April 17, 1962 H. O. GUMMERE ETAL 3,029,978

FEEDING APPARATUS

Filed May 29, 1958 4 Sheets-Sheet 1

FIG-1

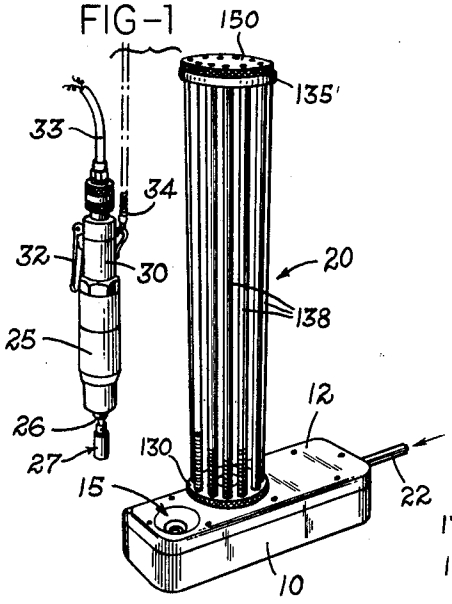


FIG-3

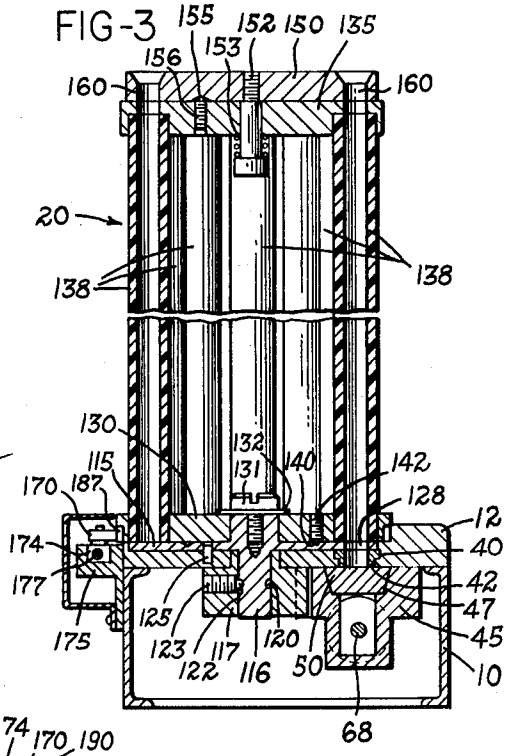


FIG-2

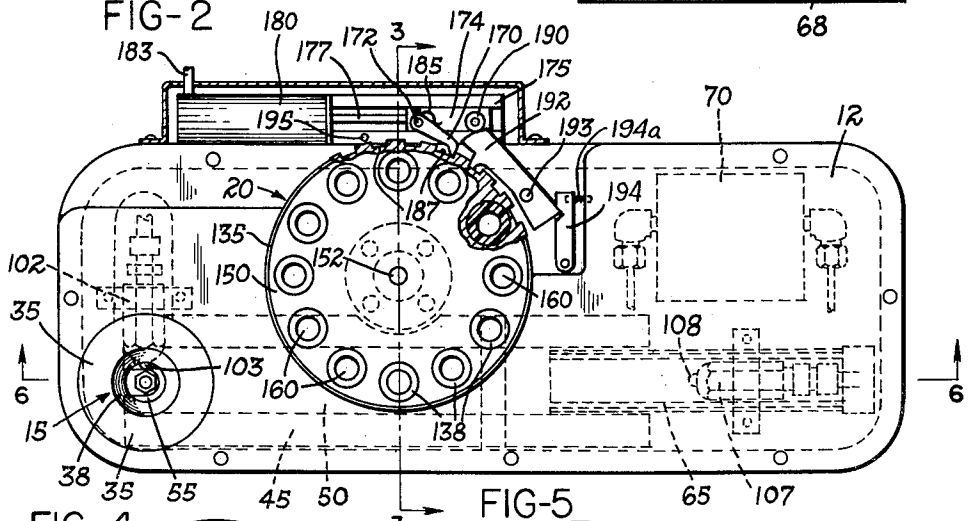


FIG-4

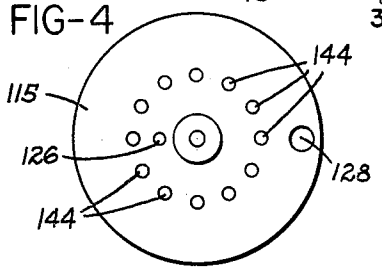
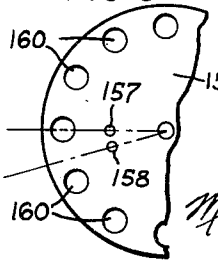


