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F. MUSKE
STAPLING MACHINES
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276,724
3 Sheets-Sheet 1

Fig. 1

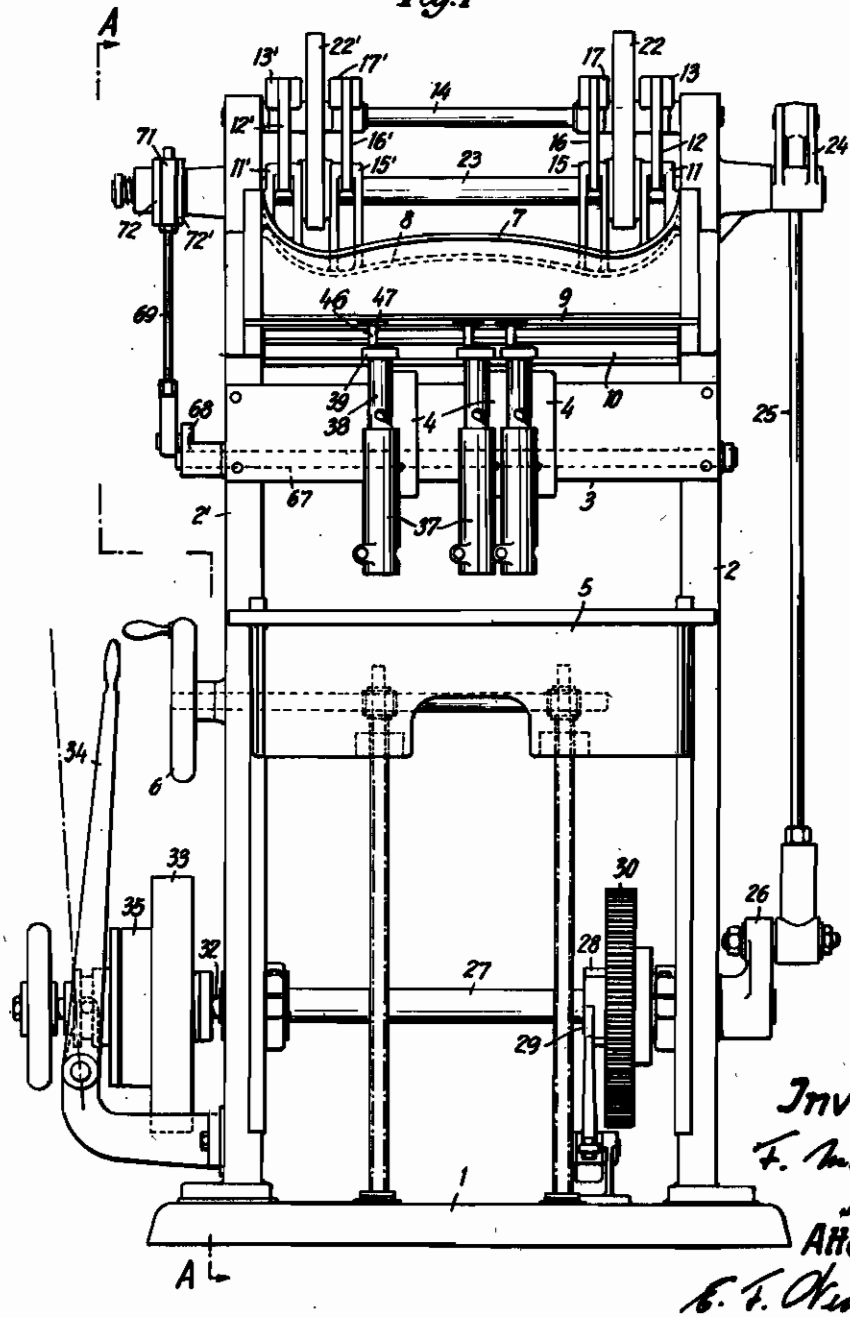

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Fig. 2

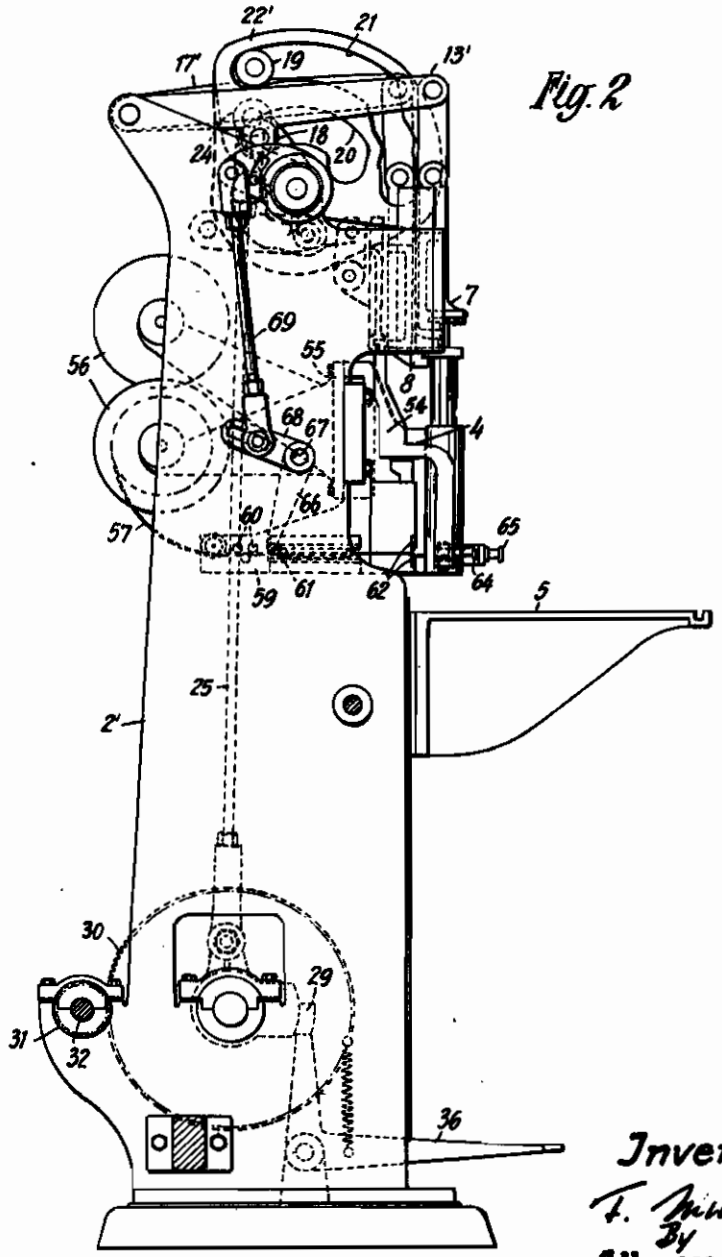

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Fig.3

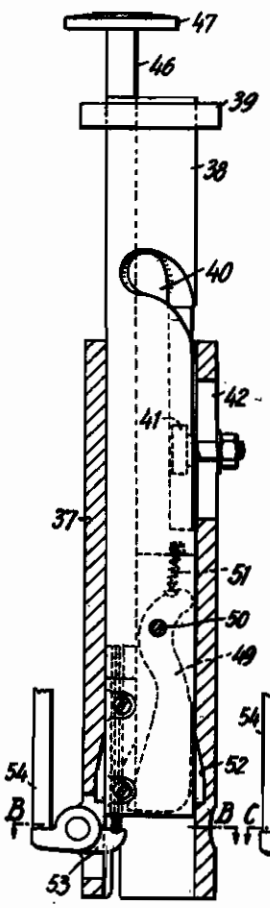


Fig.4

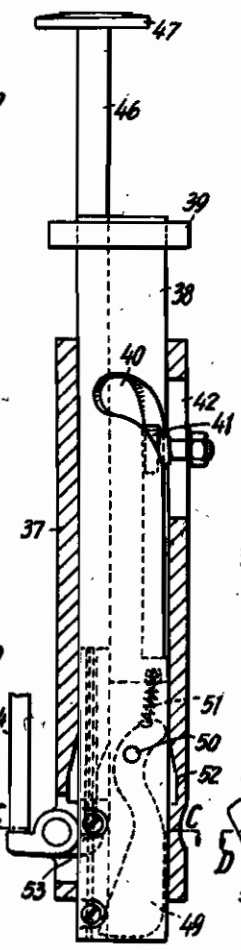


Fig.5

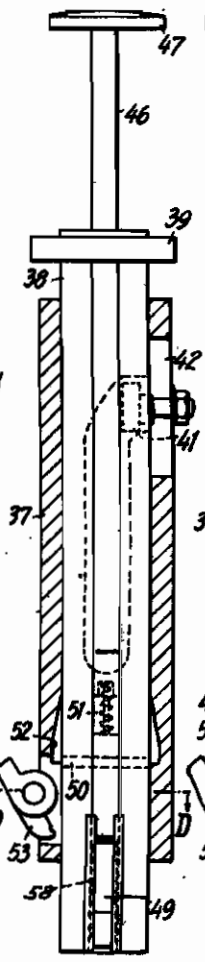


Fig.6

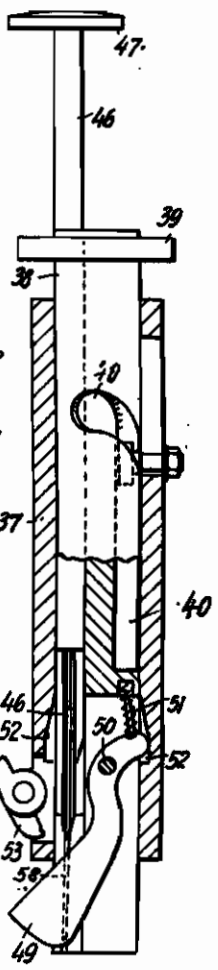


Fig.7

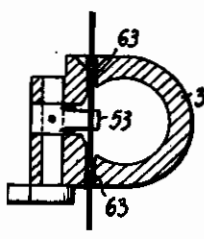


Fig.8

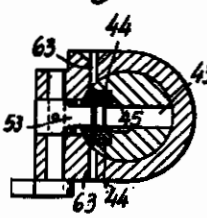


Fig.9

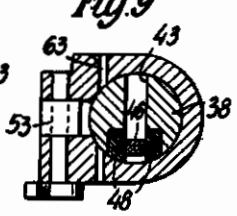
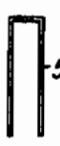


Fig.10



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ALIEN PROPERTY CUSTODIAN

STAPLING MACHINES

Franz Muske, Bremen-Sebaldsbruck, Germany;
vested in the Alien Property Custodian

Application filed May 31, 1939

This invention relates to wire stapling machines of the type in which a continuous length of wire is fed to the machine and is bent and cut to form individual staples, which are then inserted into the workpiece.

