Feb. 24, 1970 A. D. HAINES 3,496,581

MACHINE FOR MAKING BOLTS OR THE LIKE

Filed March 24, 1966 3 Sheets-Sheet 1

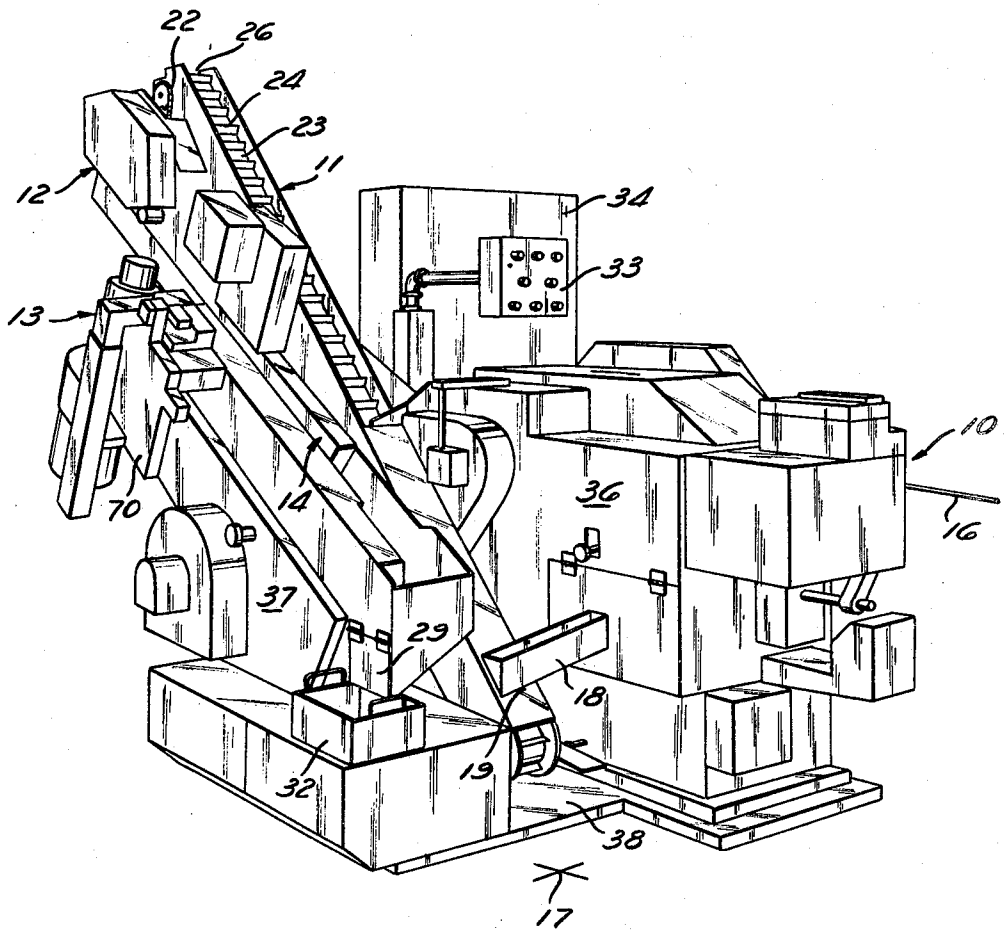

Fig. 1

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Filed March 24, 1966 3 Sheets-Sheet 2

