United States Patent

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[54] HAUL-OFF MACHINES
7 Claims, 7 Drawing Figs.

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[51] Int. Cl. B65h 17/24
[50] Field of Search 226/171, 172, 176, 188; 214/338, 339; 198/165

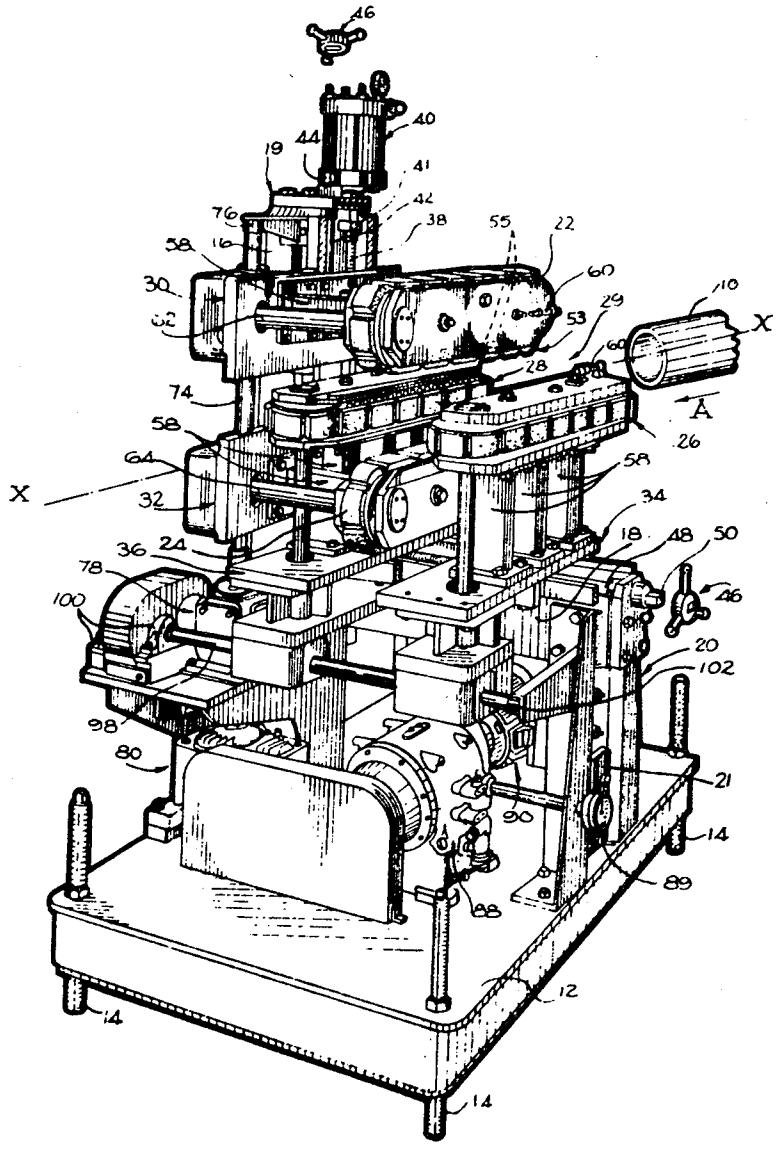
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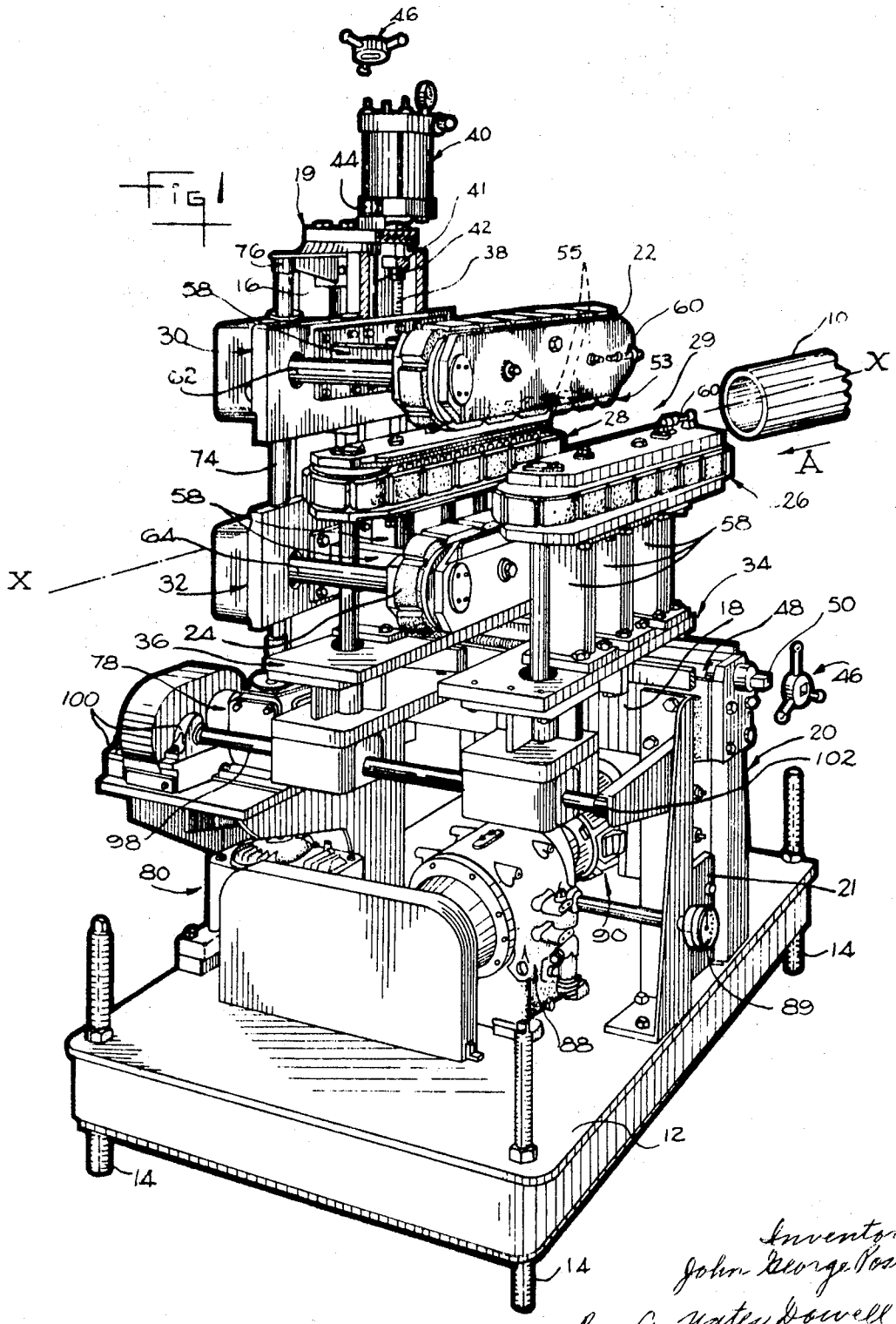
ABSTRACT: A haul-off machine having a vertical slideway and a horizontal slideway on each of which driven gripping means are adjustably mounted to accommodate and haul extrudate of different sizes and shapes and motor driven shafts parallel with the slideways and said shafts are connected to the gripping means to drive them in all positions along the slideways.



