Jan. 6, 1970 S. O. GRÖNLUND 3,487,799

ROOF SEAMING MACHINE

Filed April 12, 1968 4 Sheets-Sheet 1

FIG.10

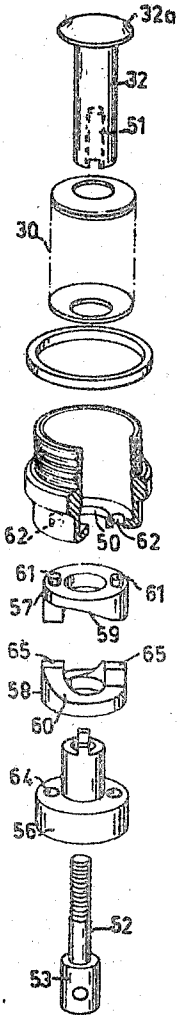


FIG.9

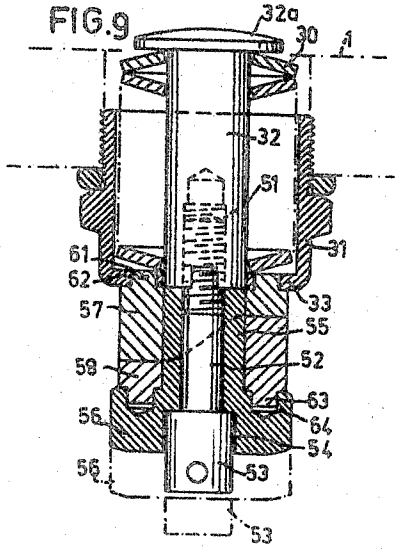
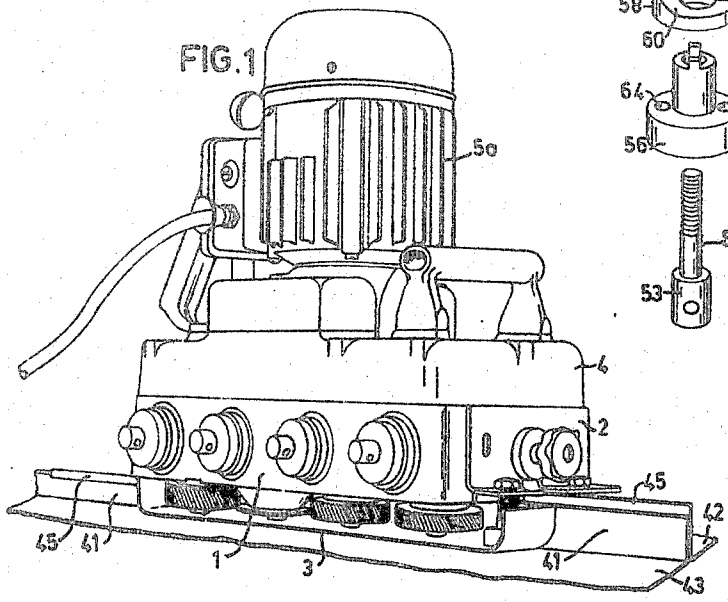