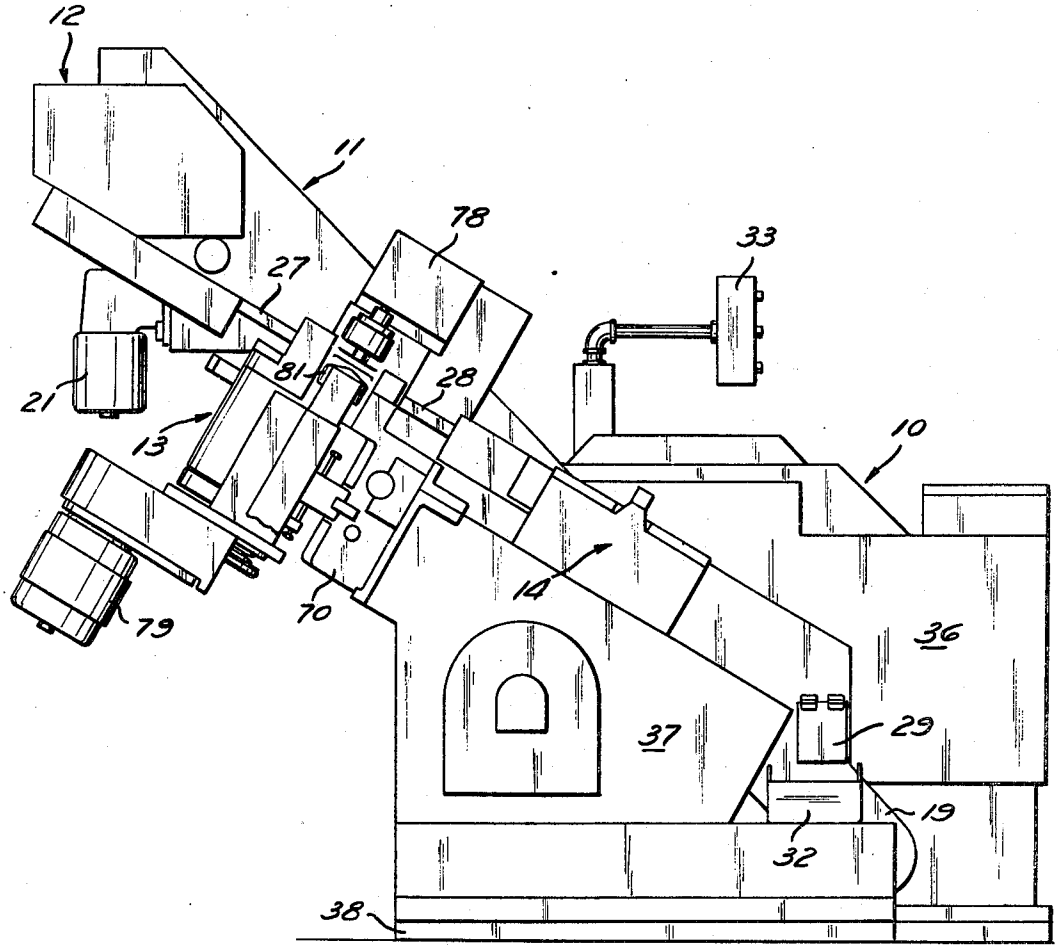

Fig. 2

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Filed March 24, 1966 3 Sheets-Sheet 3