FIG-5



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FEEDING APPARATUS

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FIG-6

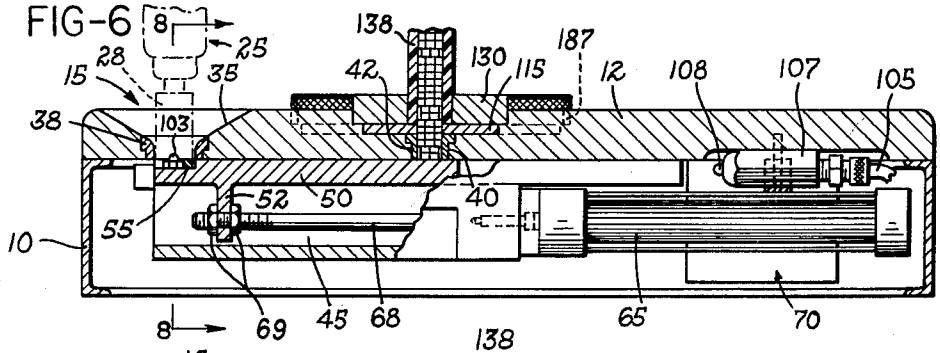


FIG-7

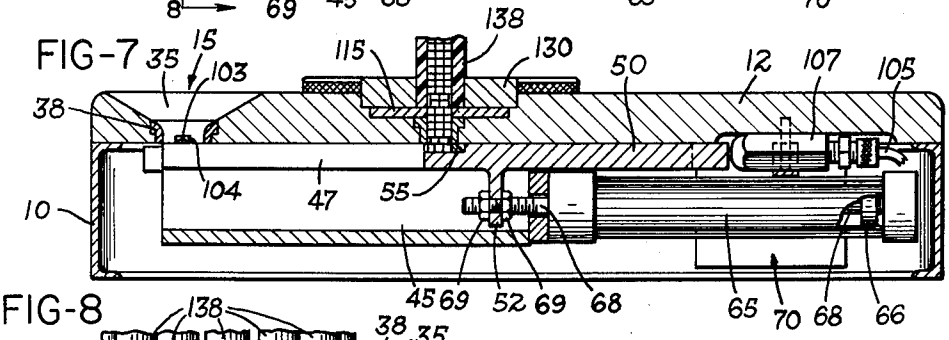


FIG-8

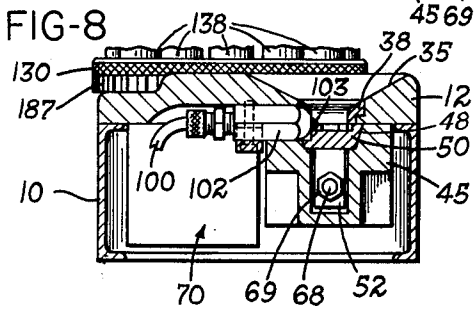


FIG-9

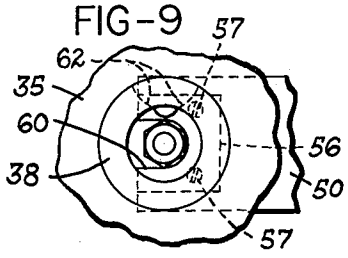


FIG-10

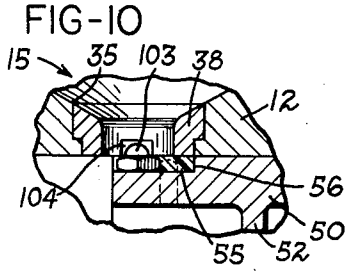


FIG-11

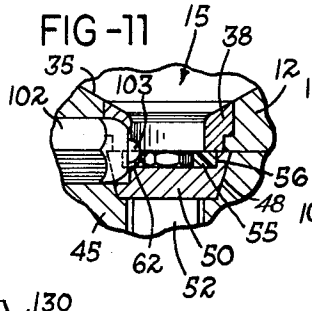


FIG-12

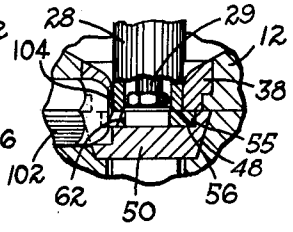
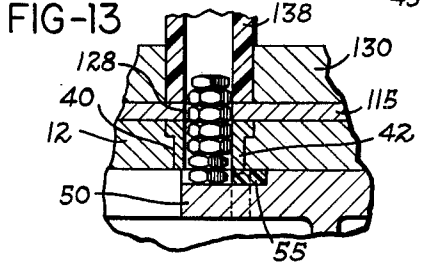


FIG-13



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FEEDING APPARATUS

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FIG-14

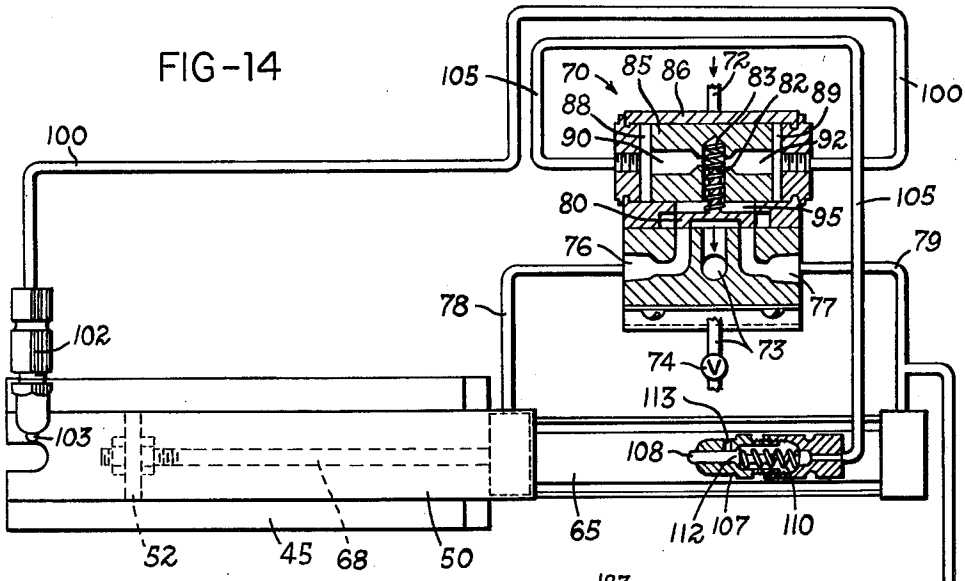
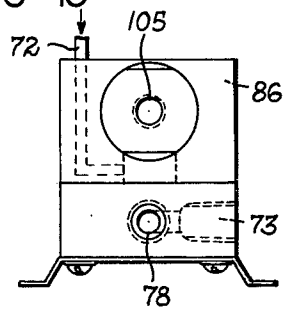