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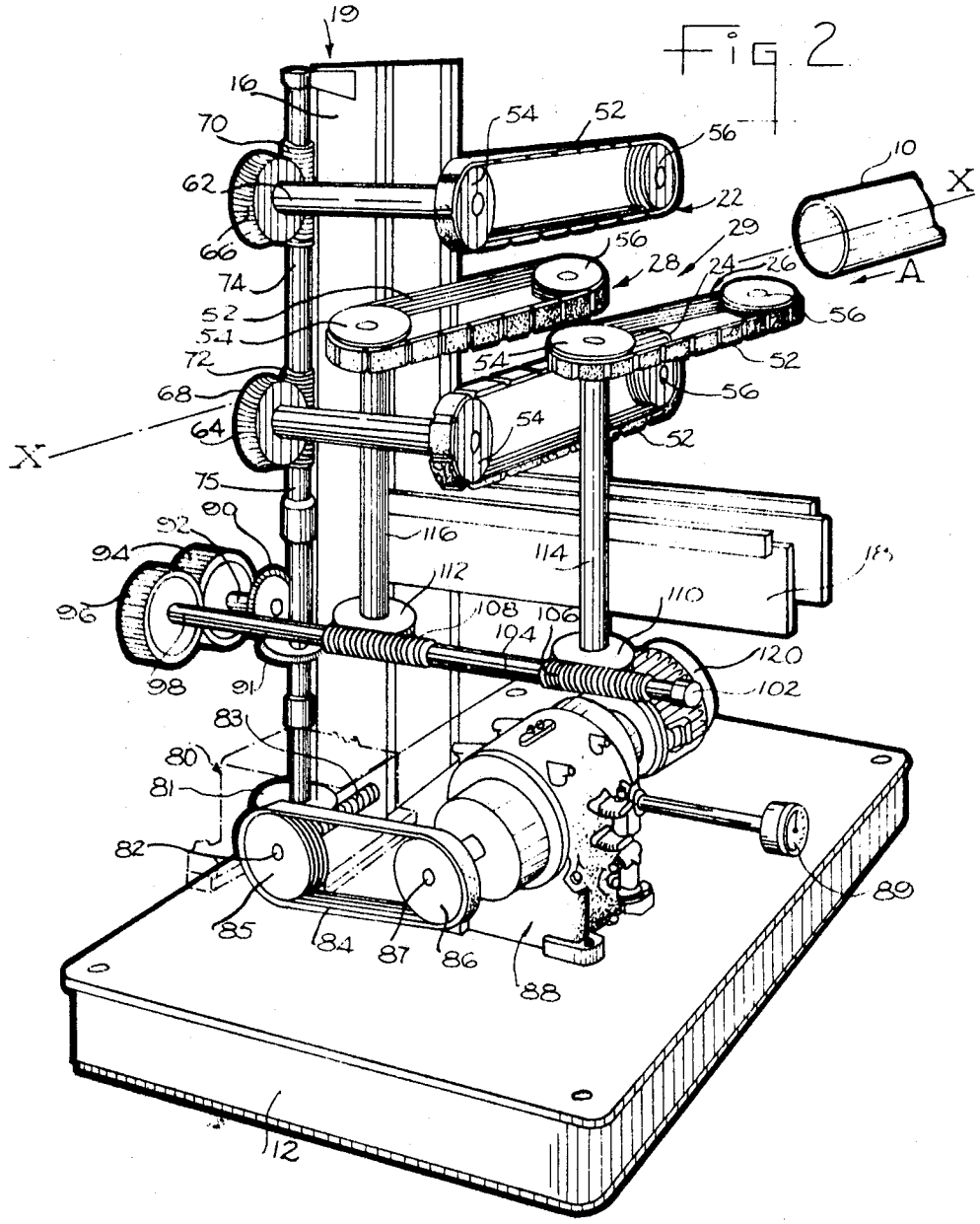
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Fig 1