FIG.1



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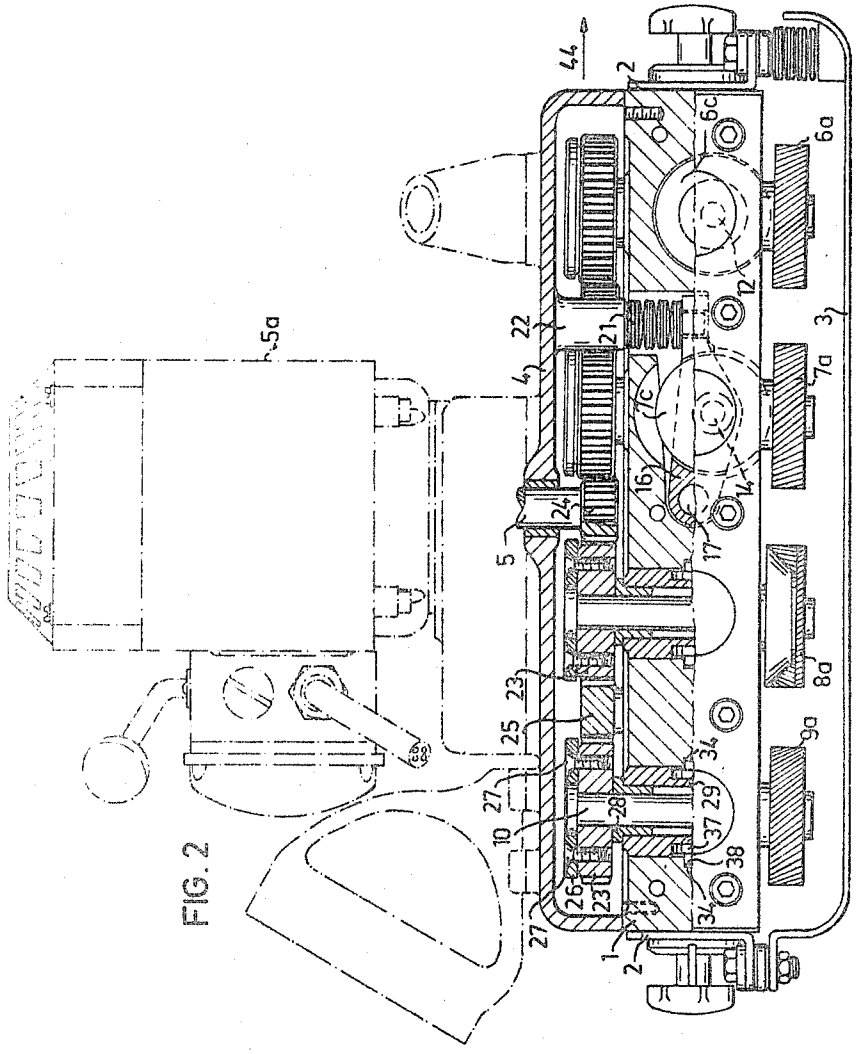


FIG. 2

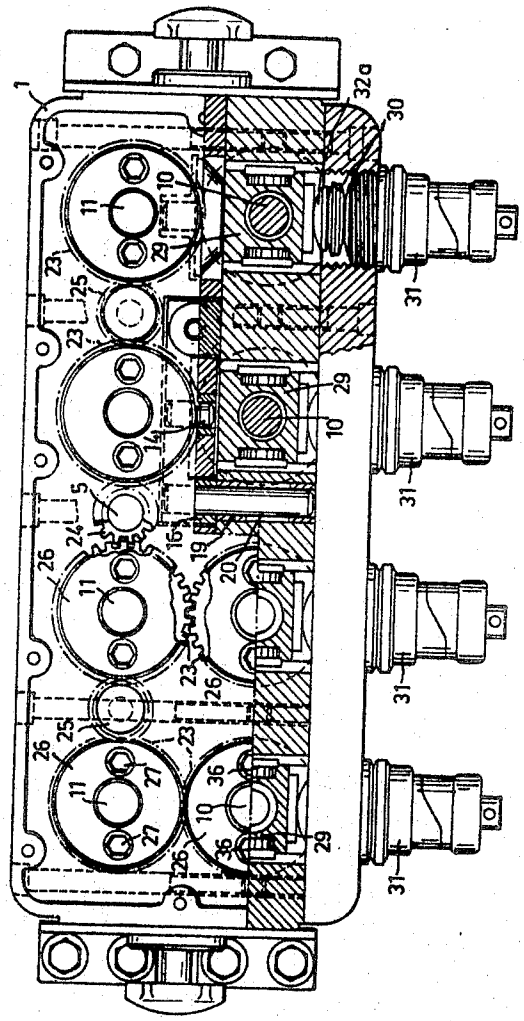
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FIG. 3