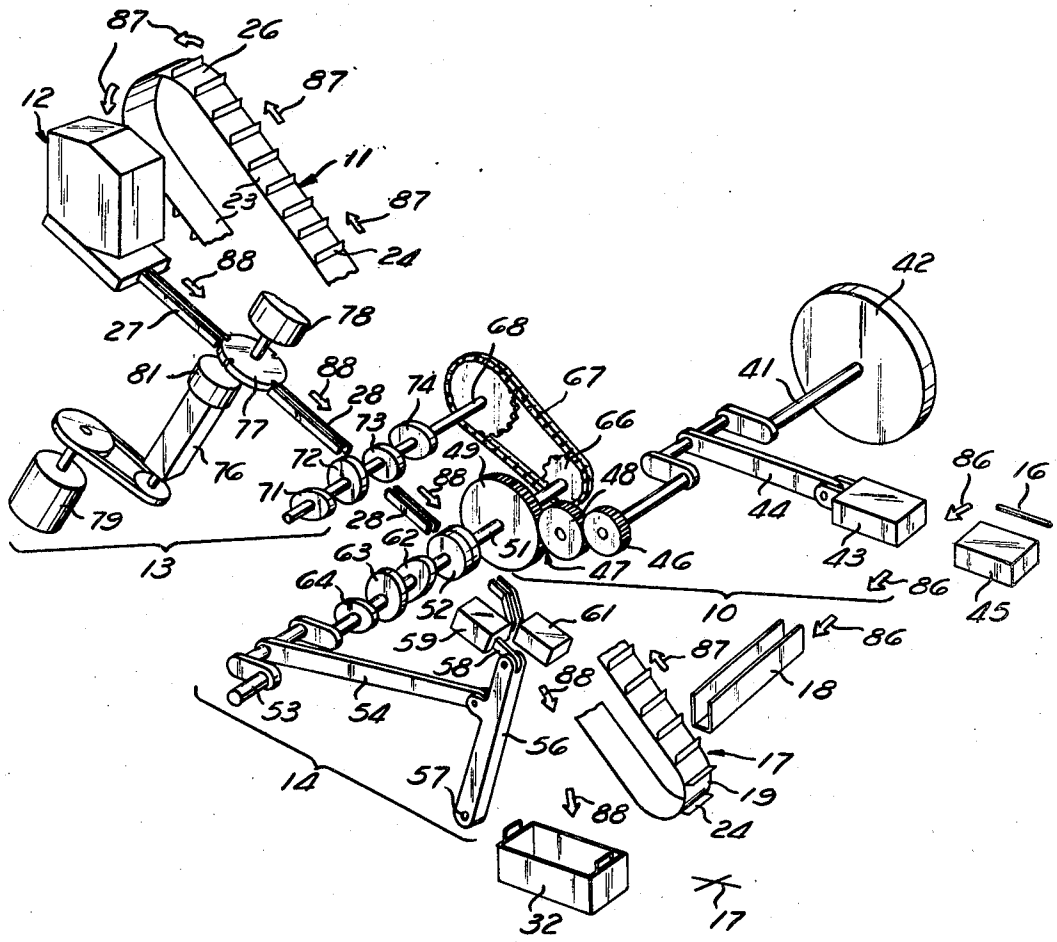

Fig. 3

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3,496,581

MACHINE FOR MAKING BOLTS OR THE LIKE

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Int. Cl. B21k 1/44
U.S. Cl. 10—11 3 Claims

ABSTRACT OF THE DISCLOSURE

A combined machine for forming headed and threaded articles is disclosed. It includes a header such as a progressive header or a double blow header for working headed blanks, an elevator for transferring the headed blanks from the discharge of the header to an orienter, a pointer which receives oriented blanks from the orienter and forms a point thereon, and a threader which roll forms threads on the pointed blanks. All of the subassemblies are arranged so that their operation can be observed and monitored by an operator while the operator remains at an operator's position. The subassemblies are also arranged so that the operator can obtain gauging samples at the various points in the forming process without leaving the operator's position so that he can determine if the machine is properly functioning.

This invention relates generally to machines for making bolts, screws, and the like, and more particularly to a novel and improved combined machine operable to produce finished bolts, screws, or the like, from wire or rod stock. A machine incorporating this invention is constructed and arranged so that the machine operator can efficiently monitor the operation of the machine to insure that each of the subassemblies of the machine is properly performing its function.

Combined machines for the manufacture of bolts, screws, and the like, (hereinafter referred to generally as "bolts") from rod or wire stock (hereinafter referred to generally as "wire") are well known. Examples of such combined machines are illustrated in the United States Letters Patents to Earl R. Frost, No. 2,020,658, John H. Friedman, No. 2,104,944, and to Robert G. Friedman, No. 3,116,499. Such combined machines include a header operable to form headed blanks from wire stock, a pointer operable to point the headed blanks and a threader operable to roll threads on the shank of the blank. In such machines automatic transfer is provided and the pointer and threader operate with a sufficient speed to perform their respective operations on the entire output of the header. Also the blanks are generally maintained in substantially the same sequence as they pass through the machine.

In the past it has been necessary for the operators of such combined machines to move from one location to another around the machine to obtain samples of blanks or finish bolts for gauging purposes. Such gauging is performed to determine if the various subassemblies of the machines are properly performing their operations within permitted tolerances. In some instances it was necessary for the operator to climb a ladder or to climb onto an elevated platform to obtain such gauging blanks or finish bolts. Because of the effort required by the operator to monitor the operation of the prior art machines there has been a tendency, in some instances, for the operator to neglect to obtain and guage sample blanks or finished articles with sufficient regularity to minimize scrap. In addition, such prior art machines were generally arranged so that the operator was unable to observe the operation of all the various subassemblies from a single location. Consequently malfunction of one or the other of the subassemblies could occur without the operator's awareness of the fact and it was necessary to depend upon automatic shutoffs, or the like, to prevent such continued malfunction.

In a combined machine incorporating the present invention the various functioning subassemblies on the machine are arranged so that an operator at a single operating position can easily obtain sample blanks or finished articles for gauging purposes. Also, the machine is arranged so that an operator at a single operating position can observe the functions of the various subassemblies and take corrective action in the event that a malfunction occurs. Consequently an improved machine incorporating the present invention results in less operator fatigue and improved operating efficiency. Still further, the structure of the machine, including the component drives, is arranged to reduce machine manufacturing cost.