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Fig. 2



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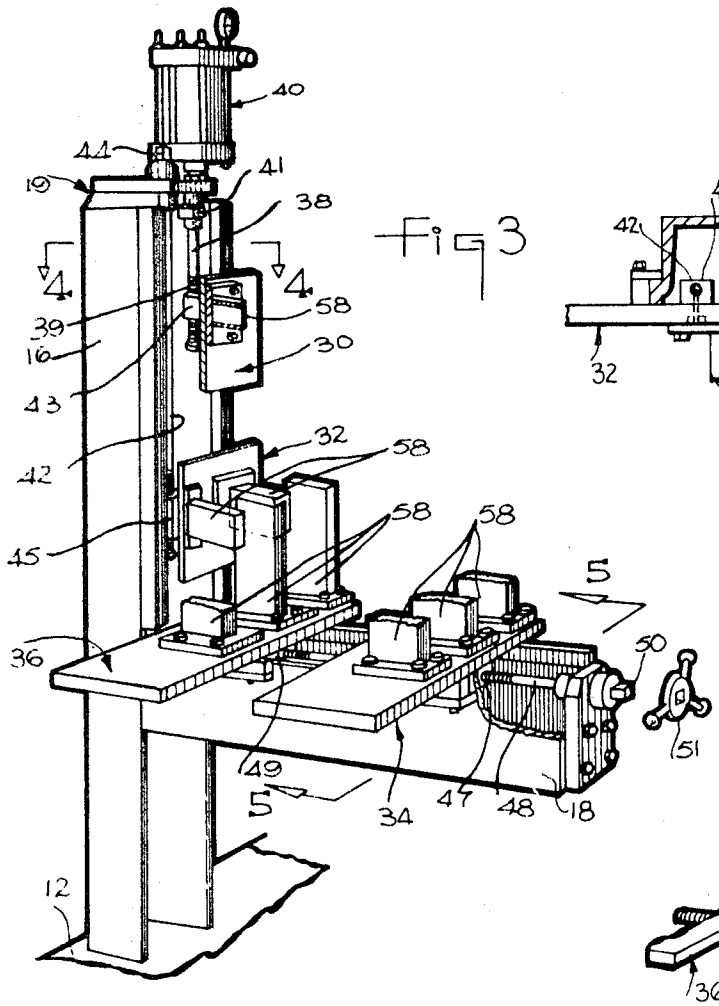


