July 12, 1960 H. E. DAVIS 2,944,379

DRAWING AND TWISTING APPARATUS

Filed Aug. 1, 1958 2 Sheets-Sheet 1

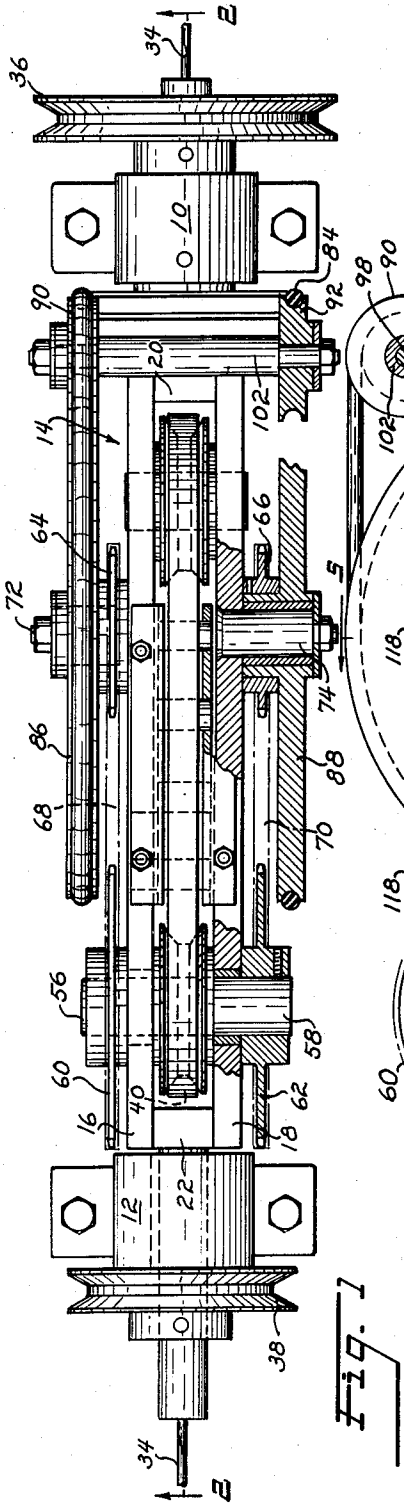


Fig. 1

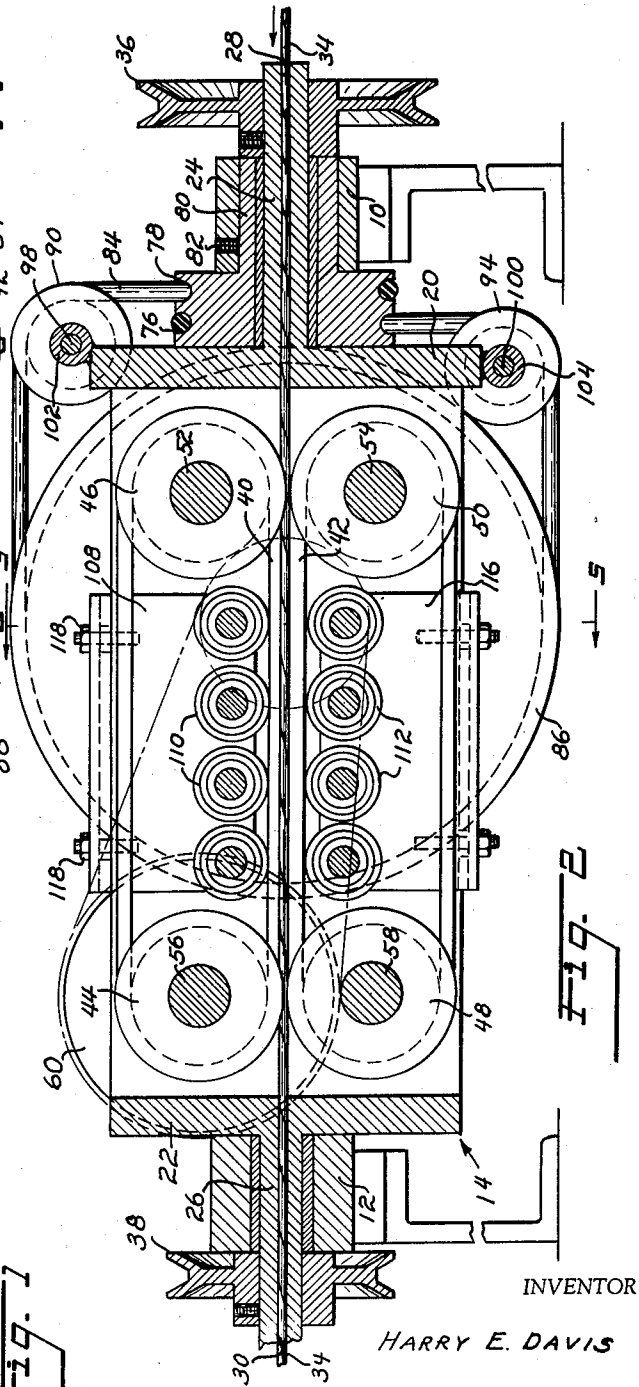


Fig. 2