FIG-15



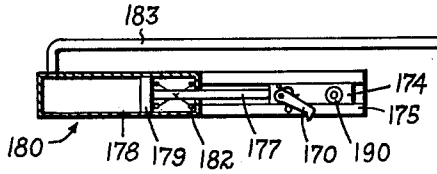
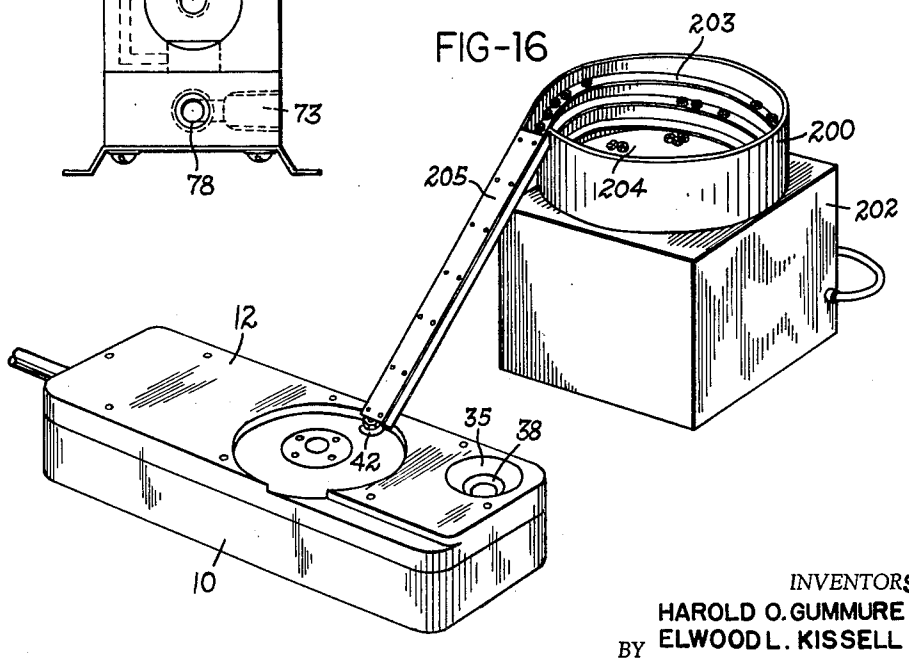


FIG-16



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April 17, 1962 H. O. GUMMERE ETAL 3,029,978

FEEDING APPARATUS

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FIG-17

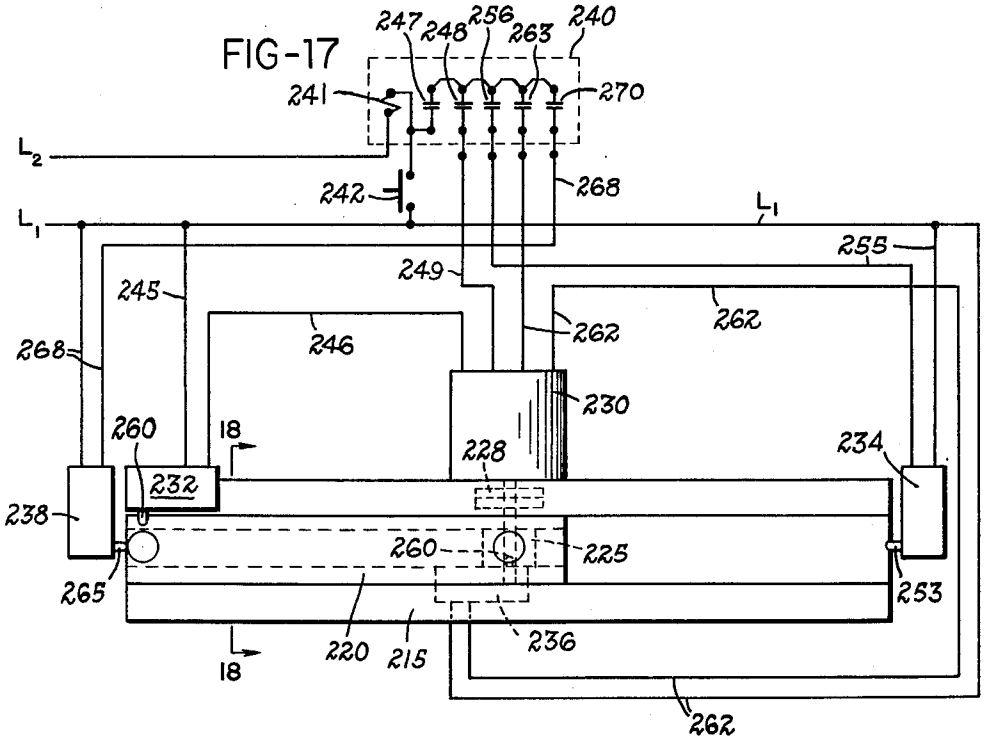


FIG-19

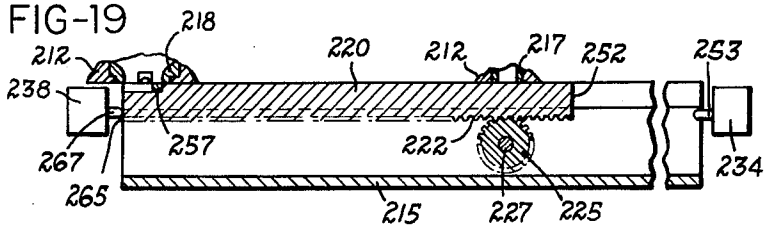


FIG-18

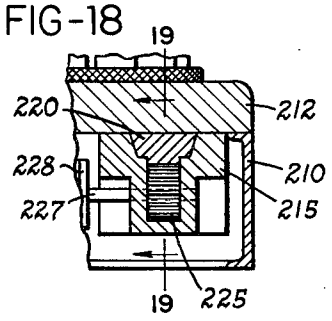
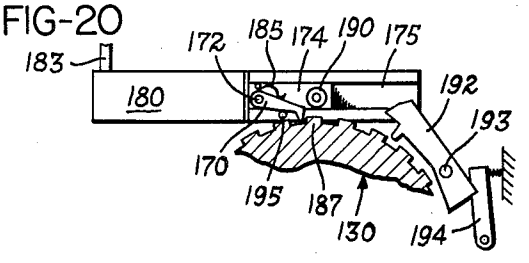


FIG-20



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United States Patent Office 3,029,978 Patented Apr. 17, 1962

3,029,978

FEEDING APPARATUS

Harold O. Gummere and Elwood L. Kissell, Dayton, Ohio, assignors to Buckeye Tools Corporation, Dayton, Ohio, a corporation of Ohio

Filed May 29, 1958, Ser. No. 738,712
12 Claims. (Cl. 221—22)

This invention relates to apparatus for feeding items, such as fasteners, individually and in succession, to a pickup station or the like, and at a rate corresponding to the demand for the items.

