United States Patent [19]

Schmidt et al.

[11] **3,750,925**

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[54] SNAP ATTACHING APPARATUS

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[52] **U.S. Cl.** **227/18,** 227/116

[51] **Int. Cl.** **B25c 7/00**

[58] **Field of Search** ..... 227/15, 18, 114, 227/116, 119, 120; 221/171, 172, 173, 175, 287, 312 R

[56] **References Cited**

UNITED STATES PATENTS

2,048,930	7/1936	Hansen et al.	227/114 X
2,261,281	11/1941	Peterson	227/119
3,225,993	12/1965	Hall	227/18
3,612,382	10/1971	Littell	227/18

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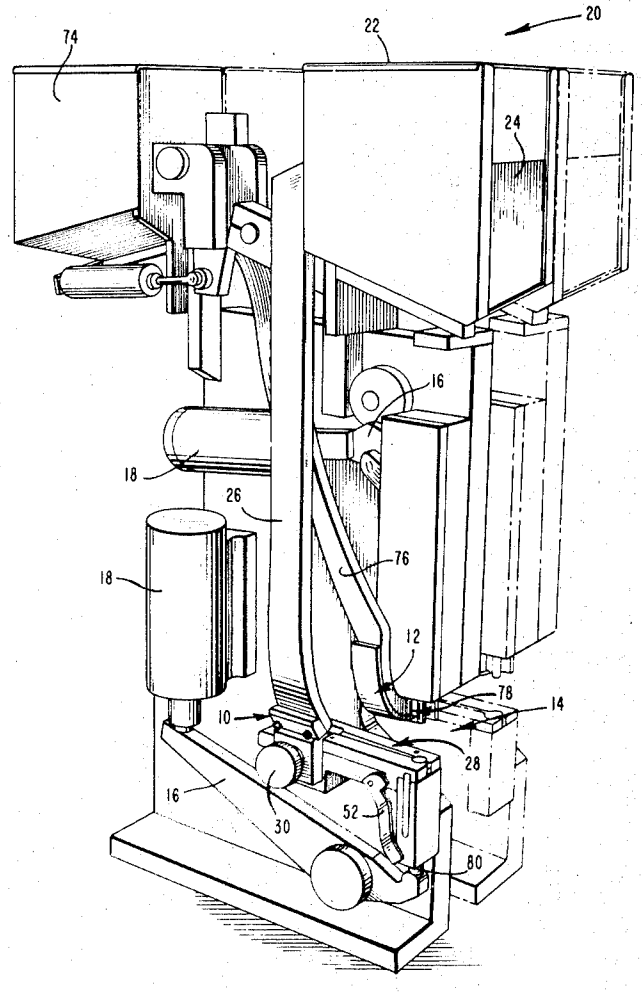
[57] **ABSTRACT**

An improved feed arrangement is disclosed for feeding two component fasteners, such as buttons, snaps and the like having a pronged element and a backing element, to an apparatus which attaches the fasteners to material, such as a garment. The feed arrangement for each component includes a hopper-chute assembly, a guide channel and a driving means. Each hopper-chute assembly is readily detachable from the apparatus to provide rapid substitution of one type or style of fastener for another and includes means preventing discharge of elements from the chute when the assembly is detached from the apparatus. The guide channel and drive means are arranged to receive elements from the chute and move them successively in a single step to a setting station where an anvil and a ram forcefully bring the elements together. The guide channel for the pronged elements is formed by a pair of spaced, opposed wall members spring biased towards each other. The wall members have faces of non-linear shape and taper towards each other in the direction of feed to form a labyrinth configuration therebetween. This configuration serves to align the prongs with the axis of the channel so that they will not be prematurely and unwantedly deformed by jaws on the anvil.