Fig 3

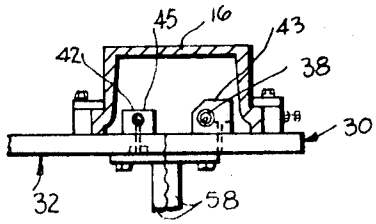


Fig 4

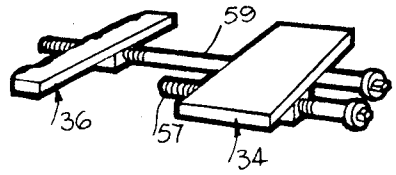


Fig 6

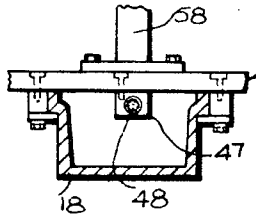


Fig 5

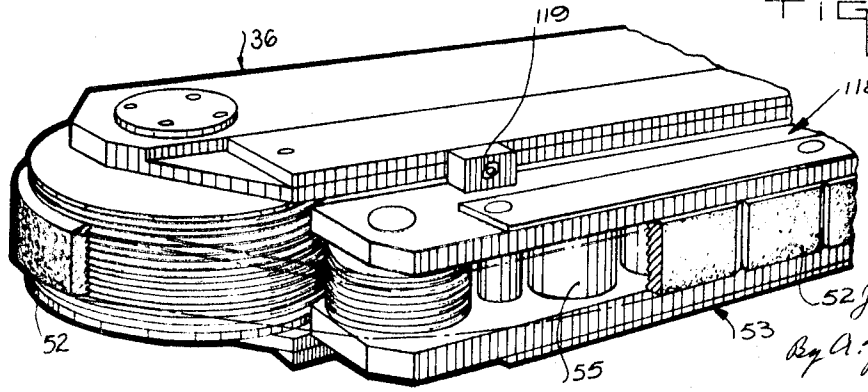


Fig 7

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HAUL-OFF MACHINES

BRIEF SUMMARY OF THE INVENTION

According to the present invention there is provided a haul-off machine of the kind comprising a supporting frame by which are supported a plurality of gripping means arranged to grip an article in an opening between them, adjustment means to adjust the gripping means on the frame, and driving means to drive the gripping means and thereby advance the article wherein the invention comprises a supporting frame including two rectilinear slideway members disposed relatively transversely, at least one gripping means slidably mounted on each of the slideway members so as to be adjustable therealong, driving shafts rotatably mounted and disposed parallel with the slideway members respectively, driven transmission means connected to the appropriate gripping means and to a driving shaft and slidable longitudinally thereof to drive the gripping means in all positions of adjustment thereof along the said slideway members, and a common driving means for the driving shafts.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be more particularly described with reference to the accompanying drawings in which:

FIG. 1 is a perspective view of the haul-off machine

FIG. 2 is a diagrammatic perspective view showing the drive transmission to the gripping means,

FIG. 3 is a fragmentary perspective view showing the adjustment means of the gripping means,

FIG. 4 is a sectional view of FIG. 3 on the lines 4–4 thereof,

FIG. 5 is a sectional view of FIG. 3 on the lines 5–5 thereof,

FIG. 6 is a view similar to FIG. 3 but showing an alternative adjustment means, and,

FIG. 7 is a fragmentary perspective view of a modified gripping means.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The haul-off machine is particularly suitable for hauling a plastics tubular extrudate article which may be circular as indicated at 10 from an extruding machine, the extrudate advancing horizontally in the direction of the arrow "A." It should be appreciated, however, that the extrudate may be of any other required cross-sectional shape which may be regular or irregular.

