

PATENT SPECIFICATION

(11) 1 588 197

1 588 197

- (21) Application No. 17372/78 (22) Filed 3 May 1978
(44) Complete Specification Published 15 Apr. 1981
(51) INT. CL.³ B21D 47/02
(52) Index at Acceptance
B3A 52 78A
B3E 14C 1G2 1Y 9H FB
(72) Inventor: HAROLD REX JURY

(19)



(54) MESH STRETCHING MACHINE

(71) We, AMPLIFORM PTY. LIMITED, an Australian Company registered under the laws of the State of South Australia, Commonwealth of Australia, of Wilson Street, Royal Park, State of South Australia, Commonwealth of Australia, do hereby declare the invention for which we pray that a patent may be granted to us and the method by which it is to be performed, to be particularly described in and by the following statement:-

This invention relates to a method of forming a mesh from aluminium or other material. The method comprises firstly forming a workpiece by the process of extrusion to have two relatively thin flanges extending along its edges, a web between the flanges containing a plurality of relatively thick ribs therein and piercing the webs between adjacent ribs to form rows of slots staggered from the slots of adjacent rows. In this invention, upon increasing the workpiece width, the metal becomes partly bent and partly stretched to form the mesh. The invention further extends to a machine which can be used for the stretching of mesh.

When a truss-like metal member is to be formed, it is important that the outer flanges remain rigid, and the intermediate struts are formed most by stretching, the bending being a relatively minor element in the formation of the member. However, there are many applications which require not a truss-like metal member but a mesh member and wherein there is no requirement for rigid outer flanges, and in such instances the length of the product is substantially reduced as the width is substantially increased to form the mesh-like member, bending being a more relevant element in the formation of the mesh than stretching.

A number of different methods have been developed for the stretching of mesh, but difficulties are encountered when there are

a large number of apertures in the member to be stretched, in that it is necessary for each element to be stretched equally, and the time taken to position the workpiece over supporting members becomes excessive.

The main object of this invention is to provide a method which will expedite the stretching of mesh, and in this invention a method comprises forming a workpiece from extrusile metal by the process of extrusion to have two relatively thin flanges extending along its edges, a web joining the flanges containing a plurality of spaced parallel relatively thick ribs therein, and piercing the web between adjacent ribs to form rows of slots staggered from the slots of adjacent rows, the method being characterised by engaging opposite sides of the workpiece adjacent the intersection of the flanges and web between respective sets of jaws of a machine having two sets of jaws each of which comprises a pair of facing flanges, and means retaining the flanges in spaced relationship with one another, such that the workpiece is freely movable along the jaws and is not clamped thereby, moving the jaw set of one side away from the jaw set of the other side to thereby increase the width but decrease the length of the workpiece and at the same time buckle the workpiece flanges, and removing the mesh so formed from the machine.

In some embodiments of this invention it is necessary to have only a thin flange on each side of the workpiece, and the jaws of each set can contact the facing surfaces of the thin flanges only adjacent their intersection by the web, and slope away. The jaws do not grip the flanges or web, but remain separated by an amount sufficient to enable the workpiece flanges to buckle, and the web to slide between the jaws towards the longitudinal centre of the workpiece. The jaws in engaging the workpiece near the

web, will not cause any curvature to be formed in a vertical plane so that the flanges can easily buckle as the workpiece length reduces. In some instances, the flanges are designed as part of the product, and need not be as thin as in other instances wherein the flanges are subsequently removed. Even in the latter case, the loss of metal due to severing the buckled flanges is an expense which is less than the expense of a slower operation wherein, for example the slots of each outer row have to be widened and then the workpiece positioned on hooks. Furthermore, the metal may be recycled as it is an extrusile metal, an extrusile metal is favoured for the method of this invention.

As said above, the invention also relates to a machine which can be used for the stretching of the mesh.

In the British Patent 1,400,137 in the name of Comalco (J. & S.) Pty. Ltd., (the previous name of the Applicant herein) there was described a machine which was useful for the stretching of mesh. That machine was very suitable for large production runs, and could be utilised for the stretching of mesh wherein the length decreased as the width increased. The machine was also suitable for stretching of the intermediate struts of a beam wherein the outer flanges remained unchanged in length but the struts were increased in length so as to provide a truss-like effect. The machine in this invention can be utilised for these purposes, but this invention provides a machine which is of much lower cost than the machine described in that specification and which is more suited to smaller production runs, in that the machine is very quickly and easily changed from being suitable for one type of mesh, to being suitable for another type of mesh, with a minimum of tooling variation.