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ROOF SEAMING MACHINE

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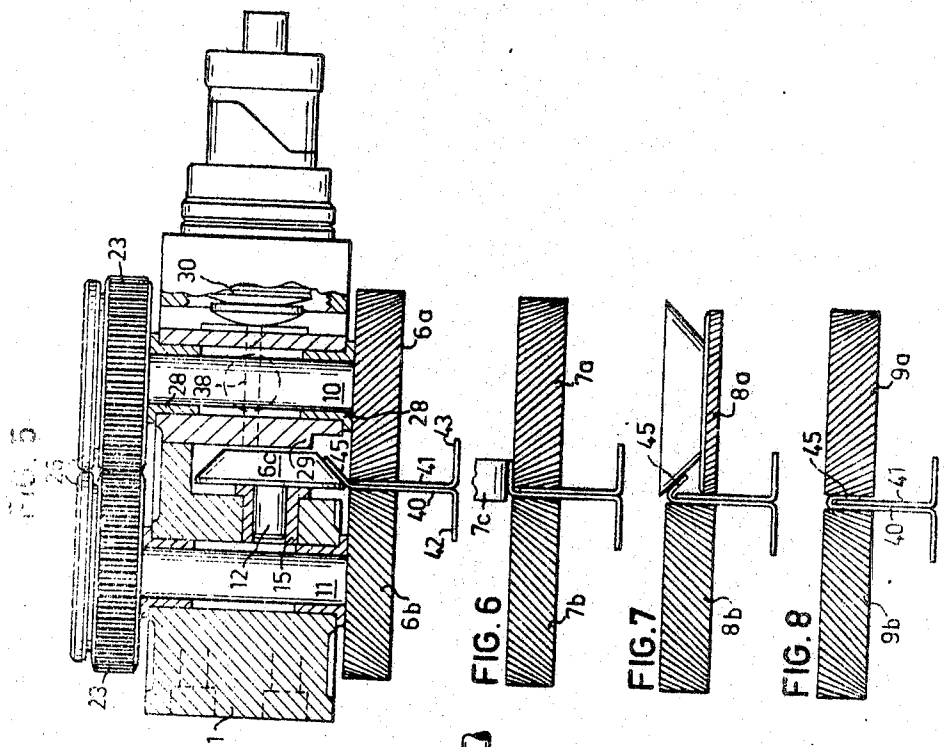
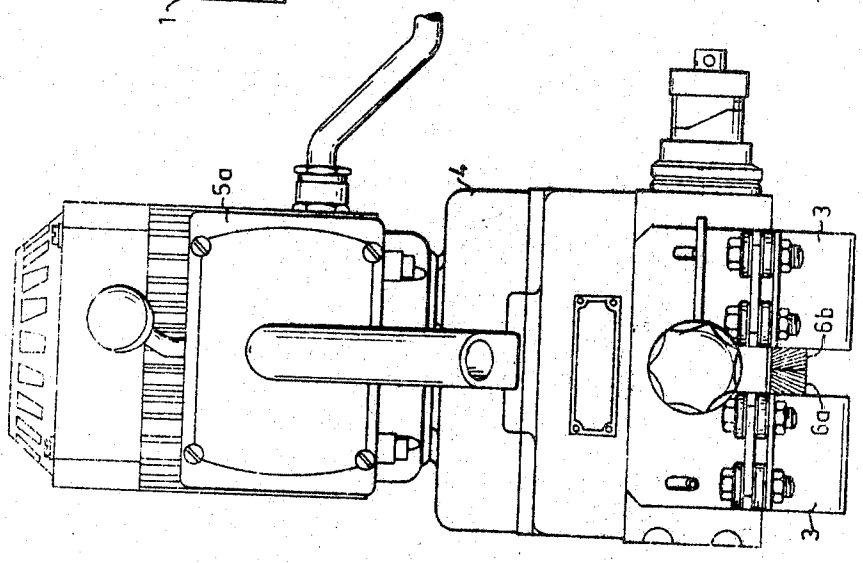


FIG. 4



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United States Patent Office

3,487,799
Patented Jan. 6, 1970

3,487,799

ROOF SEAMING MACHINE

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Filed Apr. 12, 1968, Ser. No. 721,024
Int. Cl. B21d 39/02, 19/04
U.S. Cl. 113—55 2 Claims

ABSTRACT OF THE DISCLOSURE

The present invention relates to roof seaming machines for forming standing seams to interconnect adjacent roofing sheets and is of the kind comprising a carriage with pair-wise arranged rolls which successively perform the seaming operation when the carriage is moved along the upstanding sheet flanges. One of the rolls of each pair, hereinbelow termed the folding roll, is adapted to be displaced outward relative to the other roll, herein termed the counter roll, and is acted upon by a compression spring such as to be biased toward the counter roll and to assist in folding the upstanding sheet flange or sheet flanges for producing a single or double seam. Accordingly, one of the rolls must be movable towards and away from the other roll in order to enable the spring to act on the folding roll and to enable the folding roll and the counter rock to adjust themselves to various thicknesses of the seam.