An object of the invention is to provide a machine of this type which is flexible and versatile in operation, so that the size of the staples and angular orientation at which they are inserted into the workpiece can be varied by a quick and simple adjustment.

A further object of the invention is to provide a machine of improved construction with a plurality of stapling heads in which the staples can be inserted longitudinally, that is, in line with the row of stapling heads.

A still further object of the invention is to provide a machine with a plurality of stapling heads in which the positions of the individual heads can be independently and easily varied to suit requirements.

A still further object of the invention is to provide a stapling machine of generally improved construction, which shall be robust and efficient in operation.

Broadly stated, in my invention I employ a stapling head in which the staple can be rotated after being formed and before being inserted, so that it can be formed in one plane and inserted in another. In this way it is possible to employ stapling heads placed very much more closely together than was previously possible when stapling longitudinally. It is also possible to adjust the orientation at which the staples are inserted to suit requirements.

These and other advantages which result from my invention will be more fully understood from the description which follows, in which one particular form of stapling machine is described by way of example and with reference to the accompanying drawings, in which:

Figure 1 is a front view of the machine;

Figure 2 is a section on the line A—A in Figure 1;

Figure 3 is a longitudinal section through a former and driver shown on a larger scale;

Figure 4 is a similar view to Figure 3, showing the former in another position;

Figure 5 is a similar view, showing the position of the parts just before the staple is driven in;

Figure 6 is the same view as Figure 5, showing the device when used for transverse stapling;

Figure 7 is a section on the line B—B in Figure 3;

Figure 8 is a section on the line C—C in Figure 4;

Figure 9 is a section on the line D—D in Figure 5;

Figure 10 shows a staple after it has been bent to shape.