The machine comprises a base 12 supported by adjustable screw legs 14 and rigid with an supported by the base is a vertical post or rectilinear slideway member 16. Extending forwardly from the post 16 is a horizontal arm or rectilinear slideway member 18 supported at its rear end by the post 16 so as to be rigid therewith and at its forward end by vertical strut means 20 mounted on the base 12 and carrying a control panel 21. Thus the two rectilinear slideway members 16 and 18 are disposed relatively transversely to each other and are mutually branched from each other and provide a supporting frame 19 of the machine.

Mounted on the post 16 so as to be slidable vertically is an upper driven gripping means 22 and a lower driven gripping means 24 and mounted on the arm 18 so as to be slidable horizontally is a forward driven gripping means 26 and a rearward driven gripping means 28 and the four driven gripping means form an opening 29 through which the extrudate 10 is hauled by frictional grip exerted thereon by the said four means, at the same speed that the extrudate leaves the extruding machine.

The driven gripping means 22, 24, 26 and 28 each comprise a carriage 30, 32, 34 and 36 respectively slidably mounted on the post 16 or arm 18.

The carriage 30 is connected to the piston rod 38 of a fluid, preferably pneumatic, piston and cylinder device 40 of which the cylinder is stationarily supported by the top of the post 16 whereby the carriage 30 and thus the driven gripping means

22 can be adjusted vertically relative to a horizontal axis X–X this being the axis of the extrudate article 10 and of the opening formed by the four driven gripping means. This piston rod 38 is screw-threaded at 39 and engages a screw-box 43 forming a part of the carriage 30 and said piston rod has a faceted boss 41 whereby the piston rod can be rotated to obtain fine adjustment of the carriage 30 vertically.

The carriage 32 is formed with a screw-box 45 which is engaged by a vertical screw-threaded spindle 42 rotatably mounted in the post 16 and prevented from vertical movement and is formed at its upper end with a squared end 44 to receive a hand wheel such as 46 whereby the spindle 42 can be rotated to adjust the height of the carriage 32 and thus of the driven gripping means 24 relative to the axis X–X.

The carriages 34 and 36 are formed with screw-boxes 47 and 49 respectively engaged with a horizontal screw-threaded spindle 48 rotatably mounted in the arm 18 and prevented from horizontal movement and the forward end of the screw-threaded spindle is formed as a squared end 50 to be engaged by a hand wheel 51. The screw-threaded spindle 48 is provided with two screw-threaded portions of opposite hands one of which portions engages the screw-box 47 of the carriage 34 and the other of which portions engages the screw-box 49 of the carriage 36 so that rotation of the spindle 48 causes the carriages 34 and 36 and the driven gripping means 26 and 28 respectively to be moved simultaneously towards or away from the axis X–X. Thus there are provided screw adjustment means 47, 48 and 49 to adjust the two gripping means 26, 28 on the horizontal slideway member 18, screw adjustment means 42, 45 to adjust the lower gripping means 24 on the vertical slideway member 16 and fluid-pressure operated adjustment means 40 to adjust the upper gripping means 22 on the vertical slideway member 16.

Alternatively as shown in FIG. 6 instead of having a single screw-threaded spindle 48 formed with two screw-threaded portions of opposite hands, two screw-threaded spindles 57 and 59 may be provided of which the spindle 57 engages a screw-box of the carriage 34 and the spindle 59 engages a screw-box of the carriage 36 and the two spindles are provided at their forward ends with squared ends engaged by separate hand wheels such as 51 whereby the two carriages and thus the two driven gripping means 26 and 28 can be adjusted independently along the arm 18 and thus relative to the axis X–X.

It should be appreciated that all or any of the carriages may be adjustable along the respective slideways members by screw-threaded spindles or fluid-pressure operated piston and cylinder devices.