In the roof seaming machines hitherto used, the springs act constantly on the folding rolls and this means that the machine must enter on the flanges at one end thereof and when stopping the seaming operation, the machine must be moved along the whole length of the seam to one of its ends where the rolls are disengaged from the seam. The spring force on the folding roll is so great that when the seam is pressed between the folding rolls and the counter rolls, the machine cannot be lifted from the seam.

The object of this invention is to eliminate the disadvantage of having a machine which cannot be disengaged from the seam at any desired place along the length of the sheet flanges or seam.

To this end, the machine according to the invention is characterized by the fact that the compression spring is mounted between a stationary abutment and an axially displaceable abutment which in turn is provided to transmit the spring force to the adjacent displaceable roll, the axially displaceable abutment forming one end of a shaft passing axially through the spring and having its other end connected to a device adapted to rapidly shift the shaft to either of two axial end positions, one of the end positions being the operative end position in which the spring actuates the folding roll and the other end position being a retracted end poseition in which the displaceable abutment has been retracted from its engagement with the folding roll to provide a free gap between the folding roll and the counter roll. Accordingly, the springs may be rapidly moved to their released position to enable the machine to be lifted from the seam when desired, or placed directly on any place along the seam.

An embodiment of the invention is described hereinbelow with reference to the accompanying drawing.

FIG. 1 is a diagrammatic perspective view of the machine according to the invention riding along two upstanding sheet flanges to provide a seam.

FIG. 2 is a lateral view of the machine with the upper part shown in section and the lower part unbroken. FIG. 3 is a top view of the machine with the cover of the carriage omitted and partly shown in horizontal section along a plane through the axes of the springs acting upon

the shafts of the rolls. FIG. 4 is a forward end view of the machine. FIG. 5 is a vertical cross section along a plane through the axes of rotation of the first pair of rolls. FIGS. 6, 7 and 8 illustrate in detail the second, third and fourth pair of rolls, respectively, as viewed in a vertical transverse projection of the carriage. FIG. 9 is a detail view of the device for rapidly shifting the spring between its operative and released position, respectively, and FIG. 10 is an exploded perspective view of the details of the device in FIG. 9.

In the embodiment illustrated, the carriage comprises a frame block or frame **1** which may be rectangular and the ends of which are provided with brackets **2** for supporting runners **3** adapted to support and guide the carriage on the roofing sheets to be connected by seams. The carriage has a cover **4** through which extends a shaft **5** which is mounted in the cover and which is connected to a drive motor **5***a*. On the lower side of the carriage there are four pairs of folding and counter rolls **6***a*, **6***b*, **7***a*, **7***b*, **8***a*, **8***b* and **9***a*, **9***b*. The folding rolls **6***a*, **7***a*, **8***a* and **9***a* are carried by shafts **10** which are mounted for lateral swinging in the frame, whereas the counter rolls **6***b*, **7***b*, **8***b* and **9***b* are secured to shafts **11** which are non-displaceably mounted in the frame block **1**. There are further provided means to overturn the upstanding flanges of the sheets to be secured in cooperation with the folding rolls and counter rolls, said means comprising two edge folding rolls **6***c* and **7***c* mounted on transverse shafts **12** and **14**, respectively. The shaft **12** is journalled in a bearing bushing **15** (FIG. 5) secured to the frame block **1**, whereas the shaft **14** is mounted on an arm **16**, one end of which is secured to a transverse shaft **17** which is mounted in bushings **19** in a bore **20** in the frame block **1**. The other end of the arm **16** is acted upon by a spring **21** which bears on a projection **22** on the inside of the cover **4**.