24 Claims, 8 Drawing Figures



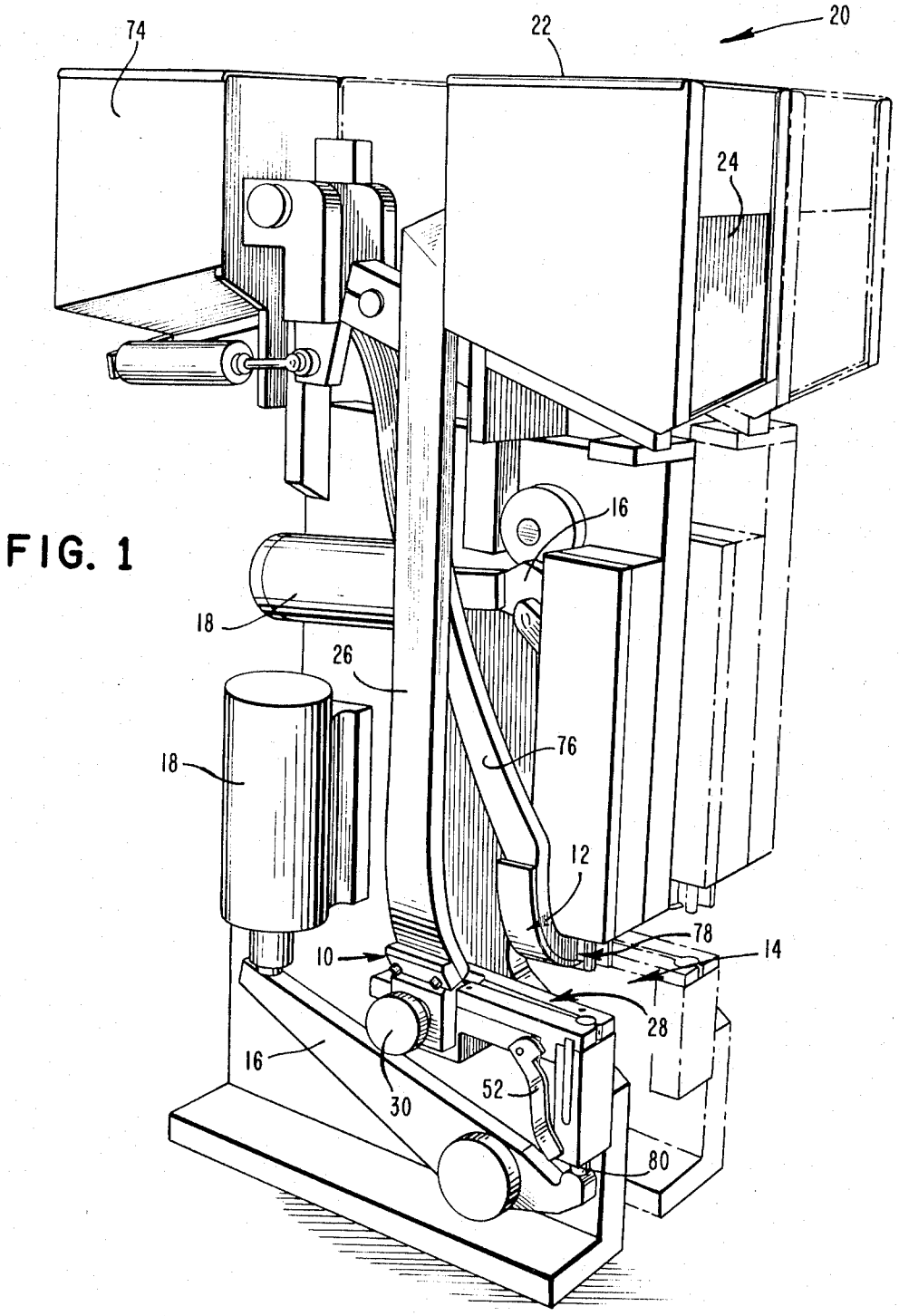


FIG. 1

FIG. 2

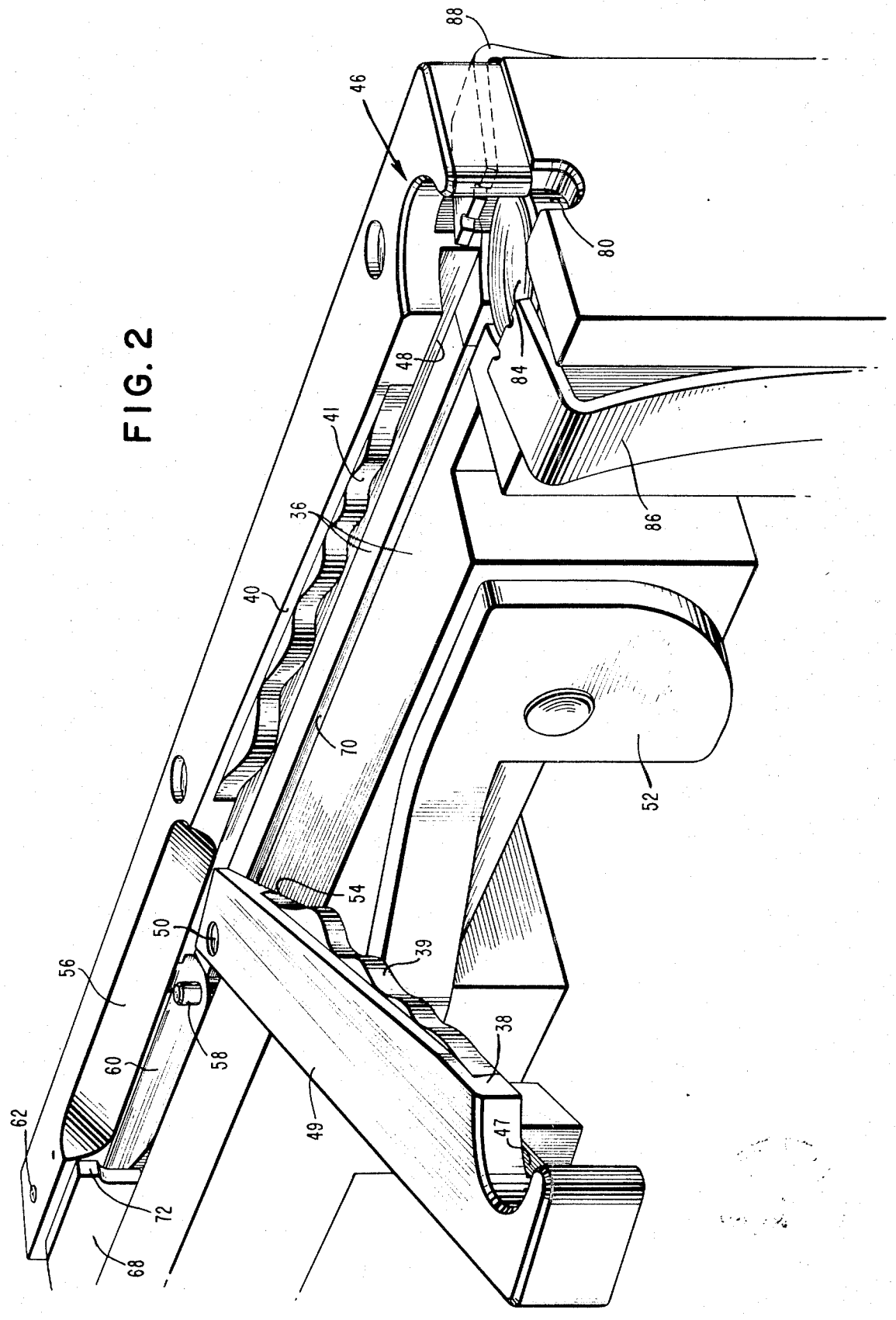