In particular, the present invention concerns the supplying of individual items, for example fasteners such as nuts or screws, to a pickup station where they may be removed on demand by a driving tool having a magnetic or equivalent pickup device, preferably associated with the driving head of the tool. Thus, the tool operator may pick up and drive a fastener, and while he is performing this operation the feeding apparatus, having sensed removal of a fastener, will rapidly supply another fastener to the pickup station. It will be appreciated that the motions of the operator are thus simplified to the point where picking up and driving a fastener approaches a cyclic action, and the entire operation is simplified and facilitated without imposing an undue burden upon the operator. This result is obtained since the operation of the feeding device is on a demand basis, subject to removal of one fastener before another is supplied to the pickup station.

Accordingly, the primary object of this invention is to provide feeding apparatus for items such as fasteners or like elements which will carry a single fastener to a pickup station from a reservoir containing a substantial supply of such fasteners, and which will operate on a demand basis, subject, for example, to removal of the fastener from the pickup station, to supply another fastener to the pickup station.

Another object of the invention is to provide such apparatus wherein the fasteners or other items being supplied are supported positively and in predetermined position at the pickup station for removal by a suitable tool or the like.

A further object of the invention is to provide such feeding apparatus wherein the mechanism for performing the feeding action, transferring a single fastener from the reservoir to the pickup station, operates in a rapid and positive fashion such that the apparatus can readily keep up with a relatively high demand at the pickup station.

Another object of the invention is to provide feeding apparatus for fasteners and like items, wherein the fasteners are fed individually and in succession, preferably on a demand basis, and are positively transferred from a reservoir to a pickup station such that the reservoir and pickup station may be located at relatively different levels, as convenient, without affecting operation of the apparatus.

Other objects and advantages of the invention will be apparent from the following description, the accompanying drawings and the appended claims.

In the drawings:

FIG. 1 is a perspective view of feeding apparatus in accordance with the invention associated with a suitable driving tool;

FIG. 2 is a top plan view, with portions broken away for illustration, of the feeding apparatus shown in FIG. 1;

FIG. 3 is a vertical section through the apparatus taken on line 3—3 of FIG. 2;

FIG. 4 is a detail view of the discharge plate and detent indexing parts of the reservoir shown in the apparatus of FIGS. 1–3;

FIG. 5 is a partial detail view of the cover piece for the reservoir;

FIG. 6 is a vertical section taken on line 6—6 of FIG. 2, with parts of the reservoir eliminated;

FIG. 7 is a view similar to FIG. 6 with the apparatus in an altered position, showing the feeding stroke;

FIG. 8 is a section taken on line 8—8 of FIG. 6;

FIG. 9 is an enlarged detail view of the parts defining the pickup station as shown in FIG. 2;

FIG. 10 is an enlarged detail section showing the pickup station defining parts as seen in FIG. 6, with a fastener supported for removal;

FIG. 11 is a detail section of the pickup station, enlarged from FIG. 8;

FIG. 12 is a view similar to FIG. 11 showing removal of the fastener from the pickup station by a suitable tool;

FIG. 13 is a detail section of the reservoir feed to the transferring mechanism, enlarged from FIG. 7;

FIG. 14 is a somewhat schematic illustration of the transfer mechanism and an associated pneumatic drive and control;

FIG. 15 is a side view of the control valve shown in FIG. 14;

FIG. 16 is a view of a modified arrangement wherein the feeding apparatus is associated with a different reservoir and a vibratory type feeder;

FIG. 17 is a somewhat schematic view of a modified form of feeding apparatus, drive, and control;

FIG. 18 is a section taken on line 18—18 of FIG. 17;

FIG. 19 is a vertical section taken on line 19—19 of FIG. 18; and

FIG. 20 is a partial view of the reservoir turning mechanism in a moved position.

Referring to the drawings, which illustrate preferred embodiments of the invention, FIG. 1 shows the overall arrangement of feeding apparatus including a base member **10** having a cover plate **12** in which there is defined a pickup station indicated generally at **15**. Mounted on cover plate **12** is a reservoir designated by the general reference numeral **20**, the purpose of which is to maintain a substantial supply of fasteners or other items to be fed and to deliver these items to the feeding apparatus one at a time.

In the embodiment shown in FIGS. 1–15 the motive drive is through pneumatically operated apparatus, and therefore a suitable supply hose **22** for pressure air is shown as extending into the base **10**. This apparatus is particularly for use with pneumatic tools of the type shown generally in FIG. 1 as including a main drive housing **25** from which extends a drive head **26** having a pickup device **27** thereon for removing the fasteners or like items from pickup station **15**. A suitable such pickup device, well known in the art, is shown in FIG. 12 as including a driving socket **28** (for use in driving nuts or headed bolts), and incorporating a small permanent magnet **29** which will attract and retain a fastener within the socket **28** for driving on a stud or the like. The tool also includes a control section **30** having a valve operated by handle **32** for controlling the supply of motive fluid from hose **33**. The entire tool may be suitably mounted as from a hanger spring **34** or the like.

Referring to FIGS. 2, 3 and 6, the pickup station **15** is provided with a tapered or generally conical opening **35** at one end of the cover plate **12**, and at the base of this opening there is a generally circular bushing **38** having an upwardly curved or tapered edge to conform to the tapered wall of opening **35**. Thus, this bushing may be removed and replaced by a similar bushing having a central aperture of different size, providing an adjustment of the apparatus for use with fasteners of different di-

mension. Spaced from the pickup station is a supply station provided with aperture 40 within which is received a further bushing 42. The interior dimension of bushing 42 is such that the fasteners or other items to be fed may be passed therethrough only in single or successive fashion, as shown for example in the illustration of FIGS. 6 and 7 wherein a stack of nuts are shown passing through bushing 42 one after the other. This bushing also is replaceable by a similar member of relatively different passage size to adapt the apparatus to feeding items of relatively different dimension.

