation, or a plurality of nut blanks may be oriented progressively in the same position to be followed by one or more nut blanks oriented in opposite position and so on.

It will be obvious from the foregoing description and detailed illustration, that the present invention provides an improved parts transfer and orienting device, particularly for small parts, capable of detecting the relative orientation of the parts as they are being fed into the device and thereafter moving the parts in the respective desired direction according to their orientation.

The present improved agreement eliminates any mechanical transfer devices such as chains, conveyors or the like, and thus is relatively noiseless in operation and requires only minimal maintenance.

The respective transfer chutes 36 between the hopper manifold 26 and the respective transfer devices 30 and 78, as well as chutes 42 from the transfer device to the receiving station are preferably of pliable flexible material to accommodate various installation requirements.

In regard to the transfer and parts orienting device 78 of the last embodiment, one of the flexible chutes 42 or 42a leading from the transfer device to the next receiving station, may have a twist of 180° so as to reorient the parts fed through this chute into the same position as the parts fed through the other chute, so that all parts are being received at the receiving station in the

same orientation; that is, the stud portions 22 of all of the nut blanks 18 facing either up or down.

Although the present invention has been described and illustrated by means of preferred embodiments, it will be obvious to anyone skilled in the art to which the invention pertains, that various changes in arrangement and structural details may be made without departing from the spirit and essential characteristic of the invention as defined in the appended claims.

We claim:

1. In transfer mechanism for handling parts which have to be separated according to their body orientation and rotated 90° including a parts supply source having a gravity feed outlet, the improvement comprising: a transfer device attached to said outlet; said transfer device having a first parts conveying channel in open communication with said outlet and a second parts conveying channel disposed along an axis intersecting the axis of said first parts conveying channel at a 90° angle; said transfer device having a parts transfer station defined by the intersection of said first channel with said second channel; said transfer station comprising a chamber having a first side wall parallel to the axis of said first channel and a said second side wall joined thereto and parallel to the axis of said second channel; pressurized fluid power means communicating with said chamber comprising: (1) normally closed fluid pressure inlet communicating with said chamber through said first side wall, (2) a normally open fluid pressure inlet port communicating with said chamber through said second side wall and a pilot conduit communicating with said second normally open fluid inlet port; a source of fluid under pressure fluidly connected to said first and second fluid inlet; normally closed valve means connected between said source of fluid under pressure and said first fluid inlet; said pilot conduit being connected to said normally closed valve means for actuation of said valve means; said second fluid inlet adapted to be closed upon the presence of a part in said chamber to thereby create a back pressure in said pilot conduit effective to actuate said valve means so as to open said valve means to cause fluid pressure at a predetermined magnitude through said first fluid inlet into said chamber to move said part into said second channel.

2. In parts orienting and transfer system adapted to change said travel and position of parts 90° from the original feeding position and to sort parts into different direction of travel according to the orientation and including a parts supply source adapted to dispense parts along a gravity feed channel, the improvement comprising: a parts transfer and orienting device disposed adjacent said parts supply source having a first parts receiving channel aligned with said parts dispensing gravity feed channel; chute means interconnecting said gravity feed channel with said parts receiving channel; second and third channels intersecting said first parts receiving channel at a right angle and extending therefrom in opposite directions; the intersection of said first parts receiving channel with said second and third channel forming a parts transfer and orienting station; said second and third channel being adapted to transfer parts from said first and third channel being adapted to transfer parts from said first parts receiving channel in a 90° rotated position; said second channel being adapted to only receive parts oriented in a first position and said third channel being adapted to only receive

parts oriented in a second position; fluid power means communicating with said parts transfer and orienting station including a normally open sensing port disposed along an axis aligned with said first parts receiving channel; opposite disposed normally closed fluid inlet ports disposed along axes aligned with said second and third channel respectively; said first and second fluid inlet port and said sensing port being fluidly connected to a source of fluid under pressure; first normally open valve means connected between said source of fluid under pressure and said first fluid inlet ports; second normally closed valve means between said source of fluid under pressure and said second fluid inlet port; a pilot conduit interconnected between sensing port and said first and second valve means, respectively, to actuate said valve means when said sensing port is closed; said sensing port adapted to remain open upon the presence of a part in said transfer and orienting station to maintain said first valve means in open position for fluid communication with said first fluid inlet to move said parts into said second channel; said sensing port adapted to be closed upon the presence of a part in said transfer and orienting station when said part is disposed in said second position causing back pressure through said pilot conduit effective to actuate said first valve means into closed position and said second valve means into open position to establish fluid communication between said source of fluid under pressure and said second fluid inlet port to move said part into said third channel.

3. In a transfer mechanism and part orienting device for transferring rectangular parts asymmetric about one axis, comprising: a first channel connected to a supply of parts and communicating with a transfer station, said first channel internally configured to feed said rectangular parts in one orientation relative to its axis, a second channel generally perpendicular to said first channel and intersecting said first channel at said transfer station, said second channel internally configured to feed said rectangular parts in a second orientation relative to its axis, said transfer station having a wall parallel to said second channel, perpendicular to said first channel and blocking said first channel and said transfer station having a second wall perpendicular to said second channel and parallel to said first channel, sensing means in said transfer station wall adapted to sense a part engaging said wall, said sensing means including a normally open fluid inlet in said transfer station wall communicating with said transfer station, power means communicating with said transfer station and adapted to transfer a part engaging said wall, through said second channel, and actuating means operably connected to said sensing means and said power means adapted to actuate said power means on signal from said sensing means, said power means including a normally closed fluid pressure inlet in said second transfer station wall, and said actuator means operably connected to said fluid pressure inlets including a valve means adapted to close said normally open inlet when the inlet is blocked by a part and open the normally closed valve to force the part into said second channel, whereby a part delivered from said first channel in one orientation relative to its axis engages said transfer station wall and is then transferred in a second orientation through said second channel.

4. The transfer mechanism defined in claim 3, characterized in that said transfer mechanism includes a

11

third channel parallel to said second channel and intersecting said first channel at said transfer station and communicating with said first channel, said rectangular parts having a reduced pilot portion extending perpendicular to the transfer axes and said first channel configured to transfer said parts with the pilot portion positioned up and down, said second and third channels internally configured to receive said parts in only one

12

pilot position including a reduced channel portion receiving said pilot, a second normally opened power means directing said parts into said third channel when the part is positioned to be received in said third channel, whereby said transfer mechanism is also adapted to separate said parts by pilot position.

* * * * *

10

15

20

25

30

35

40

45

50

55

60

65