The frame of the machine comprises two upright members 2, 2', supported on a base plate 1 and joined by a transverse member 3, on which the stapling heads 4 are slidably mounted. A table 5, which is arranged below the stapling heads 4, can be adjusted in height by means of a hand wheel 6. The workpiece into which the staples are to be inserted is placed upon the table 5.

Two driving plates 7 and 8 are mounted above the transverse member 3 so that they can slide vertically between the two uprights 2, 2'. The plate 7 is provided with a groove 9, and the plate 8 with a groove 10. The plate 7 is provided at its upper end and on each side with lugs 11, 11', which are pivotally connected to the links, 12, 12'. The links 12, 12', are in turn pivotally connected to the levers 13, 13', the other ends of which are held on a shaft 14 which is rotatably mounted in the uprights 2, 2'. The driving plate 8 is provided with lugs 15, 15' corresponding to the lugs 11, 11'. These lugs are connected through links 16, 16', to levers 17, 17', which are also mounted on the shaft 14.

Guide rollers 18 and 19 are respectively attached to levers 13, 13', and 17, 17', and engage the cam tracks 20 or 21 as the case may be, which are provided in the cam plates 22 and 22'.

The cam plates 22 and 22' are secured to a shaft 23, on which is secured an arm 24. This arm is coupled by means of a rod 25 to a crank 26 on the shaft 27. A clutch device 26 is arranged on the shaft 27 and is provided with a control member 29. A gear wheel 30, which is rotatable about the clutch device 28, meshes with a pinion 31, which is secured to the driving shaft 32, which is in turn driven by a pulley 33 which can be brought into or out of engagement by means of a clutch 35 operated by a hand lever 34.

The control member 28 can be released by means of a a foot lever 38. This causes the clutch 28 to come into engagement so that the gear wheel 30 rotates the shaft 27 through one revolution. On completion of one revolution, provided that the foot lever 36 has in the meantime been released, the control member 28 again comes into operation to interrupt the drive between the gear wheel 30 and the shaft 27.

Each stapling head comprises a cylinder 37 (as

best shown in Figure 3), in which a former 38 can reciprocate. The former 38 is provided with a head 39 which is held by, but rotatable in, the groove 10 of the driving plate 8. The former is also provided with a slot 40, the lower part of which runs axially whilst the upper part is spiral in form. A roller 41 runs in the slot 40 and is secured in a slot 42 in the cylinder 37. The former 38 at its lower end is provided with a further slot 43. This slot is reinforced on either side by means of inserts 44, which are hardened on their outer surfaces and in which axial grooves 45 are formed. The driver of the stapling head is in the form of a member 46 which can reciprocate between the inserts 44 and the driven end of which passes out through the former 38 and carries a head 47 which is held by, but rotatable in, the groove 9 of the driving plate 7. The lower end of the driver 46 is provided with longitudinal ribs 48, which run in the grooves 45 of the inserts 44. A staple support 49 is mounted in the groove 43 of the former 38 so as to rock about an axis 50. The lower and longer half of this support is broadened to the shape shown, and the upper and shorter half is acted on by a spring 51. A cavity 52 in the lower part of the inner wall of the cylinder 37 exerts a cam action on the upper part of the support 49 during the downward movement of the former 38.

A catch 53 is rotatably mounted on the cylinder 37 and has a curved nose which enters the slot 43 and a rear end which coacts with an abutment 54, the height of which can be adjusted.

As shown in Figure 2, the stapling head 4 carries a rearwardly extending arm 55 on which a reel 56 is mounted. A wire 57, which unwinds from the reel, is cut up and bent to form the staples of the shape shown in Figure 10 under the reference numeral 58. A bracket 59 is arranged below the arm 55 and carries several rolls 60 and a feeding mechanism 61 which grips the wire and advances it bit by bit. A cutting device 62 is located in front of the feeding mechanism 61 and comprises a lower fixed blade and an upper moving blade. Channels 63 are provided in the cylinder 37 and lie in the direction of the wire. An abutment 64 is arranged in front of these channels and its position can be adjusted by means of the screw 65 in accordance with the desired length of the end of wire which is to be cut off.