On the under surface of plate 12 a carrier mounting member 45 extends from the supply station to the pickup station, this mounting member being suitably secured as by bolts or screws (not shown) to the cover plate 12. A guide passage 47 is formed in mounting member 45, preferably having upwardly and outwardly inclined walls 48, as shown in FIGS. 3 and 8, and within this guide passage is mounted a feed slide or carrier member 50 having complementary inclined side walls. This slide includes a depending web 52 which extends into a lower elongation of the opening in carrier 45, for connection to the slide drive.

The forward end of slide member 50 includes a carrier bushing 55, details of which are shown in FIGS. 9–13. This bushing is secured in a recess 56 at the forward end of slide 50 by suitable screws 57 and has a generally U-shaped opening 60 which is dimensioned to receive a single fastener from the supply bushing 40 and position the fastener at the pickup station for removal and use. One side of bushing 55 includes a cut-away recess or opening 62 providing for passage of a sensing device, as will presently be described.

The linear travel of the carrier or slide 50 is provided, and controlled, by a double acting pneumatic motor including a cylinder 65 and a piston 66 with a piston rod 68 extending through the opening in mounting member 45 and secured by suitable nuts 69 to the web 52 of feed slide 50. Thus, reciprocation of the piston will operate the carrier as a transfer means between the supply and delivery or pickup positions thereof.

The control circuit for the slide drive motor is shown in FIG. 14, wherein a conventional 4-way control valve 70 is provided with an inlet connection 72 and an exhaust connection 73 which may be controlled, as by a suitable manually adjustable valve 74. The control valve 70 includes control passages 76 and 77 which are connected to opposite ends of cylinder 65 by lines 78 and 79, respectively, as shown in FIG. 14. These passages may be connected selectively to pressure or exhaust, under the control of a reciprocable control shuttle member or dual valve assembly 80 including an extended stem 82 which is surrounded by a positioning spring 83. Stem 82 and spring 83 extend into a central bore in a control piston 85 which is received in cylinder 86, defining control chambers 88 and 89 at opposite ends thereof which are connected by passages 90 and 92, respectively, to the central bore of the piston within which the spring and stem 82 are received. The pressure inlet line 72 is connected into chamber 95 above the control valve member 80, and thus with the system in balance or at rest, as shown in FIG. 14, chambers 88 and 89 are subject to equal pressure and air under pressure is contained in chamber 95.

Chamber 89 is connected through a line 100 to a sensing valve 102 including a sensing head 103 positioned at the pickup station (FIGS. 6 and 9), extending through an opening 104 in bushing 38. Likewise, chamber 88 is connected through line 105 to a similar sensing valve 107 having a sensing head 108 supported for engagement with the rear end of slide 50 when the slide is traversed to its supply position. Details of a suitable sensing valve are shown, in connection with valve 107, as including a biasing spring 110 which normally urges sensing head 108 closed, seating the valve member 112 at the rearward end thereof and closing off the exhaust passage 113 to maintain pressure within line 105. Construction of valve 102 may be of the same type, and thus when one or the other of the sensing heads 103, 108 is pushed against its biasing spring pressure air in the exhausted control chamber 88 or 89 will be exhausted, and the piston 85 will shift accordingly to connect one side of the motor to exhaust and the other to pressure.

Metering of the exhaust air flow, by appropriate adjustment of valve 74, will control the interval required for the shuttle valve 80 to be reversed. This provides sufficient delay of the slide at the withdrawn or delivery position for a fastener to drop into the transfer bushing 55.

FIGS. 1–7 and 13 show one suitable type of reservoir for use with the above described feeding apparatus, including a base plate or disk 115 having a central mounting shaft 116 which preferably is integral therewith, received at its lower end within a mounting sleeve 117 suitably fixed to the cover plate 12. The shaft member 116 includes an annular groove 120 (FIG. 3) which may engage a ball detent 122 held in place by a set screw 123. This structure will serve to support the member 115 on the cover 12, and a pin 125 extends from cover 12 into an indexing hole 126 in member 115 for the purpose of aligning the feed aperture 128 therein with the bushing 42 at the delivery station.

A rotatable reservoir 20 is provided by a bottom disk member 130 received over the upper end of shaft member 116, and secured in place on shaft 116 by bolt 131 and washer 132. An upper disk member 135 of similar dimension is provided, and between the disk members 130 and 135 extend a plurality of reservoir tubes 138, preferably made of transparent plastic material or the like to provide for observation of the quantity of fasteners stacked therein. The lower disk 130 carries a spring loaded ball detent 140 secured in place by a set screw 142, and engageable with any selected one of a plurality of detent recesses 144 (FIG. 4) formed in the face of member 115. Thus the reservoir may be rotated to align the tubes 138 successively with the feed aperture 128 and feed bushing 42, and it is possible by positioning the rotating parts between detent recesses to close off the feed aperture 128 from any reservoir tube, as during transport of the reservoir.

At the upper end of the reservoir, extending over disk 135, is a cover plate 150 which is secured in place by a central bolt 152 extending in freely rotatable relation through disk 135, and cooperating with a biasing spring 153 to retain these parts in face to face contact. A further detent 155, positioned by a set screw 156, engages either of two detent recesses 157 and 158, in the under surface of cover member 150. When the detent engages recess 157, the filling apertures 160 are aligned with the individual reservoir tubes, and when the detent engages recess 158 the upper ends of these tubes are closed off.

It will be obvious from the above described construction that a large quantity of fasteners can be stored in the reservoir tubes, and when one tube empties, the reservoir may be indexed to move a full tube over the feed aperture 128 and delivery bushing 42. It is possible to have a number of such reservoirs available, and by closing off the bottom and top of the reservoir tubes, as previously mentioned, a full reservoir may be transported or stored, being removable from the feeding mechanism merely by withdrawing the entire reservoir member against the bias of detent 122.