Keyed onto the upper end of each shaft **10** and **11** is a toothed wheel or gear **23**, and the drive shaft **5** has secured to it a pinion **24** which meshes with the gears **23** on the shafts **11** on either side of the pinion **24**. By means of intermediate toothed wheels or gears **25**, these gears **23** in turn mesh with gears **23** on the shafts **11** which carry the first counter roll **6***b* and the last counter roll **9***b* in the row in which the counter rolls are disposed one behind the other in the carriage. The gears **23** on each pair of shafts **10**, **11** also mesh with each other. Consequently, all of the shafts of the folding and counter rolls **6***a*–**9***a* and **6***b*–**9***b*, respectively, are driven by the shaft **5** by means of gears.

Each shaft **10** and **11** is provided with a support roll or disc **26** which is connected to the shaft preferably through the toothed wheel **23**. As will be seen from FIGS. 2 and 3, the support roll **26** is fastened to the upper side of the toothed wheel **23** by means of screws **27**. The support rolls **26** on the toothed wheel **23** in each pair of shafts **10**, **11** are in peripheral engagement with each other and define a minimum distance between the upper ends of the shafts, thereby preventing the teeth of the wheels **23** from getting wedged to each other when the folding roll moves outwards away from the counter roll.

The shaft **10** of each folding roll **6***a* and **9***a* is mounted, for instance by means of bushings **28**, in a sleeve **29** which is laterally displaceable towards and away from the opposite shaft **11** of the corresponding counter roll **6***b*–**9***b*. The sleeve **29** is laterally acted upon by a spring means which consists of a plurality of superposed resilient rings or washers **30** guided in a spring case **31** on an axially movable shaft **32** having a head **32***a* which bears on the outwardly directed plane side of the sleeve **29**. The outer end of the spring bears upon bottom **33**

of the spring case **31** which is screwed to the frame **1** as shown in FIGS. 3 and 10.

A cavity **35** in the frame **1** has guide grooves **34** by means of which the sleeve **29** is guided such as to be displaceable towards and away from the shaft **11**. To this end the sleeve **29** has on either side thereof bearing members **36** each of which has a disc or cylindrical portion **37** and a straight portion **38**. The disc or cylindrical portion **37** is mounted in a corresponding recess in the side of the sleeve **29**, whereas the straight portion **38** is a block which slidably fits the guide groove **34**. When the folding roll **6***a* is moved toward the counter roll **6***b*, the sleeve **29** will be displaced and simultaneously turned on the bearing members **36** around an axis transversely of the shaft **10**, the straight portions **38** of the bearing member **36** sliding along the guide grooves **34**. During this movement the support rolls **26** at the upper ends of the appertaining shafts **10, 11** maintain their engagement with each other, thereby preventing the corresponding gears **23** from getting wedged to each other and further preventing noticeable axial displacement of the folding rolls **6***a*–**9***a* relative to the counter rolls **6***b*–**9***b*.

When the machine is to be used, it is placed at one end of the upstanding flanges **40, 41** of two adjacent sheets **42, 43** which are to be connected by seams (FIGS. 1 and 5). Then the carriage is moved in the direction indicated by the arrow **44** (FIG. 2) such that the rolls **6***a*, **6***b* will be disposed on either side of the upstanding sheet flanges **40, 41**. In case of single overseaming a portion **45** of one sheet flange extends above the other flange, as shown in FIG. 5. The projecting portion **45** comes into engagement with the conical edge folding roll **6***c*. The rotation of the shaft **5** will be imparted to all of the shafts **10, 11**. The rolls **6***a*, **6***b* are kept in firm engagement with the sheet flanges **40, 41** by means of the springs **30**, and upon rotation of the rolls **6***a*, **6***b* by means of their shafts **10, 11** the carriage will be moved along the sheet flanges, while the projecting portion **45** is folded or turned over the sheet flange **41** by the conical face of the edge folding roll **6***c*, as shown in FIG. 5. Upon continued movement of the carriage, the edge folding roll **7***c* is brought into engagement with the projecting portion **45** which will be turned down against the upper side of the folding roll **7***a* under the action of the spring **21** which acts upon the arm **16** that carries the roll **7***c*, FIG. 6. The sheet edge **45** is then further turned downwards between the rolls **8***a* and **8***b*, the roll **8***a* having a conical portion to effect this downward folding, as shown in FIG. 6. Finally, the portion **45** is folded inwards against the sheet flange **41** between the last pair or rolls **9***a*, **9***b*, as shown in FIG. 7.