In another aspect the invention comprises a machine for the stretching of mesh by the above-defined method having two longitudinally extending jaw sets which are adapted to receive the workpiece so that it can move freely along the jaw sets and one of which is movable with respect to the other, and means to effect the relative movement of the jaw sets, characterised in that each jaw set comprises a pair of flanges, and means retaining the flanges in a spaced relationship with one another, said flanges of each jaw set having inner surfaces which are mutually convergent towards the space between the flanges and said flanges of each jaw set being mutually convergent in a direction away from the other jaw set.

It has been found that by having the flanges converging in a direction away from the other jaw set, a thin flanged workpiece will easily buckle while simultaneously moving between the jaw set pairs as its length

reduces. Further, the stretching of the struts in a beam-like member is facilitated, in that the workpiece flange has no load placed upon it during the stretching excepting at the locality of the central web. Further again, the use of channel frames makes possible the use of runners which support hooks for the stretching of mesh in those instances wherein hooks are still required.

The machine preferably includes a chain extending longitudinally and between the jaw sets, the chain being provided with means for unloading a workpiece after it has been stretched or for loading a further workpiece prior to stretching.

An embodiment of the invention is described hereunder in some detail with reference to and is illustrated in the accompanying drawings in which:

Figure 1 is a plan view of the stretching machine,

Figure 2 is an end elevation of same,

Figure 3 is a perspective view of an extruded workpiece after slotting but before stretching,

Figure 4 is a plan view of the workpiece after stretching,

Figure 5 is a section through one of the jaw sets, drawn to an enlarged scale,

Figure 6 is a perspective view of a hook which is sometimes utilised in the stretching of a workpiece, and

Figure 7 is a side elevation of a hook which forms part of the machine.

In this embodiment a stretching machine 10 is provided with a fixed base frame 11 there being a channel frame 12 comprising a pair of jaws 13 secured to the fixed base frame 11 at one side and there being a moving base frame 15 on the other side of the longitudinal median plane of the machine, the moving base frame 15 having on it a second channel frame 12 similar to the first.

Each channel frame 12 comprises two channel members 17 (Figure 5) with horizontal webs 18 facing one another and flanges 19 at the edges of webs 18, the flanges 19 of the lower channel member extending upwardly and of the upper channel extending downwardly, and the channel members 17 are spaced with respect to one another by means of adjusting bolts 20 and locking bolts 21 having locknuts 22 thereon. By this means it is possible to adjust the space 23 between the facing flanges 19 of each channel frame. The flanges 19 of each channel frame closest to the longitudinal median plane of the machine have inner surfaces lined with lower friction nylon strips 24 these inner surfaces converging inwardly toward the centre of the channel frame, that is away from the corresponding flanges of the other channel frame, so that for example when a thin section flange 25 of

70

75

80

85

90

95

100

105

110

115

120

125

130

the workpiece 26 to be stretched abuts the inner surfaces of the channel frame flanges 19 and the workpiece web 26 projects between the edges thereof, said flanges 19 bear on the bearing location of said flange 25 adjacent the workpiece web 26. This limits distortion of the workpiece flange 25 in a vertical plane, and greatly facilitates buckling of the flanges 25 of the workpiece in a horizontal plane (as shown in Figure 4), as the ribs 27 of the workpiece bend to form a mesh-like configuration.

The moving base frame 15 is coupled to the fixed base frame 11 through a series of hydraulic cylinders 29 driven by a pump 30 and capable of moving the moving base frame 15 away from the fixed base frame 11 to thereby effect the required stretching of the mesh (or the formation of the beam if the machine is used for that purpose).

Sometimes mesh is to be formed from a workpiece without flanges 25, or when the flanges show less tendency to buckle, although there is still more bending and less stretching of the struts than when a beam is to be formed with stiff rigid outer flanges (no beam is illustrated herein). To facilitate supporting of such mesh and at the same time allow the required reduction of length, each channel frame may be provided with a plurality of runners 34 as illustrated in Figure 6, each runner 34 having a central web 35 which passes through the space 23 between opposing jaws and terminates within the respective channel frame in a flange 36 the inner surface 37 of which slides along the inner faces of the channels of the channel frame strips 24. Each runner 34 has a hook 38 at its outer end which engages in a workpiece slot 39 (Figure 3) for effecting the required grip.

In order to facilitate handling of the workpieces into and out of the machine 10, between the two channel frames 12 there is provided a chain 44 having a hook 45 (Figure 7) thereon, and the chain is coupled to power driven means so that before stretching, the hook passes through one of slots 39 and engages the workpiece, and the chain is driven to draw the workpiece into the machine, its edges being constrained (either by flanges 25 or by runners 34, whichever method is used) by the jaw flanges 19. The hook is pivoted to the chain 44 and coupled thereto by spring 46, so that reversal of chain direction momentarily releases the hook before stretching takes place.