FIG. 4

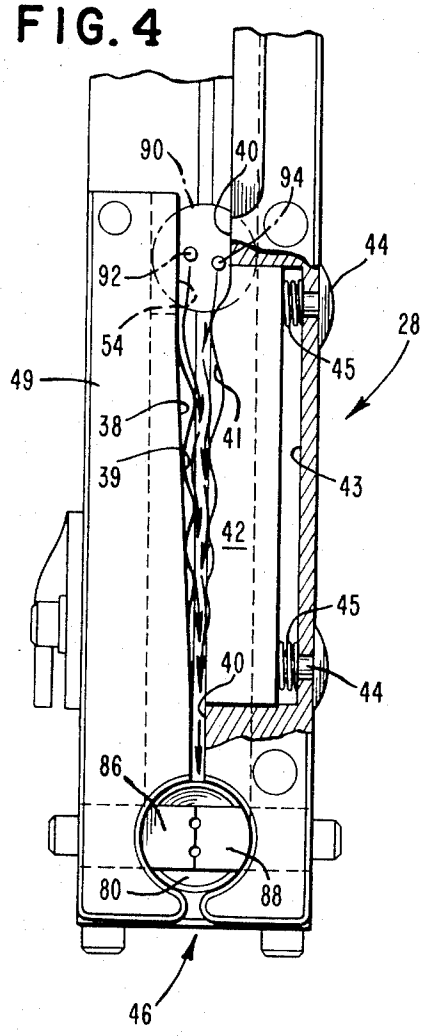
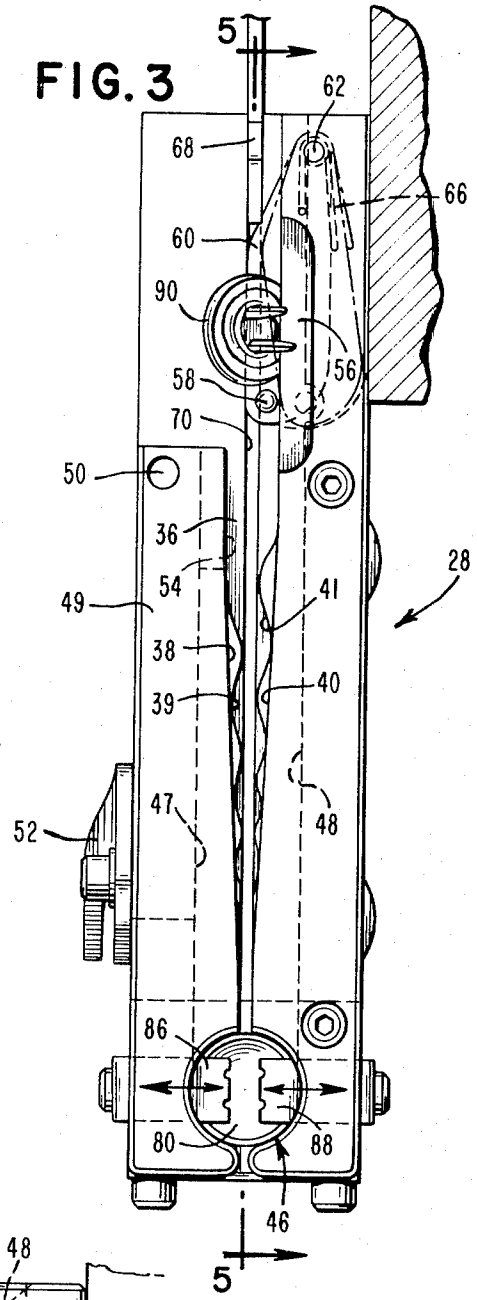