Having explained the general construction and operation of the machine, specific reference is now made to FIGS. 9 and 10 showing a device adapted to enable a quick release of the machine from the seam at any desired place along the length of the flanges or seam. Each of the four springs **31** in FIG. 3 is guided in a spring case **31** and shiftable from the operative position shown in FIG. 9 to a retracted position in which the spring does not actuate the sleeve **29** and the respective folding roll towards the corresponding counter roll.

The spring case **31** has a central bore **50** in its bottom **33** for guiding the shaft **32**. The shaft **32** has a central threaded bore **51** for receiving a bolt **52** which has a head **53** engaging a recess **54** at the end of a sleeve **55**. The sleeve is formed with a wheel **56** for rotating the sleeve between two end positions as will be described below.

Between the bottom **33** and the wheel **56** are two rings **57** and **58** engaging each other by means of cooperating helical cam surfaces **59** and **60**. Rotation of one ring **58** relative to the other ring **57** will thus provide axial displacement of the rings from each other from the position shown in FIG. 9 which means that ring **58** will move the sleeve **55**, the bolt and the shaft **32** axially outwards to the position indicated by dotted lines for the wheel **56** in FIG. 9. Thus, the head **32***a* and the spring **30** are retracted to a released position to provide a free gap between the folding rolls and the counter rolls so that the machine may be lifted easily from the seam or vice versa, and be mounted at any place of the seam.

To enable the rotation of the cam rings **57, 58** relative each other, the ring **57** has axial projections **61** engaging corresponding holes **62** in the bottom **33**. Similarly, the ring **58** has axial projections **63** engaging corresponding recesses **64** in the wheel **56**. Thus, when rotating the wheel, the ring **58** is rotated, whereas the ring is locked against rotation by the projections **61** to the bottom **33**.

Thus, the device shown in FIGS. 9 and 10 will enable a rapid release of all folding rolls from their engagement with the seam simply by rotating all wheels **56** about half a turn until the flat radial end surfaces **65** of the cam surfaces **59** and **61** rest against each other to hold the rings in their open position.

Vice versa, the springs are again brought to action simply by rotating all wheels **56** back half a turn.

What I claim is:

1. A roof seaming machine for forming standing seams comprising a carriage provided with pairwise arranged rolls being displaceable out from the other roll, the counter roll, which sucessively perform the seaming operation, one of the rolls, the folding roll, of each pair of cooperating rolls being displaceable out from the other roll, the counter roll, against the action of a compression spring which is housed in a spring case secured to the frame of the carriage, characterized in that the compression spring is mounted between a stationary abutment and an axially displaceable abutment which in turn is provided to transmit the spring force to the adjacent displaceable roll, the axially displaceable abutment forming one end of a shaft passing axially through the spring and having its other end connected to a device adapted to rapidly shift the shaft to either of two axial end positions, one of the end positions being the operative end position in which the spring actuates the folding roll and the other end position being a retracted end position in which the displaceable abutment has been retracted from its engagement with the folding roll to provide a free gap between the folding roll and the counter roll.

2. A machine according to claim **1**, in which each compression spring is housed in a spring case secured to the frame of the machine and is concentrically mounted on a shaft which at its inner end has a head forming an inner abutment for the spring, the outer abutment for the spring being formed by a bottom of the spring case, the shaft extending through the bottom of the spring case and being connected to a rotatable shifting device comprising two coaxial rings engaging each other by means of helical cam surfaces, one of said rings being rotationally fixed to said bottom and the other ring being secured to a wheel for rotating the ring and effecting an axial displacement of the rings relative one another, the outer end of said shaft being axially fixed to the wheel and the ring to be rotated thereby.

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RICHARD J. HERBST, Primary Examiner