The chain may also be utilised for unloading the workpiece. The handle workpieces of varying size (except in those instances wherein runners 34 are used), the only adjustment required is adjustment of the spacing between the flanges of each channel frame, and in many instances not even this is

required. The machine functions very rapidly in its loading, stretching and unloading sequences. If numbers of workpieces require stretching or bending by the same amount, this can be achieved by separating the channel frames 12 until the movable frame abuts adjustable abutment screws 48 on the fixed frame which are appropriately adjusted.

In the embodiment described herein, the workpiece illustrated in Figures 3 and 4 is aluminium or an aluminium alloy extruded to have its central web 26 containing a plurality of spaced ribs 27 extending along its length, and it is also provided with the two relatively thin flanges 25 extending along its outer edges. The web 26 intersects the flanges 25 at a central locality between the flange edges so that the extruded product is symmetrical about two transverse axes.

The plurality of slots 39 are then formed in the web between the ribs, and between the outermost ribs and the flanges, the slots of any one row are staggered with respect to the slots of an adjacent row and overlap the slots of the adjacent row, and the workpiece is then placed into the stretching machine 10. The flanges are relatively thin, and as the tools draw the workpiece flanges away from one another, the length diminishes and the flanges buckle outwardly as described above. Severing of the buckled flanges is required in most instances and this is achieved by prior art methods, in this embodiment by a guillotine.

In a variation of the above embodiment however, the outer flanges 25 form portions of the finished product, and are not subsequently severed. The outer flange on one side of the product may be complementary in shape to the outer flange on the other side, so that two contiguous outer flanges interengage when two products are positioned side by side.

It has been found with this invention that a mesh can be formed with a large number of relatively small apertures, and at very low cost. Even when the apertures are large, the production rate is so high that the production costs are relatively small, and the metal which is removed from the edges has a scrap value since it is capable of being recycled.

WHAT WE CLAIM IS:-

1. A method of forming a mesh comprising firstly forming a workpiece from extrusile metal by the process of extrusion to have two relatively thin flanges extending along its edges, a web joining the flanges containing a plurality of spaced parallel relatively thick ribs therein, and piercing the web between adjacent ribs to form rows of slots staggered from the slots of adjacent rows.

the method being characterised by engag-

70

75

80

85

90

95

100

105

110

115

120

125

130



the workpiece 26 to be stretched abuts the inner surfaces of the channel frame flanges 19 and the workpiece web 26 projects between the edges thereof, said flanges 19 bear on the bearing location of said flange 25 adjacent the workpiece web 26. This limits distortion of the workpiece flange 25 in a vertical plane, and greatly facilitates buckling of the flanges 25 of the workpiece in a horizontal plane (as shown in Figure 4), as the ribs 27 of the workpiece bend to form a mesh-like configuration.

The moving base frame 15 is coupled to the fixed base frame 11 through a series of hydraulic cylinders 29 driven by a pump 30 and capable of moving the moving base frame 15 away from the fixed base frame 11 to thereby effect the required stretching of the mesh (or the formation of the beam if the machine is used for that purpose).

Sometimes mesh is to be formed from a workpiece without flanges 25, or when the flanges show less tendency to buckle, although there is still more bending and less stretching of the struts than when a beam is to be formed with stiff rigid outer flanges (no beam is illustrated herein). To facilitate supporting of such mesh and at the same time allow the required reduction of length, each channel frame may be provided with a plurality of runners 34 as illustrated in Figure 6, each runner 34 having a central web 35 which passes through the space 23 between opposing jaws and terminates within the respective channel frame in a flange 36 the inner surface 37 of which slides along the inner faces of the channels of the channel frame strips 24. Each runner 34 has a hook 38 at its outer end which engages in a workpiece slot 39 (Figure 3) for effecting the required grip.

In order to facilitate handling of the workpieces into and out of the machine 10, between the two channel frames 12 there is provided a chain 44 having a hook 45 (Figure 7) thereon, and the chain is coupled to power driven means so that before stretching, the hook passes through one of slots 39 and engages the workpiece, and the chain is driven to draw the workpiece into the machine, its edges being constrained (either by flanges 25 or by runners 34, whichever method is used) by the jaw flanges 19. The hook is pivoted to the chain 44 and coupled thereto by spring 46, so that reversal of chain direction momentarily releases the hook before stretching takes place.

The chain may also be utilised for unloading the workpiece. The handle workpieces of varying size (except in those instances wherein runners 34 are used), the only adjustment required is adjustment of the spacing between the flanges of each channel frame, and in many instances not even this is

required. The machine functions very rapidly in its loading, stretching and unloading sequences. If numbers of workpieces require stretching or bending by the same amount, this can be achieved by separating the channel frames 12 until the movable frame abuts adjustable abutment screws 48 on the fixed frame which are appropriately adjusted.