INVENTOR
HARRY E. DAVIS
BY Scrivener & Parker
ATTORNEYS

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Fig. 3

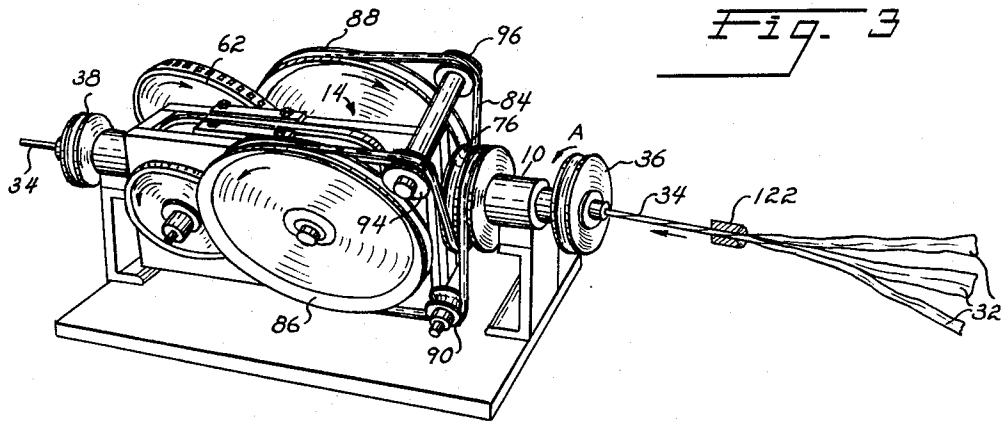
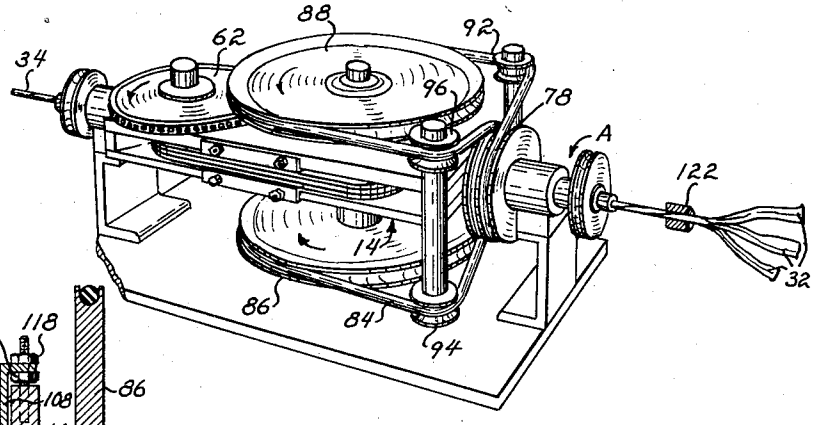