It is an important object of this invention to provide a novel and improved combined machine for forming bolts and the like from wire stock constructed and arranged so that an operator can obtain samples for gauging purposes without leaving a single operators position.

It is another important object of this invention to provide a novel and improved combined machine, according to the preceding object, constructed and arranged so that an operator can observe the various machine components to determine when a malfunction occurs without leaving the operator's position.

It is still another object of this invention to provide a novel and improved machine combining a header operable to form bolt blanks from wire stock and a threader operable to form threads on such blanks with automatic transfer means between the header and threader wherein the machine is constructed and arranged so that the blanks formed by the header are discharged from the header adjacent to the operator's position and wherein the thread bolts are also discharged from the threader adjacent to the operator's position.

It is still another object of this invention to provide a novel and improved combined machine according to the last preceding object wherein a pointer is provided to point the blanks formed by the header before such blanks reach the threader.

It is another important object of this invention to provide a novel and improved pointer and threader arranged to receive bolt blanks at an elevated position spaced from an operator's position and automatically convey such blanks through the pointer and threader by moving such blanks downwardly along an incline and path extending to a location adjacent to the operator's position.

It is still another object of this invention to provide a combined machine for forming bolts, or the like, having a header and threader wherein the header and threader are provided with separate frames and wherein the threader is driven by the header in timed relationship therewith through a flexible drive coupling.

It is still another object of this invention to provide a novel and improved combined machine, according to the last preceding object, having a pointer mounted on the frame of the threader driven in timed relationship by the header.

Further objects and advantages will appear from the following description and drawings, wherein:

FIGURE 1 is a perspective view of a combined machine for forming bolt blanks incorporating the present invention;

FIGURE 2 is a side elevation of the machine illustrated in FIGURE 1; and,

FIGURE 3 is a schematic illustration of paths of blank movement and of the drive connecting the various subassemblies of the machine.

Referring to FIGURES 1 and 2, the illustrated machine incorporating the present invention includes a double blow header **10** operable to form headed blanks from wire stock, an elevator **11** operable to convey blanks formed by the header to a sorter **12**, a pointer **13** operable to point the blanks, and a threader **14** operable to form threads on the pointed blank to complete the bolt.

The header **10** illustrated is a double blow header which automatically forms headed blanks for bolts, and the like, from wire stock **16**. Such machines automatically cut off measured blanks from the stock **16** and work such blanks in two working strokes, within a single die, to complete a blank having a shank and head. One such machine is illustrated in the United States patent to Robert G. Friedman, No. 3,031,698. Other forms of headers may be used in a combined machine incorporating this invention including other types of double blow headers, as well as machines known as progressive headers which automatically transfer a blank through a series of work stations and progressively form such blank at each station. The header should be arranged to discharge the bolt blanks at a location substantially adjacent to an operator's position indicated by a cross **17**.

In the illustrated embodiment the headed blanks are discharged from the header **10** down along an inclined chute **18**. The chute **18** is open on its top to permit the operator to easily remove sample blanks therefrom for gauging purposes. If desired, a partial or hinged cover can be provided on the chute **18**.

The chute **18** carries the blanks to the lowered end **19** of the elevator **11**. The elevator **11** is driven by a motor **21** (illustrated in FIGURE 2) through a drive chain **22** (illustrated in FIGURE 1) and includes an endless belt **23** provided with spaced flites **24**. The belt **23** and flites **24** cooperate to form pockets which receive blanks from the chute **18** at **19**. These pockets carry the blanks in substantially the same sequence as they are made by the header **10** to the upper end **26** of the elevator **11** where the belt passes over a pulley and the blanks fall down a chute into the sorter **12**.

The sorter **12** may be of any suitable type operable to arrange the randomly oriented blanks from the elevator in a predetermined orientation for movement to the pointer. In this predetermined orientation the blanks hang by their heads on parallel tracks **27** with the shank of the blank extending down between the tracks. One suitable sorter is illustrated in the United States Patent No. 3,116,499.

The tracks **27** are inclined at about 30° relative to the horizontal, so that the blanks slide under the influence of gravity downwardly to the pointer **13**. The illustrated pointer **13** is described in detail in my copending application, Ser. No. 523,744, filed Jan. 28, 1966. Here again, other types of pointers may be utilized providing they are compatible with the remaining portions of the combined machine.