FIG. 3



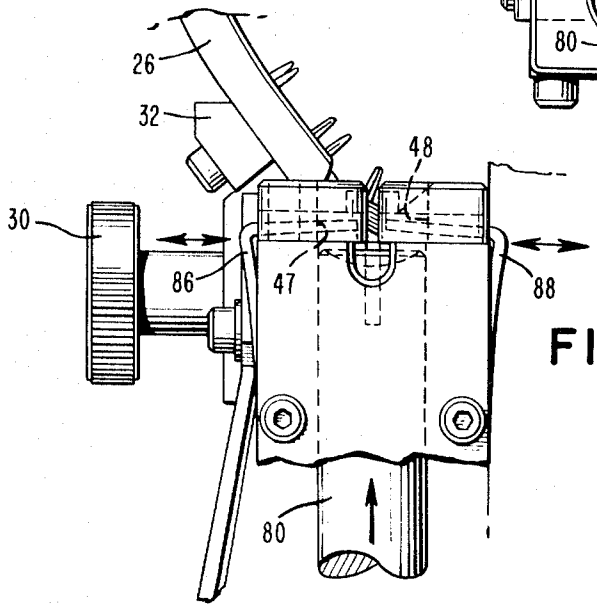


FIG. 7

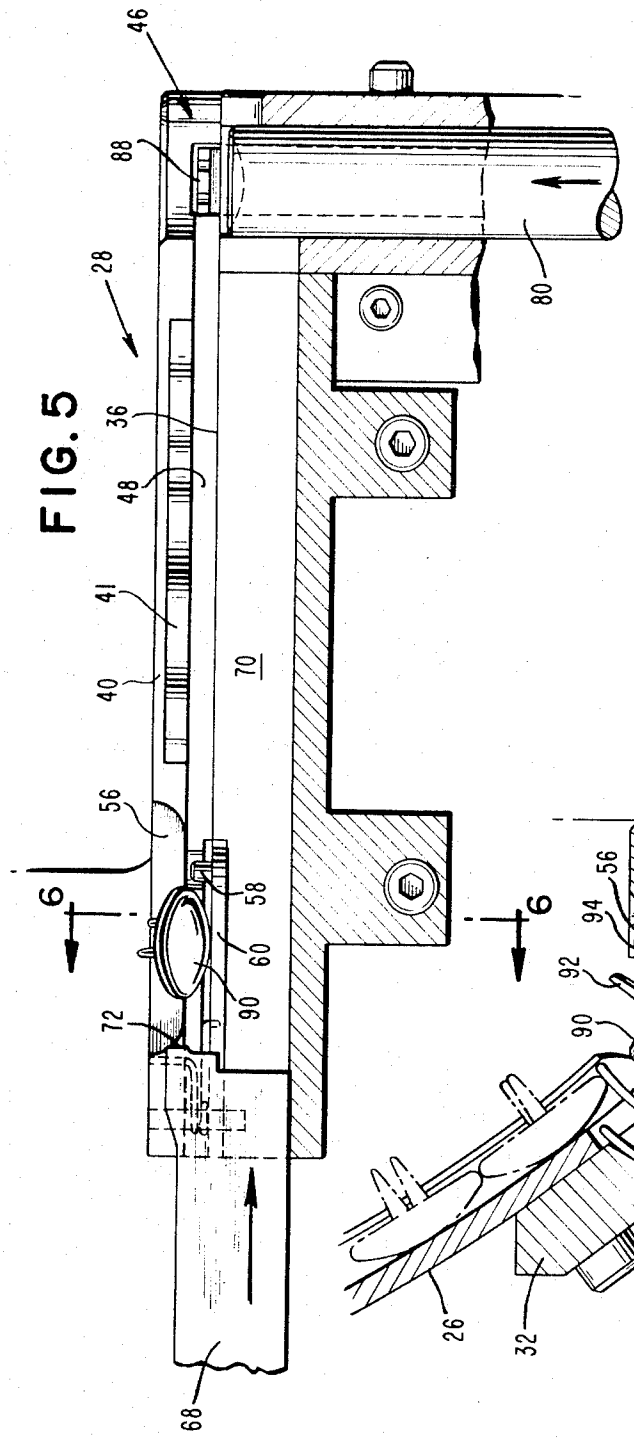


FIG. 5

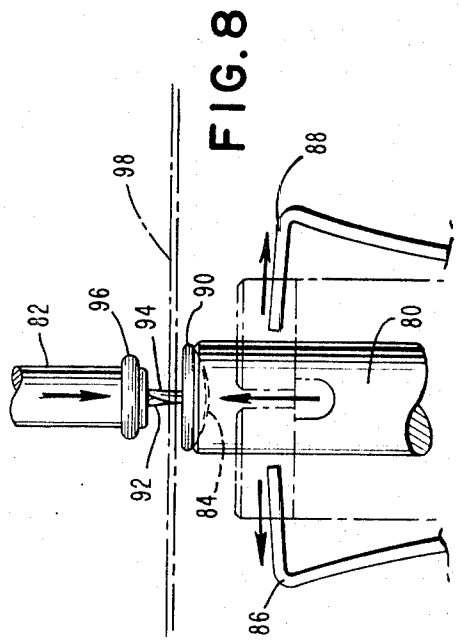


FIG. 8

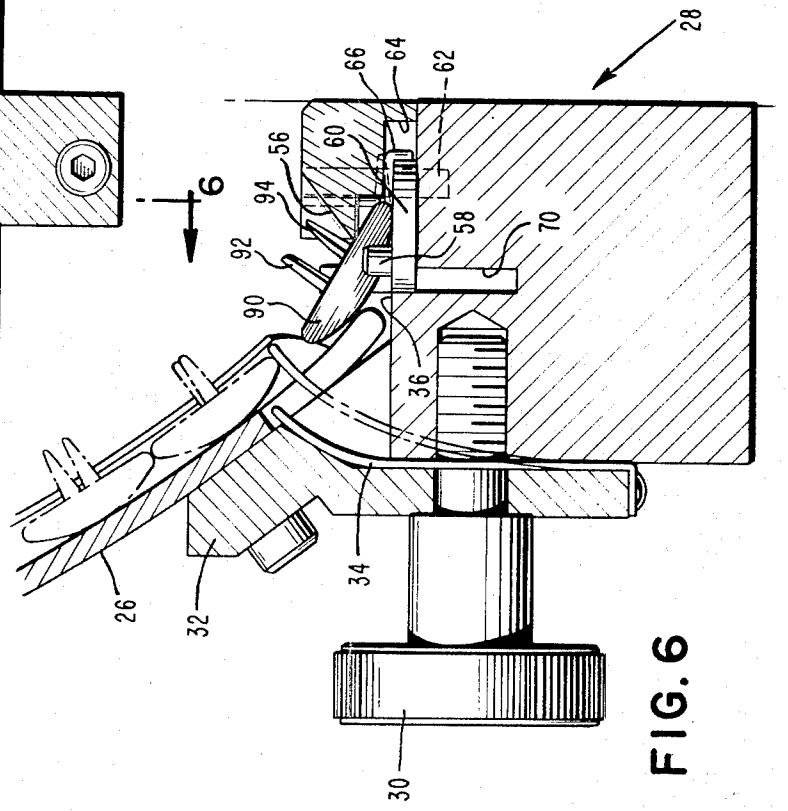


FIG. 6

SNAP ATTACHING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an apparatus for attaching two components of a fastener to material in a sandwich configuration and in particular to a feed device having a guide channel with a labyrinth passage which engages prongs projecting from one of said components to position properly the prongs by the time the pronged component reaches a setting station.

2. Description of the Prior Art

The prior art is cognizant of apparatus which attaches fasteners to material, wherein the fastener is one of the several known types adapted to close an opening in material, such as an article of clothing. Fasteners of this general type include buttons, snap fasteners, rivets and the like. In each case the fastener is characterized by at least two components, one of which has at least two prongs projecting therefrom. The prongs are adapted to penetrate both the material and the other component before being deformed to secure the fastener and material together. Examples of such fasteners may be found in U. S. Pat. Nos. 1,815,792 (metal snaps), 2,377,263 (buttons), and 3,107,408 (plastic snaps).

In the heretofore known fastener attaching machines, as shown for example in U. S. Pat. Nos. 1,944,510; 2,048,930; 2,614,714; and 3,225,993, the head elements having at least two prongs extending therefrom and the mating backing elements are stored in separate hoppers and are fed via separate chutes to a setting station where an anvil and ram drive the elements together to fix the fastener on the material. The backing elements have presented little difficulty in delivery to the setting station since they are substantially flat members which are readily positioned in the backing element chute. However, the pronged head elements present far more difficulty in delivery since the prongs must be in substantially correct alignment with jaws of the anvil or ram at the beginning of the setting operation or the closing of the jaws will prematurely deform the prongs resulting in either a sloppy appearance of the fastener or inadequate overlap of the prongs on the backing element which will cause the fastener to come apart after only a few times of use.