In conjunction with the above described apparatus it may be desired under some circumstances to feed like fasteners of different size in sequence, there being but a relatively slight difference between the sizes such that a single carrier bushing 55 will accommodate all. Thus, if the different size fasteners be placed in consecutively arranged reservoir tubes 138, then by indexing the reservoir after each pickup operation the carrier bushing will transport the different size fasteners in desired sequence.

By appropriate arrangement of the different size fasteners in the consecutively arranged tubes **138**, and by providing an appropriate number of such reservoir tubes, it is thus possible to accommodate several different sizes, feeding them in desired sequence.

A suitable power drive for this purpose is shown in connection with FIGS. 2, 3 and 14, and this drive may be provided either as a part of the overall feeder construction, or as an attachment to the basic device. The power drive may be of the ratchet and pawl type, wherein the panel **170** is pivotally mounted on a pin **172** carried on a slide **174** which is in turn mounted within guideways **175**. Slide **174** is connected to the piston rod **177** of a single acting air motor **178** having a piston **179** within cylinder **180** and normally biased to one position by a spring **182**. When pressure air is supplied through inlet **183** to the cylinder, the piston will advance slide **174** to the normal position of the apparatus shown in FIG. 2.

In this position the spring **185** biases pawl **170** into engagement with a ratchet tooth **187**, there being an appropriate number of such teeth equal in number to, and aligned with, the reservoir tubes **138** and formed on the disk member **130** at the bottom of the reservoir turret. In this normal position of the apparatus a roller **190** carried on slide **174** engages a toothed locking arm **192** which is pivotally mounted at **193** upon the cover plate **12**, and rotates this arm against the bias of a spring pressed arm **194** (urged by spring **194***a*) into a position locking the arm **192** against a ratchet tooth.

The air inlet **183** to motor **180** is connected to control line **79** (FIG. 14) so that whenever the carrier or slide **50** is in its advanced position, supporting a fastener at the pickup station, pressure air is supplied to motor **180** and the parts are in the relative positions shown in FIG. 2. As the sensing valve **102** is opened by entry of the tool socket **28** into bushing **38** the slide member **50** moves to the right, as viewed in FIG. 2, and at the same time motor **180** is exhausted, with the result that spring **182** carries the pawl **170** to the left where it is guided away from the ratchet by pin **195**. When pressure air is again supplied to line **79** to advance the feed slide with another fastener, piston **179** will advance the pawl in engagement with a tooth, producing the desired indexing movement of ratchet **187** and aligning the next desired reservoir tube **138** with the feed aperture **128** to supply the desired different size fasteners. Obviously, this arrangement can be varied as desired to accommodate any different number or sequence of feeding different fasteners.

The above described reservoir mechanism is but one suitable type which may be adapted to use with the present invention. For example, referring to FIG. 16, a suitable feeding apparatus, refeerred to commercially as a "Syntron" vibratory feeder, may be employed. This apparatus includes a reservoir **200** mounted on a base **202** which includes suitable mechanism for vibrating the reservoir. The interior walls of reservoir **200** include a track **203** of generally helical configuration, extending from the bottom **204** of the reservoir and discharging in a generally tangential direction at the top into a feeding chute **205**. The dimensions of track **203** and chute **205** are such that the items, such as fasteners, will be fed singly in line, and they may be discharged into the delivery bushing **42** for delivery to the feed slide **50**. The operation of such a vibratory feeder is well known in the art, and details thereof are not a part of the invention.

FIGS. 17–19 show a modified form of feeding apparatus arranged for fully electrical operation. This may be desired under some circumstances, as when electrical power is used for the tools with which the apparatus is employed. In this construction the base **210** and associated cover plate **212** are shown as housing a guide or carrier member **215** which extends between a feed bushing **217** (FIG. 19) and a bushing **218** which defines a pickup station. A feed slide or carrier **220** is mounted for reciprocating movement in guide member **215**, and includes rack teeth **222** formed in the bottom surface thereof and meshing with a pinion **225**. This pinion is also housed within guide member **215** and secured to a shaft **227** which in turn extends to a conventional slip clutch **228**.

The clutch is in turn connected to the output shaft **229** of a reversible electric motor **230** which supplies the power to the feed slide for reciprocating the same between the delivery station and pickup station on demand for fasteners or other items being fed, constituting therefore a linear motion drive. Line L_1 is connected to a terminal on each of four switches **232**, **234**, **236** and **238** which are placed to control the cycle of operation. A conventional stepping switch, indicated schematically at **240**, is connected to line L_2 and to each of the aforementioned controlling switches. Such stepping switches are generally well known and may be, for example, of the rotary solenoid type including a latch (not shown) for each position thereof which may be disengaged by energizing the contacts at the next position.

Line L_2 passing into the stepping switch **240** is fused at **241**, and a manually operated start-stop switch **242** is provided between the stepping switch and line L_1. Control switch **232** is connected on one side through line **245** to line L_2, and on the other side through line **246** to one side of the winding of reversible motor **230** which produces rotation thereof in a direction for causing movement of the slide **220** in a left to right direction, as viewed in FIG. 17. The first position of stepping switch **240** is shown schematically at **247**, and the second position **248** is connected through line **249** to the opposite side of the motor winding to which line **246** is wired.

Thus, with the operator **250** of switch **232** being positioned at the pickup well, when a fastener is removed from the pickup station, switch **232** is closed to energize the motor **230** and at the same time cause stepping switch **240** to advance to its second position. This produces clockwise rotation of pinion **225** as viewed in FIG. 19, and moves slide **220** to the right until the back end **252** thereof engages the operator button or pin **253** of switch **234**. This switch is connected in lines **255** which extend from line L_1 through switch **234** to the third position contacts **256** of the stepping switch, and thus when switch **234** is closed by slide **220**, the stepping switch is advanced to stop motor **230** and the system is at rest with the slide in its delivery station, aligned with delivery bushing **217**.