Each of the driven gripping means 22, 24, 26 and 28 comprises an article gripping element in the form of an track 52 endless and the outer surface of which is formed with pads or is in any other way adapted to grip the extrudate 10 and said endless track is internally formed with a plurality of integral side-by-side V-belts and is mounted at its ends on a multi V-groove driving roller 54 and a follower roller 56 suitably mounted in a bracket 58 forming a rigid part of an appropriate carriage 30, 32, 34 or 36 and each bracket 58 comprises three parallel arms and the arms of the gripping means 24 extend between the arms of the gripping means 28 to permit relative adjustment of said gripping means 24 and 28 along the rectilinear slideway members 16 and 18 respectively. The follower roller 56 is adjustable by screw means 60 to tension the endless track 52. The two rollers 54 and 56 are connected by the endless tracks 52 and the inner run of each endless track, i.e. that run adjacent the axis X–X is supported by a bed support 53 comprising a plurality of rollers 55 which are supported close to each other in side plates of the bracket and the axes of the rollers 54, 55 and 56 are parallel.

The driving rollers 54 of the upper and lower driven gripping means 22 and 24 are fixed to the forward ends of rotatable horizontal shafts 62 and 64 rotatably supported in the carriage 30 and in the carriage 32 respectively and fixed to the rearward ends of the shafts 62 and 64 are worm wheels 66 and 68 respectively which are engaged by two worms 70 and

72 respectively disposed within and movable with the carriages 30 and 32 respectively. The worms 70 and 72 are mounted on a vertical rotatable shaft 74 supported at its upper end by a bearing 76 mounted on the post 16 and at its lower end passing through a bevel gearbox 78 and entering a reduction gearbox 80 so as to form the output shaft of the right-angle reduction gear drive unit 80 which supports the lower end of the shaft 74 provided with a worm wheel 81. The input shaft 82 of the unit 80 has a worm 83 which engages the worm wheel 81 and said shaft has a pulley 85 driven by an endless belt 84 from a pulley 86 on an output shaft "87 of a variable speed gearbox 88 provided with manually" rotatable adjustment means 89 and said gearbox is driven by an electric motor 120.

Formed in the vertical shaft 74 is a longitudinal key-way 75 which is engaged by keys on the worms 70 and 72 which are slidable longitudinally of the shaft but are keyed thereto so as to be rotatable with the shaft.

Fixed to the vertical shaft 74 within the bevel gearbox 78 is a bevel gear 91 which meshes with a bevel gear 90 fixed to a forward end of a short horizontal rotatable shaft 92 supported in the gearbox and to the rearward end of the shaft is fixed a toothed wheel 94 meshing with a toothed wheel 96 of the same size fixed to the rear end of a horizontal rotatable shaft 98 of which the rearward end is mounted in bearings 100 and the forward end is mounted in a bearing 102 mounted on an arm of the strut means 20.

Formed in the horizontal shaft 98 is a longitudinal key-way 104 engaged by two keys on worms 106, 108 disposed in the carriages 34 and 36 respectively so as to be movable therewith an slidable along the shaft 104 so that said worms are rotated with the horizontal shaft 98 but are slidable therealong. The worms 106 and 108 are engaged with worm wheels 110 and 112 respectively secured to the lower ends of vertical rotatable shafts 114 and 116 respectively to the upper ends of which are fixed the driving rollers 54 of the driven gripping means 26 and 28 respectively. The shafts 114 and 116 are suitably mounted in the carriages 34 and 36.

It follows therefore that there is provided a driving connection 81, 83 between the common driving means motor 20 and the vertical driving shaft 74 and bevel gear drive means 90, 91 between said driving shaft 74 and the driving shaft 98. Furthermore there are provided drive transmission means 62, 66, 70 and 64, 68, 72 slidably connected to the driving shaft 74 and to the gripping means 22 and 24 respectively and drive transmission means 108, 112, 116 and 106, 110, 114 slidably connected to the driving shaft 98 and to the gripping means 28 and 26 respectively so that all said gripping means can be driven in all of their positions of adjustment along the slideway members 16 and 18 towards and away from the axis X–X to accommodate extrudates of various sizes and shapes.