From the pointer **13** the pointed blanks slide down second tracks **28**, aligned with the tracks **27**, to the threader **14**. The illustrated threader functions to automatically roll threads onto the shank of the blank completing the bolt. Reference may be made to United States Letters Patent to Robert G. Friedman, No. 3,139,776, which illustrates the structural details of one roll threader which may be used in this machine.

As best illustrated in FIGURES 2 and 3, the tracks **27** and **28** are aligned and inclined relative to the horizontal so that the blanks are carried by gravity first to the pointer **13** and then to the threader **14**. Similarly, the pointer **13** and threader **14** are inclined so that they operate on blanks moving along an inclined and relatively straight path. With such a structure the orientation of the blanks established by the sorter **12** is maintained until the blanks are threaded and smooth feeding of the blanks is assured. Also, an operator at the operator's position **17** can view the movement of the blanks up along the conveyor **11** to the sorter **12** and also as they emerge from the threader **14**. The finished bolts are discharged from the threader at **29** substantially adjacent to the operator's position **17**. Therefore, it is a simple matter for the operator to obtain a sample finished bolt for gauging purposes without leaving his position **17**. In the illustrated machine the finished bolts pass through the door **29** and are collected in handling means represented by a tote box **32**. If desired, a power conveyor may be provided to carry the finished bolts away from the machine for cleaning and packaging.

A control panel **33** is mounted above the header **10** in such a position that can be easily reached by the operator at the operator's position **17**. The various relays and automatic controls for the machine are located in a panel **34**.

In the illustrated machine the header **10** is provided with a frame **36** and the threader with a frame **37**. The two frames **36** and **37** are mounted on a single base plate **38** and the pointer **13** and elevator **11** are supported on the frame **37**. The separate frames are easier and more economical to manufacture when compared to a machine having a single frame for all of the subassemblies.

FIGURE 3 schematically illustrates the drive for the header **10**, pointer **13** and thread roller **14**. The header **10** is provided with a main crankshaft **41** journaled on the frame **36** (illustrated in FIGURES 1 and 2). A flywheel **42** is mounted on one end of the crankshaft **41** and is preferably driven by an electric motor through a belt drive (not illustrated). The main crankshaft **41** is connected to the header slide **43** of the header **10** by a pitman **44**, so that the header slide is reciprocated back and forth, relative to the fixed die **45**, through one cycle each time the crankshaft **41** rotates through one revolution. Since the header **10** is a double blow header a single blank is formed each time the header slide performs two working strokes, so a single blank is produced each time the crank **41** rotates through two complete revolutions.

Mounted on the end of the crankshaft **41** opposite the flywheel **42** is the first gear **46** of a gear train **47**, consisting of the first gear **46**, an idler gear **48** and a driven gear **49**. The gear train **47** is arranged to provide a two to one speed reduction so that the driven gear **49** rotates at half the speed of the crankshaft **41**.

The driven gear **49** is mounted on a shaft **51** journaled on the frame **36** and is connected through a flexible coupling **52** to a crankshaft **53** journaled on the frame **37**. Because the shafts **51** and **53** are journaled on different frames a flexible coupling **52** is used to connect the two shafts and provides compensation for slight misalignment between the shafts. With this arrangement it is not necessary to precisely locate the frames **36** and **37** and the shafts **51** and **52** relative to each other. This permits greater manufacturing tolerances and reduces cost.

The crankshaft **53** is connected through a drive link **54** to a rocker arm **56** pivoted at **57** on the frame **37**. A second drive link **58** connects the upper end of the rocker arm **56** to a reciprocating thread rolling die **59**. Consequently, rotation of the crankshaft **53** causes reciprocation of the sliding die **59** back and forth with respect to the fixed thread rolling die **61**. The thread roller **14** is provided with a gate, inserter and pusher of the type described in the United States Patent No. 3,139,776, but these elements are not illustrated in FIGURE 3 in order to simplify the drawings. However, three cams **62**, **63** and **64** are mounted on the crankshaft **53** and connected to drive the gate, inserter and pusher in proper timed relationship to the operation of the other elements of the thread roller. Here again, the linkage operated by the cams **62** through **64** are not illustrated to simplify the drawings.