Fig. 4



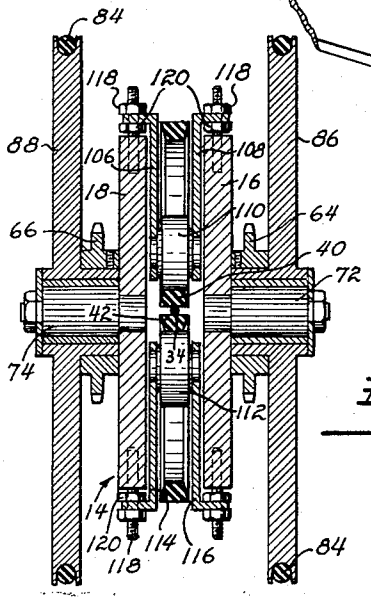


Fig. 5

INVENTOR
HARRY E. DAVIS

BY Scrivener & Parker

ATTORNEYS

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DRAWING AND TWISTING APPARATUS

Harry E. Davis, 510 E. Cuyahoga Falls Ave., Akron 10, Ohio

Filed Aug. 1, 1958, Ser. No. 752,493

6 Claims. (Cl. 57—31)

This invention relates to a combined drawing and twisting apparatus and more particularly to a mechanism for drawing a relatively narrow and thin film-like strip or strips or strands of plastic or other material such as paper, for example, while simultaneously twisting the strip or strips about the axis of travel thereof to form a stick or cord material.

One of the objects of the present invention is to provide a combined drawing and twisting apparatus which includes a pair of endless belts which are so arranged as to frictionally grip and draw the strip or strips from one point to another while simultaneously twisting the strip or strips about the axis of movement thereof whereby the twisted stick or cord material is formed.

Another object of the invention is to provide a simplified construction including a movable frame together with novel motion translating mechanism for moving the endless belts to simultaneously draw and twist the strip or strips or strands.

Still another object is to provide a novel arrangement of a stationary pulley member and movable pulleys for securing the drawing and twisting operations during rotation of the movable frame.

A still further object is to provide in an apparatus of the foregoing character, a novel mechanism for readily adjusting the frictional engagement between the endless belts and the material to be drawn and twisted.

A further object is to provide a novel drawing and twisting apparatus which is relatively simple in construction and wherein the parts are readily available for inspection and adjustment.

Other objects and novel features of the invention will appear more fully hereinafter from a consideration of the following detailed description when taken in connection with the accompanying drawings illustrative of one form of the invention. It is expressly understood however, that the drawings are utilized for purposes of illustration only and are not to be taken as a definition of the limits of the invention, reference being had for this purpose to the appended claims.

Referring to the drawings, wherein similar reference characters refer to similar parts throughout the several views:

Fig. 1 is a top view partly in section of a combined drawing and twisting apparatus embodying the principles of the present invention;

Fig. 2 is an axial sectional view of the apparatus taken along line 2—2 of Fig. 1;

Figs. 3 and 4 are diagrammatic perspective views showing the apparatus of Fig. 1 in two positions of operation; and

Fig. 5 is a transverse sectional view taken along line 5—5 of Fig. 2.

Referring more particularly to Figs. 1 and 2, the novel combined drawing and twisting apparatus of the present invention is illustrated therein as including stationary frame parts 10 and 12 together with a movable frame 14, the latter comprising side plates 16 and 18 together with

end plates 20 and 22. End plate 20 is provided with a shaft 24 which is rotatably mounted in the frame part 10 while the end plate 22 is provided with a shaft 26 which is rotatably mounted in the frame part 12, the shafts having axially aligned bores 28 and 30 through which the strips 32, see Fig. 3, are drawn to form the twisted material 34. A suitable drive pulley 36 is secured to the shaft 24 for operating the apparatus and if desired, a pulley 38 may be connected to the shaft 26 for operating a suitable mechanism, not shown, for cutting the stick material 34 into convenient lengths. It will be readily understood from the foregoing that rotation of the drive pulley 36 will cause rotation of the movable frame 14 which latter is supported in the frame parts 10 and 12 by the shafts 24 and 26.