A fastener passing to the transfer bushing **257** in slide **220** will engage the operator member **260** of switch **236**, closing this switch, and it in turn is connected in line **262** which extends from line L_1 through the reverse windings of motor **230** to the fourth position contacts **263** of the stepping switch. This causes the motor to operate in the opposite direction and advance the feed slide to the pickup station. The forward end **265** of slide **220** then engages the operator **267** of switch **238**, closing that switch and completing a circuit through line **268** from line L_1 to the fifth contact position **270** of stepping switch **240**. This shuts off motor **230** and may initiate a reset operation of the stepping switch in a well known manner such that it returns to the first contact position **247** in preparation for the next cycle of operation.

Thus, the present invention provides apparatus for feeding items such as fasteners on demand, singly, in succession, to a suitable pickup station which may be located at any convenient position according to the operation with which it is intended to be used. The transfer of a single fastener from the delivery station to the pickup station is rapid and accurate, and the control for the transferring or feeding mechanism is so arranged that it will respond to removal of one fastener from the pickup station and initiate a single cycle of operation of the feeding mechanism, providing the desired "demand" operation. It will be appreciated that the construction of the present invention may be varied in different situations to meet the

need of a given desired arrangement. Since the transferring action is positive and not under the influence of gravity, the apparatus may be mounted in a variety of ways and may be associated with various types of reservoirs, dependent upon the need in a given installation.

While the forms of apparatus herein described constitute preferred embodiments of the invention, it is to be understood that the invention is not limited to these precise forms of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. Apparatus for supplying fasteners or the like singly and in succession subject to demand therefor, comprising means defining a pickup station at which a single fastener may be positioned for removal and use, a reservoir adapted to hold a quantity of fasteners, means for discharging the fasteners singly in succession from said reservoir, a supply station having a connection with said discharging means, a carrier mounted for movement between said supply station and said pickup station, receiver means on said carrier dimensioned to carry said fasteners to said pickup station in predetermined position, means controlling travel of said carrier to align said receiver means selectively with said supply station and said pickup station, drive means connected to move said carrier, and sensing means at said pickup station responsive to placement in said pickup station of a tool for removal of a fastener therefrom and connected to initiate movement of said carrier to supply another fastener to said pickup station.

2. Apparatus for supplying fasteners singly in succession to a work station, comprising a base adapted for mounting at the work station, means forming a pickup station in said base wherein a fastener may be positioned for removal and use, a reservoir for holding a plurality of fasteners including means for discharging the fasteners in succession, means on said base spaced from said pickup station defining a supply station, means forming a passage of sufficient size to admit a single fastener between said supply station and said reservoir, a carrier mounted for reciprocating movement between said supply station and said pickup station and including a receiver dimensioned to carry a single fastener, means limiting the travel of said carrier to align said receiver alternately with said supply station and said pickup station, drive means connected to reciprocate said carrier, and control means operably connected to said drive means for regulating the reciprocating movement of said carrier.

3. Apparatus for supplying fasteners or the like singly and in succession subject to demand therefor, comprising means defining a pickup station at which a single fastener may be positioned for removal and use, a reservoir adapted to hold a quantity of fasteners, means for discharging the fasteners singly in succession from said reservoir, a supply station having a connection with said discharging means, a carrier mounted for movement between said supply station and said pickup station, receiver means on said carrier dimensioned to carry said fasteners, index means connected to said carrier providing for movement thereof to align said receiver means with said supply station and with said pickup station selectively, drive means connected to move said carrier under control of said index means, a pneumatic control valve connected to control operation of said drive means, and a pneumatic sensing valve supported at said pickup station for engagement with a tool placed thereat to remove a fastener from said receiver, said sensing valve being connected to said control valve for initiating movement of said carrier to supply another fastener to said pickup station.

4. Apparatus for supplying fasteners singly in succession to a work station, comprising a base adapted for mounting at the work station, means forming a pickup station on said base wherein a single fastener may be positioned for use, said means including a cup-shaped member having walls converging toward said pickup station to guide a tool head into position for removing a fastener therefrom, a reservoir for holding a plurality of fasteners, means associated with said reservoir for discharging the fasteners in succession therefrom, means on said base spaced from said pickup station defining a supply station, means forming a passage of sufficient cross-section to pass single fasteners in succession between said supply station and said reservoir, a carrier mounted for movement between said supply station and said pickup station and including receiver means dimensioned to carry single fasteners, means controlling the travel of said carrier to align said receiver means selectively with said supply station and said pickup station, drive means for moving said carrier, and sensing means at said pickup station responsive to placement in said pickup station of a tool for removal of a fastener therefrom to initiate movement of said carrier and supply an addition fastener to said pickup station.

5. Apparatus for supplying fasteners singly in succession to a work station, comprising a base adapted for mounting at the work station, means forming a pickup station in said base wherein a single fastener may be positioned for removal and use, a reservoir for holding a plurality of fasteners including means for discharging the fasteners in succession, means on said base spaced from said pickup station defining a supply station, means forming a passage of sufficient size to admit a single fastener between said supply station and said reservoir, a carrier mounted for reciprocating movement between said supply station and said pickup station and including a receiver dimensioned to carry a single fastener, means limiting the travel of said carrier to align said receiver alternately with said supply station and said pickup station for carrying a single fastener under controlled conditions to said pickup station, drive means connected to reciprocate said carrier, and sensing means at said pickup station responsive to placement in said pickup station of a tool for removing of a fastener therefrom to initiate a reciprocating cycle of said carrier for moving an additional fastener to said pickup station.

6. A device to supply fasteners and like items in accordance with demand for their use, comprising means defining a supply station including a passage dimensioned to pass the fasteners in single file and in predetermined alignment, means defining a pickup station including guiding walls located to position a pickup tool, transfer means dimensioned to carry a single fastener, a movable support for said transfer means including means for aligning said transfer means selectively with said supply station and said pickup station, and reversible drive means connected to impart linear motion to said movable support for selectively reciprocating said transfer means to supply fasteners singly in succession to said pickup station.