Mounted on the end of the shaft **51** opposite the flexible coupling **52** is a sprocket wheel **66** connected through a chain drive **67** to a cam shaft **68** journaled on the frame **70** of the pointer **13**. Because the chain **67** is a flexible

drive it accommodates slight variations in the position of the shaft **68** relative to the shaft **51**, so the manufacturing tolerances of the frame positioning surfaces need not be unnecessarily small.

The pointer as described in my copending application, Ser. No. 523,744, filed Jan. 28. 1966, includes four drive cams. These drive cams are illustrated schematically by the cams **71**, **72**, **73** and **74** mounted on the shaft **68**. The cam **71** operates the gripper for gripping the blanks at the pointing station, the cams **72** and **73** reciprocate the cutter spindle **76** and the cam **74** operates the injector for injecting blanks from the track **27** into an indexing dial **77**. The drive for the indexing dial **77** is schematically illustrated at **78** and is driven by a chain drive (not illustrated) from the shaft **68**. A motor **79** is connected to rotate the cutter head **81** for pointing the blanks.

The operation of the pointer **13** and threader **14** is automatically timed with the operation of the header **10**, since both the crankshaft **53** and cam shaft **68** are driven from the shaft **51** of the header. Since the pointer **13** and thread roller **14** perform a complete operation each time their respective shafts **53** and **68** rotate through one revolution, they operate at the same cyclic rate as the header **10**.

In the event that a progressive header is substituted for the double blow header **10** and such progressive header operates to produce a blank each time its crankshaft rotates through one complete revolution the drive shaft **51** would be driven at the same speed as such header crankshaft.

In the event that pointing is not required the pointer **13** may be eliminated and the blanks are then carried by the tracks directly from the sorter **12** to the threader **14**. Such a machine, however, would still provide the advantages of the present invention because an operator located at a single position can obtain sample blanks or bolts for gauging purposes without leaving the operator's position.

In FIGURE 3 the arrows **86** illustrate the blank movement from the stock **16** through the header **10** and chute **18** to the conveyor **11**. Arrows **87** indicate the movement of the blanks by the conveyor **11** along an inclined path upward and away from the operator's position **17** to the sorter **12**. The arrows **88** indicate the direction of blank movement from the sorter along an inclined path extending downward and toward the operator's position **17**.

Because operator fatigue is reduced and because the effort required to obtain samples is minimized the operator is more alert and, in practice, tends to gauge samples at more frequent intervals. Since frequent gauging reduces the likelihood of manufacturing bolts which do not meet specification requirements scrap is reduced and operating efficiency is improved. Also, improved efficiency results from the arrangement of the machine, so that the operator can observe the operation of the various subassemblies including the feeding of stock **16** into the header, the output of the header **10**, the movement of the blanks

up along the conveyor **11** and the discharge from the threader **14** without leaving his operating position. Therefore, any malfunction of any portion of the machine is immediately determined and corrective action can be immediately taken.

Although a preferred embodiment of this invention is illustrated, it is to be understood that various modifications and rearrangements of parts may be resorted to without departing from the scope of the invention as defined in the following claims.

I claim:

1. A combined machine for making headed and threaded articles comprising a header including a header slide to form headed blanks from wire stock and discharge such blanks at a first discharge location, a threader separate from said slide to receive blanks at a supply position spaced from said first discharge location and discharge said blanks at a second discharge location substantially adjacent to said first discharge location after forming a thread thereon, and transfer means to transfer blanks from said first discharge location to said discharge location to said supply position, said header including a first frame, said threader including a second frame, mounting means securing said frames in predetermined positions relative to each other, and mechanical means driving said threader in timed relation to the operation of said header, said mechanical means including a first shaft journaled on sad first frame, a second shaft journaled on said second frame, and a flexible drive connecting said shafts, said flexible drive allowing limited displacement of said second shaft from a predetermined position relative to said first shaft.

2. A combined machine as set forth in claim **1** wherein a pointer is provided to point blanks received from said transfer means and deliver pointed blanks to said threader, said pointer including a pointer frame mounted on said second frame, and a mechanical drive between one of said shafts and said pointer driving said pointer in timed relation to said header, said last named mechanical drive including a third shaft journaled on said third frame and a second flexible drive connecting said third shaft and said one shaft.

3. A combined machine as set forth in claim **2** wherein said one shaft is said first shaft.

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U.S. Cl. X.R.

10—12, 27, 162, 165