Some of the attempts to solve this alignment problem have required complicated mechanical arrangements which sensed the positioning of either the head element itself or the prongs projecting therefrom. Most of these machines have proved to be unsatisfactory for a number of reasons which include vulnerability to jamming and being both complicated and expensive to produce and maintain. Also, the devices of the prior art have had a rather broad beam preventing their use in closely spaced arrangements which would allow securing of all of the fasteners on a garment in a single operation.

SUMMARY OF THE PRESENT INVENTION

It is therefore an object of the present invention to provide a guide channel which will properly orient prongs projecting from fastener elements as the elements are fed to a setting station.

It is also an object of the present invention to provide a guide channel having few moving parts which will reliably and accurately align prongs of fastener elements fed therethrough.

It is another object of the present invention to provide a hopper and chute arrangement which can be readily exchanged on an attaching apparatus, which will not unintentionally dispense fasteners when dismounted from the apparatus, and which will feed fastener elements to a guide channel at an angle of approximately 45° so that the apparatus will present a narrow profile.

It is a further object of the present invention to provide an apparatus for attaching fasteners to a garment, which apparatus can be arranged in closely adjacent series so that all of the fasteners for a garment can be mounted in a single operation.

It is still another object of the present invention to provide a guide channel for a fastener attaching apparatus which is substantially free of stoppages but may be readily opened to clear any stoppages which may occur.

It is yet another object of the present invention to provide a single step feed mechanism for a fastener attaching apparatus which mechanism will feed only one mating pair of fastener elements at a time to setting station with the pronged element arriving at the station in substantially correct orientation.