7. A device to supply fasteners and like items in accordance with demand for their use, comprising means defining a supply station including a passage dimensioned to pass the fasteners in single file and in predetermined alignment, means defining a pickup station including guiding walls located to position a pickup tool, transfer means dimensioned to carry a single fastener, a movable support for said transfer means including means for aligning said transfer means selectively with said supply station and said pickup station, drive means connected to move said movable support for selectively positioning said transfer means to supply fasteners singly in succession to said pickup station, control means for said drive means normally positioning said transfer means at said pickup station, and a sensing element at said pickup station responsive to placement in said pickup station of a tool for removing of a fastener and connected to actuate said control for delivering a further fastener to said pickup station.

8. A device to supply fasteners and like items in accordance with demand for their use, comprising means defining a pickup station at which a single fastener may

be positioned for removal and use, a reservoir adapted to hold a quantity of fasteners, means for discharging the fasteners singly in succession from said reservoir, a supply station having a connection with said discharging means, receiver means dimensioned to carry a single fastener, a movable support for said receiver means including means for aligning said receiver means selectively with said supply station and said pickup station, reversible drive means connected to impart linear motion to said movable support for selectively reciprocating said receiver means to supply fasteners singly in succession to said pickup station, control means for said drive means normally positioning said receiver means to said pickup station, a first sensing element adjacent said pickup station responsive to placement in said pickup station of a tool for removing of a fastener and connected to actuate said control means for causing movement of said receiver means to said supply station, and a further sensing element mounted to respond to positioning of said transfer means at said supply station and connected to said control means for reversing said drive means to return said receiver means to said pickup station with an additional fastener.

9. Apparatus for supplying fasteners or the like singly and in succession subject to demand therefor, comprising means defining a pickup station at which a single fastener may be positioned for removal and use, a reservoir adapted to hold a quantity of fasteners, means defining a supply station in spaced relation to said pickup station, said reservoir including a plurality of tubular containers each adapted to contain a quantity of fasteners stacked singly one upon the other therein, means mounting said reservoir adjacent said supply station including indexing mechanism for selectively aligning one of said tubular containers with said supply station, receiver means dimensioned to carry a single fastener, a movable support for said receiver means including means for aligning said receiver means selectively with said supply station and said pickup station, drive means connected to move said support and sensing means at said pickup station responsive to placement in said pickup station of a tool for removing of a fastener therefrom and connected to initiate movement of said receiver means to supply another fastener to said pickup station.

10. Apparatus for supplying fasteners or the like singly in succession to a work station, comprising a base adapted for mounting at the work station, means forming a pickup station in said base wherein a fastener may be positioned for removal and use, means on said base spaced from said pickup station defining a supply station, a reservoir adapted to hold a quantity of fasteners, said reservoir including a plurality of tubular containers each adapted to contain a quantity of fasteners stacked singly one upon the other therein, mounting means on said base for removably supporting said reservoir adjacent said supply station, indexing means cooperative with said mounting means and said reservoir for selectively aligning one of said tubular containers with said supply station, receiver means dimensioned to carry a single fastener, a movable support for said receiver means including means for aligning said receiver means selectively with said supply station and said pickup station, drive means connected to remove said support and sensing means at said pickup station responsive to placement in said pickup station of a tool for removing of a fastener therefrom and connected to initiate movement of said receiver means to supply another fastener to said pickup station.

11. Apparatus for supplying fasteners or the like singly and in succession subject to demand therefor, comprising means defining a pickup station at which a single fastener may be positioned for removal and use, a reservoir adapted to hold a quantity of fasteners, means defining a supply station in spaced relation to said pickup station, said reservoir including a plurality of containers each adapted to contain a quantity of fasteners, means mounting said reservoir adjacent said supply station including indexing mechanism for selectively aligning one of said containers with said supply station, receiver means dimensioned to carry a single fastener, a movable support for said receiver means including means for aligning said receiver means selectively with said supply station and said pickup station, drive means connected to move said support, power operated means connected to produce relative movement between said reservoir and said supply station, sensing means at said pickup station responsive to placement in said pickup station of a tool for removing of a fastener therefrom and connected to initiate movement of said receiver means to supply another fastener to said pickup station, and means responsive to operation of said sensing means for actuating said power operated means to align a different container of said reservoir with said supply station.

12. Apparatus for supplying fasteners or the like singly in succession to a work station, comprising a base adapted for mounting at the work station, means forming a pickup station in said base wherein a fastener may be positioned for removal and use, means on said base spaced from said pickup station defining a supply station, a reservoir adapted to hold a quantity of fasteners, said reservoir including a plurality of tubular containers each adapted to contain a quantity of fasteners stacked singly one upon the other therein, mounting means on said base for removably supporting said reservoir adjacent said supply station, indexing means cooperative with said mounting means and said reservoir for selectively aligning one of said tubular containers with said supply station, power operated means for rotating said mounting means to align different containers with said supply station, receiver means dimensioned to carry a single fastener, a movable support for said receiver means including means for aligning said receiver means selectively with said supply station and said pickup station, drive means connected to move said support, sensing means at said pickup station responsive to placement in said pickup station of a tool for removing of a fastener therefrom and connected to initiate movement of said receiver means to supply another fastener to said pickup station, and a connection between said power operated means and said drive means providing for alignment of a different container with said supply station in response to an operating cycle of said drive means.

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CERTIFICATE OF CORRECTION

Patent No. 3,029,978 April 17, 1962

Harold O. Gummere et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 5, line 11, for "panel 170" read -- pawl 170 --; line 52, for "refeerred" read -- referred --; column 8, line 17, for "addition" read -- additional --; column 9, line 13, for "to" read -- at --; same column, lines 40 and 63, after "support", each occurrence, insert a comma.

Signed and sealed this 28th day of August 1962.

(SEAL)

Attest:

ESTON G. JOHNSON

Attesting Officer

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