In the embodiment described herein, the workpiece illustrated in Figures 3 and 4 is aluminium or an aluminium alloy extruded to have its central web 26 containing a plurality of spaced ribs 27 extending along its length, and it is also provided with the two relatively thin flanges 25 extending along its outer edges. The web 26 intersects the flanges 25 at a central locality between the flange edges so that the extruded product is symmetrical about two transverse axes.

The plurality of slots 39 are then formed in the web between the ribs, and between the outermost ribs and the flanges, the slots of any one row are staggered with respect to the slots of an adjacent row and overlap the slots of the adjacent row, and the workpiece is then placed into the stretching machine 10. The flanges are relatively thin, and as the tools draw the workpiece flanges away from one another, the length diminishes and the flanges buckle outwardly as described above. Severing of the buckled flanges is required in most instances and this is achieved by prior art methods, in this embodiment by a guillotine.

In a variation of the above embodiment however, the outer flanges 25 form portions of the finished product, and are not subsequently severed. The outer flange on one side of the product may be complementary in shape to the outer flange on the other side, so that two contiguous outer flanges interengage when two products are positioned side by side.

It has been found with this invention that a mesh can be formed with a large number of relatively small apertures, and at very low cost. Even when the apertures are large, the production rate is so high that the production costs are relatively small, and the metal which is removed from the edges has a scrap value since it is capable of being recycled.

WHAT WE CLAIM IS:-

1. A method of forming a mesh comprising firstly forming a workpiece from extrusile metal by the process of extrusion to have two relatively thin flanges extending along its edges, a web joining the flanges containing a plurality of spaced parallel relatively thick ribs therein, and piercing the web between adjacent ribs to form rows of slots staggered from the slots of adjacent rows,

the method being characterised by engag-

6

4

1 588 197



4

ing opposite sides of the workpiece adjacent the intersection of the flanges and web between respective sets of jaws of a machine having two sets of jaws each of which comprises a pair of facing flanges, and means retaining the flanges in a spaced relationship with one another such that the workpiece is freely movable along the jaws and is not clamped thereby, moving the jaw set of one side away from the jaw set of the other side to thereby increase the width but decrease the length of the workpiece and at the same time buckle the workpiece flanges, and removing the mesh so formed from the machine.

2. A method according to claim 1 further characterised by severing the buckled flanges from the mesh after it has been formed.

3. A method according to either claim 1 or claim 2 wherein said machine comprises a hook on a chain, the chain extending longitudinally along the machine, the method being further characterised by locating said hook in one of said slots and engaging the workpiece and moving the chain, to in turn draw the workpiece into the machine with its web passing between said jaws of respective said jaw sets before stretching the workpiece.

4. A method according to claim 3 further characterised by releasing the hook from the workpiece before stretching the workpiece.

5. A machine for the stretching of mesh by the method of claim 1 having two longitudinally extending jaws sets which are adapted to receive the workpiece so that it can move freely along the jaw sets and one of which is movable with respect to the other, and means to effect the relative movement of the jaw sets, characterised in that each jaw set comprises a pair of flanges, and means retaining the flanges in a spaced relationship with one another, said flanges of each jaw set having inner surfaces which are mutually convergent towards the space between the flanges and said flanges of each jaw set being mutually convergent in a direction away from the other jaw set.

6. A machine according to claim 5 further characterised by a fixed base frame, a moving base frame and guide means therebetween to guide the moving base frame in transverse movement with respect to the base frame, and means securing said jaw sets to respective said base frames.

7. A machine according to claim 6 further characterised by hydraulic cylinders interconnecting said frames and pump means coupled to said hydraulic cylinders operable to effect said relative transverse movement of the base frames.

8. A machine according to any one of claims 5 to 7 further characterised in that

each jaw set comprises a pair of channel section members secured together with their flanges directed towards each other, and strips of low friction material secured to the inner surfaces of said mutually converging flanges.

9. A machine according to any one of claims 5 to 8 further characterised by sprockets at each end of the machine, a chain extending over the sprockets, a hook on the chain adapted to releasably engage the workpiece by locating in one of the said slots of the workpiece, and drive means coupled to said chain and arranged to drive said chain and in turn progress said hook along the machine and between the jaw sets.

10. A machine according to claim 6 or any of claims 7 to 9 when dependent on claim 6 further characterised by abutment screws on said fixed frame engageable by said moving frame.

11. A method of forming mesh substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

12. A machine substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

BAILEY, WALSH & CO.,
Chartered Patent Agents,
9 Park Place,
Leeds, LS1 2SD.
Agents for the Applicants.

Printed for Her Majesty's Stationery Office,
by Croydon Printing Company Limited, Croydon, Surrey, 1981.
Published by The Patent Office, 25 Southampton Buildings,
London, WC2A 1AY, from which copies may be obtained.