The present invention is used in a fastener assembly apparatus and is characterized by a pair of hoppers and their associated chutes arranged to be readily dismountable from the apparatus, means at one end of each chute to prevent the unintended discharge of fastener elements from the chute when dismounted from the apparatus, and the chutes arranged to feed fastener elements to their guide channels at an angle of approximately 45°. The head element guide channel is formed by a pair of opposing, tapering, non-linear wall members forming therebetween a labyrinth configuration extending along the longitudinal axis of the channel. The channel has few moving parts and one wall portion is pivotally mounted in order to provide access to fastener elements within the channel. A fastener retainer member is arranged in the channel adjacent the chute to act in cooperation with pusher arm means to release the next successive fastener element only upon the initial forward movement of the pusher arm means. Drive means, including the pusher arm, are arranged to move the elements through the guide channel to a setting station in a single stop.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects and advantages of the present invention will be apparent from the following detailed description when considered with the accompanying drawings in which:

FIG. 1 is a perspective view of a fastener assembly apparatus embodying the present invention with a second like apparatus being shown in phantom;

FIG. 2 is another perspective showing the guide channel in an open position;

FIG. 3 is a top plan view of the guide channel of the present invention;

FIG. 4 is a schematic view, similar to FIG. 3, partially in section showing the passage of a pronged fastener elements through the guide channel and the details of one wall member;

FIG. 5 is a longitudinal section through the guide channel and chute taken along line 5—5 of FIG. 3;

FIG. 6 is a vertical section through the guide channel and chute taken along line 6—6 of FIG. 5.

FIG. 7 is an end view of the apparatus embodying the present invention; and

FIG. 8 is a schematic representation of the setting station during attachment of the fastener to a piece of material.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention has been shown and is described in connection with a fastener assembly apparatus of a conventional type. Only those portions of the known apparatus which are necessary for an understanding of the present invention have been shown with any detail for descriptive purposes. For further details of the operating mechanism and structure of known apparatus of this type, reference is made to U. S. Pat. Nos. 2,048,930; 2,377,263; and 3,225,993. Also, the fastener shown is a snap fastener having a head element with at least two prongs projecting from the reverse side and a backing element formed as the socket portion of the snap. The obverse side of the head element can be colored or configured as desired but the present device will not register any head elements having an asymmetric design. The present feed arrangement will, of course, feed the mating stud element and its associated backing element, the only requirement being that the element having the projecting prongs must be fed through the guide channel having the labyrinth configuration.

The attaching apparatus according to the present invention includes a head element feed assembly **10**, a backing element feed assembly **12**, a setting station **14** and driving means **16, 18** for each feed assembly.

The head element feed assembly **10** includes a storage hopper **20** having a top filling cover **22**, a bottom emptying cover **24**, and an opening (not shown) through which the head elements are passed to a head element feed chute **26** by conventional means (also not shown). The lower end of chute **26** is detachably secured to a guide channel **28** bY means of thumb screw **30** and end element **32** as illustrated in FIG. **6.** A leaf spring **34** is mounted in end element **32** to normally block passage of head elements from the chute when the thumb screw **30** does not hold end element **32** tightly against the guide channel **28.** The end of the chute **26** approaches the guide channel at an angle of approximately 45°.

The guide channel **28** extends in the feed direction from the area of the chute **26** to the setting station **14** and is constructed with a bottom surface **36** and two spaced side wall members **38** and **40.** Each side wall member includes a portion **39** and **41,** respectively, profiled to present a non-linear surface which decreasingly tapers inwards towards the longitudinal axis of the channel in the direction of feed. The details of only wall member **40** have been shown in FIG. **4** but it is to be understood that both wall members are substantially the same in this non-linear portion.

Element **42** is mounted in slot **43** formed in wall member **40.** A surface of element **42** directed toward the longitudinal axis of the channel is profiled to present the above mentioned non-linear tapering profile. The element **42** is mounted on a pair of spaced pins **44** having coil springs **45** mounted thereon between the element **42** and the wall member **40.** The pins **44** have enlarged heads limiting the inward movement of the element towards the axis of the channel while permitting the outward movement away from the axis. The elements forming portions **39** and **41** together form a spring biased labyrinth passage in the channel.

The ends of the side wall members, at the setting station has an arcuate recess which together form a vertically directed annular guide **46.** Each side wall member also includes a longitudinal recess **47, 48** adjacent to and forming an extension of the bottom surface **36.**

Side wall member **38** is formed as an assembly **49** which is pivoted on pin **50** and can be locked in the closed position by locking means **52.**

The end of the side wall member **38** towards chute **26** includes a camming surface **54** which is inclined downwardly in the direction of feed. As is illustrated in FIGS. **5** and **6,** a bevelled area **56** is formed in side wall **40** opposite the chute **26.** A retainer pin **58** mounted on the free end of a rotatable arm **60** extends above bottom surface **36** at the forward feed end of the bevelled area **56.** The arm **60** is pivoted on pin **62** (FIG. **3**) for horizontal movement in a recess **64** and is biased to the position shown in FIG. **6** by a spring **66.** A pusher arm **68** is mounted at the rear end of the guide channel **28** and is adapted to be driven by drive means (not shown) longitudinally through the length of the guide channel in a slot **70.** The front end of pusher arm **68** has a profiled portion **72** adapted to engage the fastener element.