It further follows, therefore, that the two driven gripping means 22 and 24 are driven from a rotatable vertical shaft 74 and the two driven gripping means 26 and 28 are driven from a horizontal rotatable shaft 98 and which shafts are respectively parallel with the post 16 and arm 18 and said two shafts are driven by a common motor 20 and the arrangement is such that the driven gripping means are all driven at the same speed this being equal to the speed of advance of the extrudate which is gripped by the four driven gripping means at positions spaced 90° apart so that maximum pressure can be exerted on the extrudate whilst causing the minimum distortion of the extrudate.

Any suitable conventional controls are provided for stopping and starting the machine and for operating the piston and cylinder device 40 to raise and lower the driven gripping means 22 and to quickly and easily adjust the pressure which is exerted downwardly by said means 22 on the extrudate.

It should be appreciated that the upper and lower driven gripping means 22 and 24 are independently relatively adjustable and said means and the forward and rearward driven gripping means 26 and 28 are independently adjustable, and said means 26 and 28 may be either relatively simultaneously or independently adjustable.

To enable the machine to haul extrudate of smaller cross-sectional dimensions than the machine shown in FIG. 1 is capable of dealing with, one or more of the carriages 30, 32, 34 and 36 may have an attachment 118 secured thereto by screws 119 to afford the bed support 53 for the inner run of the endless track 52 which can thus be positioned closer to the axis X–X than in the machine shown in FIG. 1.

The invention thus provides a haul-off machine of the kind specified which comprises two rectilinear slideway members 16 and 18 disposed relatively transversely and on each of which may be slidably mounted two driven gripping means so that the four driven gripping means grip an article in an opening formed by said means and through which opening the extrudate article 10 is hauled by said means and this machine is less complicated and less expensive than known machines whilst achieving the advantages of some known machines these advantages being that the extrudate can be gripped with the maximum pressure whilst subjecting the extrudate to the minimum distortion.

I claim:

1. A haul-off machine of the kind comprising a supporting frame by which are supported a plurality of gripping means arranged to grip an article in an opening between them, adjustment means to adjust the gripping means on the frame, and driving means to drive the gripping means and thereby advance the article wherein the invention comprises a supporting frame (19) including two rectilinear slideway members (16, 18) disposed relatively transversely, at least one gripping means (22, 24 or 26, 28) slidably mounted on each of the slideway members so as to be adjustable therealong, driving shafts (74, 98) rotatably mounted and disposed parallel with the slideway members (16, 18) respectively, drive transmission means (62, 66, 70; 64, 68, 72; 108, 112, 116; 106, 110, 114) connected to the appropriate gripping means and to a driving shaft (74, 98) and slidable longitudinally thereof to drive the gripping means in all positions of adjustment thereof along the said slideway members (16, 18), and a common driving means (120) for the driving shafts (74, 98).

2. A haul-off machine according to claim 1 wherein the invention comprises a driving connection (81, 83) between the driving means (120) and one driving shaft (74) and bevel gear drive means (90, 91) between said driving shaft and the other driving shaft (98).

3. A haul-off machine according to claim 1 wherein the invention comprises the two rectilinear slideway members (16, 18) disposed at right-angles to each other.

4. A haul-off machine according to claim 3 wherein the invention comprises a horizontal rectilinear slideway member (18), two gripping means (26, 28) slidably mounted on said horizontal slideway member (18), a vertical rectilinear slideway member (16) and two gripping means (22, 24) slidably mounted on said vertical slideway member (16).

5. A haul-off machine according to claim 4 wherein the invention comprises screw adjustment means (47, 48, 49) to adjust the two gripping means (26, 28) on the horizontal slideway member (18), screw adjustment means (42, 45) to adjust the lower gripping means (24) on the vertical slideway member (16) and fluid-pressure operated adjustment means (40) to adjust the upper gripping means (22) on the vertical slideway member (16).

6. A haul-off machine according to claim 1 wherein the invention comprises carriages (30, 32, 34 and 36) forming parts of the gripping means and to a carriage is secured an attachment (118) affording a bed support (53) for a gripping element (52) to enable the machine to haul an article of relatively small cross-sectional dimensions.

7. A haul-off machine according to claim 1 wherein the invention comprises at least two carriages (32, 36) forming parts of the gripping means (24, 28), each of said carriages including brackets (58) having parallel arms of which the arms of one gripping means (24) extend between the arms of the gripping means (28) to permit relative adjustment of said gripping means (24, 28) along the rectilinear slideway members (16, 18) respectively.