The wire feeding mechanism 61 is driven by means of an arm 66 which is splined to the shaft 67, which is journaled in the uprights 2, 2'. One end of this shaft carries a crank 68 connected to a rod 69. In order to be able to adjust the stroke of the feeding mechanism, the crank 68 is provided with a slot, in which the position of the end of the rod 69 is adjustable. The other end of the rod 69 is secured to a cam plate 71 driven by clutch plates 72, 72' which form a friction coupling. The plates 72, 72', are carried on the shaft 23.

The operation of the machine is as follows:

The requisite number of stapling heads 4 are mounted on the transverse member 3 at the desired intervals, the heads 39 of the formers 38 being inserted in the groove 10 of the driving plate 8 and the heads 47 of the drivers 46 being inserted in the groove 9 of the driving plate 7. The table 5 carrying the workpiece into which the staples are to be inserted is then adjusted to the required height. If longitudinal stapling is required, i. e. if the staples are to be inserted in the workpiece in a vertical plane parallel to the front of the machine, the position of the roller 41 is adjusted until it approximates to that shown in Figure 3.

To begin the stapling operation, the foot lever 36 is depressed, which releases the control member 29, so that the shaft 27 and the crank 26 rotate through one complete revolution. The drive is transferred by means of the rod 25 and the arm 24 to the cam plates 22 and 22', which rock the levers 13, 13' and 17, 17', in accordance with the contours of their cam tracks 20 and 21. This causes the driving plates 7 and 8 to undergo a corresponding movement, so that the formers 38 and, independently, the drivers 46 of all the stapling heads are simultaneously driven. In the initial position shown in Figure 3, an end of wire which has already been cut off, lies symmetrically across the nose of the catch 53. The former 38 is now pressed downwards into the position shown in Figure 4, during which movement the projecting ends of wire are engaged by the inserts 44 and bent downwards, the two bent ends which form the two limbs of the staple lying in the grooves 45 of the inserts.

So far the position of the catch 53 has been determined by the abutment 54, and no rotation of the former 38 has taken place. The abutment 54 is now removed, which causes the catch 53 to move clear of the former 38 (as shown in Figure 5) and during further downward movement of the former 38 the support 49 rocks into the slot 43 between the limbs of the staple which are lying in the grooves 45. This movement of the support 49 occurs automatically as a result of the short upper end of the support entering the cavity 52 under the action of the spring 51. During this further downward movement of the former 38 the roller 41 enters the spiral part of the slot 40 and thus causes the former 38 to rotate through 90°. On completion of this operation, the former 38 is in the position shown in Figures 5 and 9, in which the staple has rotated through 90° from its original position.

The staple 58 is now inserted by means of the driver 46, which is forced downwards at this point. During this operation, the support 49 is deflected sideways. On completion of the stapling operation, all the parts return to their initial position and the drive is interrupted by means of the foot lever 36.

If transverse stapling is required, i. e. if the staples are to be inserted in a vertical plane at right angles to the front of the machine, the position of the roller 41 is adjusted to that shown in Figure 6, where the roller is fixed at the bottom of the slit 42 so that during the stroke of the former 38 the roller does not enter the spiral part of the slot 40. Thus, no rotation of the former 38 takes place, so that the staple is inserted without alteration in its orientation, i. e. while lying in a vertical plane at right angles to the front of the machine.

By appropriate adjustment of the roller 41 in the slot 42 any desired orientation of the staple can be achieved. As can be clearly seen from Figures 3 to 6, it is perfectly easy to arrange for the staple to be rotated through more than 90° by continuing the spiral slot further.

Besides the common driving plates for the formers and for the drivers, additional ones can be provided for other members, e. g. for the cutting mechanisms and the catches 53. These additional driving plates can also be controlled by cam slots in the cam plates 22, 22'.

It is clear that by using the machine described

many advantages are obtained. It is possible to staple longitudinally while using a large number of stapling heads arranged close together, so as to give a stitching effect. This was impossible with previous continuous wire fed machines, since the wire feeding mechanisms prevented the heads from being placed close together when stapling longitudinally. Other obvious advantages result from being able to adjust the number and position of the stapling heads and the orientation at which the staples are inserted, in such an easy and simple manner.

FRANZ MUSKE.