The backing element feed assembly **12** is somewhat similar to the head element feed assembly **10.** Backing element hopper **74** is substantially the same as hopper **20** and a chute **76** is similar to chute **26** while differing therefrom in length. Chute **76** is attached to a backing element guide channel **78** which is arranged to feed the backing elements to the setting station by any a pusher arm (not shown) which may be similar to the pusher arm **68** associated with guide channel **28.**

As is shown in FIG. **8,** the setting station includes an anvil **80** and a coaxially mounted ram **82.** The upper end of anvil **80** has a slightly concave surface **84.** Spring gripping jaws **86** and **88** are mounted on opposite sides of anvil **80** and are normally biased towards each other. The anvil and ram are attached to drive means (not shown) arranged to drive the anvil and ram vertically together.

The apparatus includes several drive means none of which have been shown in detail since they may be of any suitable type such as electric, electromechanical, hydraulic or pneumatic systems. Each hopper is provided with drive means which initially move the elements from storage in the hopper to the chute. The pusher arm of each guide channel is operatively connected to drive means to be driven thereby in order to push an element through its respective channel in a single step. A drive means drives the hammer and anvil together to set the fastener on the material. The last two mentioned drive means are preferably synchronized. Conventional means, such as a foot operated switch (not shown), are provided for the operator to actuate the drive means and effect the setting operation.

In order to operate the above apparatus, hoppers **20** and **74** are filled with head elements and backing elements, respectively, and the system is charged by a sufficient number of actuations of the hopper drive means to fill the associated chutes with fastener elements. Chute **26** is firmly held against channel **28** by thumb screw **30** so that spring **34** clears the chute for passage of the head elements. The leading head element **90** will fall into channel **28** at an angle of approximately 45°

with the prongs **92** and **94** extending into bevelled area **56** and the head portion resting against retainer pin **58** and extending partially into recess **48.** The lead backing element **96** will enter feed channel **78** about this same time.

The apparatus is now ready for the operator to position the material in the setting area and actuate the apparatus drive means by any conventional means (not shown) such as the foot switch mentioned above. The feed arm drive means (not shown) will cause the respective pusher arms to move forward in the feed direction. When pusher arm **68** moves forward it causes arm **60** to rotate counterclockwise against the bias of spring **66** until pin **58** clears the head element **90.** As head element **90** begins to move forward, its uppermost or raised edge engages cam surface **54** and is cammed downward until the entire head portion rests against bottom surface **36** and the prongs **92** and **94** extend substantially vertically. The continued forward movement of pusher arm **68** and head element **90** brings the prongs **92** and **94** into a random engagement with the labyrinth passage formed by wall portions **39** and **41.** As the prongs strike the wall portions, see FIG. **4,** they will cause the head element to oscillate during advancing movement in the channel until the prongs are substantially in line with the longitudinal axis of the channel and the jaws **86** and **88** of the anvil **80.** Any sharp blows of the prongs against the labyrinth passage will be absorbed by the spring biased portion forming elements.

The pusher arm delivers the head element **90** to anvil **80** substantially simultaneously with the delivery of a backing element **96** to ram **82.** As the pusher arms begin to withdraw, the drive means for the ram and anvil (schematically shown by **16** and **18**) are actuated. Anvil **80** is driven upward with jaws **86** and **88** initially holding the head element **90** in the desired position. The jaws will be cammed out of contact with the head element with the upward movement of the anvil and the head element will continue to be guided by the walls of the vertically directed annular guide **46.** At the same time the anvil begins to move, the ram commences its downward trip carrying backing element **96** with it.

The upward drive of anvil **80** causes prongs **92** and **94** to penetrate the material **98,** the backing element **96** and strike the end of ram **82** which causes the prongs to be deformed until the fastener elements and material are held tightly together. The anvil and ram are then drawn apart and the finished material removed.

The present fastener attaching apparatus has many features which represent significant advances in the art. Among these features is the head element feed chute approaching the guide channel at an angle of approximately 45°. This allows for the construction of apparatus having a narrow beam thus enabling formation of a closely spaced array of apparatus (see FIG. **1**) adapted to place all of the fasteners on a garment in a single operation.

The head element guide channel **28** has only a few moving parts, namely, the labyrinth forming elements for aligning the prongs of the head element. This results in a substantial improvement over prior art devices in both economy of parts and improved operation since the likelihood of jamming is substantially eliminated. Also the ends of the side wall members at the setting station form a vertically directed guide which keeps the head elements properly aligned after they are released by the anvil jaws.

The placement of the hoppers on the apparatus is also advantageous with the hopper for the backing element towards the rear of the hopper for the head elements towards the front. The backing elements are generally similar, regardless of the garment, while the head elements may be of different colors, patterns etc. and require frequent change for the various garments being manufactured. The head element hopper is readily accessible and, since single step feed is used, substitution of head elements can be rapidly made. Also the relative location of the hoppers clearly indicates which elements are to be placed therein thus lessening training requirements for the operators.

Inasmuch as the present invention is subject to many variations, modifications and changes in detail, it is intended that all matter contained in the foregoing description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. In an apparatus for attaching pronged head elements and backing elements of two component fasteners to material at a setting station by means of an anvil and cooperating ram, an improved means for feeding said pronged head elements to said setting station comprising:

a pronged head element feed assembly including a hopper, a guide channel one end of which opens at said setting station, a chute connected to said hopper and the other end of said guide channel, and pusher arm means adapted to drive pronged head elements through said guide channel,

said guide channel including a bottom surface and a pair of spaced side walls disposed to define a longitudinal channel therebetween tapered in a feed direction, with at least one of said side walls having a portion with a non-linear surface whereby engagement of the prongs of said head elements with said at least one non-linear surface portion causes oscillation of said head element into proper alignment.

2. The invention according to claim **1** wherein said ram and anvil are vertically actuated, and

each side wall of said guide channel has a portion with a non-linear surface forming a labyrinth passage between said portions.

3. The invention according to claim **2** wherein one of said side wall portions is movable relative to the other portion, and means biasing said at movable portion towards said channel.

4. The invention according to claim **2** wherein said chute is attached to said guide channel at an angle of approximately 45°, and

further comprising a bevelled area formed in a side wall of said channel opposite said chute adapted to receive the prongs of said head elements entering said guide channel at said **45°** angle.

5. The invention according to claim **4** further comprising a camming surface formed on the side wall of said guide channel to which said chute is attached, said camming surface being forward of said bevelled area in the direction of feed and serving to cam the head elements downward to fully seat in said guide channel with the prongs extending upward to engage said labyrinth configuration.

6. The invention according to claim 2 further comprising means pivotally attaching one of said side walls to said channel, and

locking means adapted to normally hold said pviotal said wall in a closed position, whereby said guide channel may be opened to clear stoppages.

7. The invention according to claim 2 further comprising element retainer means adapted to hold said head elements at said chute, and

means on said pusher arm means adapted to remove said retainer means from the path of said head element upon commencement of drive of said pusher arm means toward said setting station.

8. The invention according to claim 7 wherein said element retainer means comprises,

a recess formed in the bottom surface of said guide channel,

an arm pivotally mounted in said recess,

a pin mounted on one end of said arm and extending above said bottom surface, and

spring means biasing said arm to a position where said pin prevents passage of a head element through said guide channel.

9. The invention according to claim 2 wherein said side walls together form a vertically directed, annular guide at said setting station through which said anvil moves during setting operation.

10. The invention according to claim 2 wherein each said side wall further comprises a longitudinally extending groove adjacent to and forming an extension of said bottom surface, the peripheral edge portion of said head elements engaging in said recesses to be guided thereby.

11. The invention according to claim 1 further comprising a profiled leading end on said pusher arm means adapted to engage a peripheral edge portion of said elements.

12. The invention according to claim 1 wherein said hopper includes a filling port, a cover over said filling port, an emptying port, a door normally closing said emptying port, and a feeding port, said chute being connected to said feeding port.

13. The invention according to claim 1 further comprising means to detachably connect said chute to said guide channel.

14. The invention according to claim 13 further comprising detent means in the end of said chute which is normally connected to said guide channel adapted to prevent unwanted discharge of elements from said chute when the latter is detached from said guide channel.

15. The invention according to claim 14 wherein said detent means comprises a leaf spring moved to an inoperative position when said chute is attached to said guide channel.

16. The invention according to claim 1 wherein said hopper and chute form an assembly mounted so as to be readily accessible from a front portion of said apparatus.

17. The invention according to claim 1 wherein said chute is attached to its guide channel at an angle of approximately 45° whereby said apparatus presents a narrow profile.

18. The invention according to claim 17 further comprising a plurality of said apparatus assembled in a closely spaced series whereby all of the fasteners for a garment may be set in a single operation.

19. The invention according to claim 1 wherein said anvil includes a concaved end adapted to receive said head elements, and

a pair of jaws mounted on opposite sides of said anvil and adapted to hold said head elements thereon during the setting operation,

said guide channel aligning said prongs with said jaws.

20. A guide channel for orienting prongs projecting from one side of an element comprising

a bottom surface, and

a pair of spaced side walls each having a portion with a non-linear surface tapering towards the longitudinal axis of said channel in a feed direction to define a labyrinth passage therebetween whereby engagement of said prongs with said labyrinth passage causes rotation of said element to the desired alignment.

21. A guide channel according to claim 20 wherein each side wall has a longitudinally extending groove adjacent to and forming an extension of said bottom surface whereby said labyrinth passage overhangs said bottom surface.

22. A guide channel according to claim 20 further comprising a pivotal member forming one of said side walls, and

means to lock said pivotal member in a normal closed position, whereby said channel can be opened to clear stoppages.

23. A guide channel according to claim 19 wherein said non-linear portions are formed on elements spring biased toward the axis of said channel whereby said labyrinth passage is spring loaded.

24. The invention according to claim 1 further comprising a backing element feed assembly including another hopper, another guide channel one end of which opens at said setting station, another chute connecting said another hopper to the other end of said another guide channel, and pusher arm means adapted to drive backing elements through said another guide channel.

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