Novel means are provided by the present invention for simultaneously drawing and twisting the material as it passes through the bores 28 and 30 and, as shown, such means includes a pair of V-belts 40 and 42 which frictionally grip the material 34 in the manner shown in Figs. 1, 2 and 5. More particularly, the belt 40 is carried by spaced-apart pulleys 44 and 46, while the belt 42 is carried by pulleys 48 and 50, all of said pulleys being positioned between the plates 16 and 18. Pulleys 46 and 50 constitute idler pulleys and are fixed to shafts 52 and 54 respectively, which are rotatably mounted in the side plates 16 and 18 as shown. Pulleys 44 and 48 on the other hand are driving pulleys which are fixed to driving shafts 56 and 58 respectively, the latter being rotatably mounted in the side plates 16 and 18 with the shaft 56 extending through the plate 16 and with the shaft 58 extending through the plate 18, see Fig. 1. Thus it will be seen that upon rotation of the drive pulleys 44 and 48 in opposite directions, the adjacent portions of the endless belts 40 and 42 will travel from right to left as viewed in Figs. 1 and 2 to draw the material 34 through the bore 28 and pass it through the bore 30.

One of the important features of the invention resides in the novel mechanism which is employed for rotating the drive pulleys 44 and 48 in opposite directions. In the form of the invention illustrated, such means includes sprocket wheels 60 and 62 which are respectively secured to the shafts 56 and 58 and which are driven by respective sprocket chains 68 and 70. Sprocket wheel 64 is rotatably mounted on shaft 72 which is fixed to side plate 16 while sprocket wheel 66 is rotatably mounted on shaft 74 which is fixed to side plate 18, the fixed shafts being in axial alignment as shown in Fig. 5.

In order to rotate the sprocket wheels 64 and 66 during rotation of the movable frame 14, a novel arrangement including a stationary pulley member 76, 78 is utilized. As shown, the stationary pulley member, 76, 78 is formed with a sleeve 80 within which the shaft 24 is rotatably mounted and such sleeve is fixed to the frame part 10 as by means of a set screw 82. An endless belt 84 is trained over the stationary pulley member 76, 78 and over driving pullleys 86 and 88 in the manner shown in Figs. 1, 3 and 4, the driving pulley 86 being secured to sprocket 64 and they in turn being rotatably mounted on fixed shaft 72 and the driving pulley 88 being secured to sprocket 66 and they in turn being rotatably mounted on fixed shaft 74. A pair of guide rollers 90, 92 and 94, 96 are provided for suitably guiding the belt during operation of the apparatus, the rollers 90, 92 being secured to a shaft 98 and the rollers 94, 96 being secured to a shaft 100. The shafts 98 and 100 are respectively supported by bearing sleeves 102 and 104 which in turn are mounted on the end plate 20 as shown.

Means are preferably provided for adjusting the endless belts 40 and 42 in order to adjust the frictional grip between the belts and the material 34. As shown, see Figs.

2 and 5, such means comprises a pair of plates 106 and 108 positioned between the side plates 16 and 18 and rotatably carrying a plurality of rollers 110 which bear upon the upper surface of the endless belt 40. In like manner, a plurality of rollers 112 bear upon the under surface of the endless belt 42 and the rollers 112 are rotatably carried by a pair of plates 114 and 116. The position of the pairs of plates and hence the rollers supported thereby may be readily adjusted by the adjusting nuts 118 and 120 in order to adjust the frictional contact between the material 34 and the endless belts 40 and 42.

In operation, it will be understood that the strip or strips 32 are fed through a suitable guide or die member 122 and threaded through the bore 28, between the belts 40 and 42 and thence through the bore 30. The driving pulley 36 is then rotated from any suitable source of power such as an electric motor, not shown, whereupon the endless belts 40 and 42 will be rotated in a direction to draw the material 34 through the bore 28 and feed the material through the bore 30. At the same time, the apparatus will function to rotate the belts 40 and 42 about the axis of advancement of the material 34 to simultaneously twist the material as it is drawn lengthwise. More particularly, and assuming in Figs. 3 and 4 that the driving pulley 36 and movable frame 14 are moved in a counterclockwise direction as denoted by the arrow A, it will be understood that due to the cooperation between the stationary pulley member 76, 78, the endless belt 84 and the driving pulleys 86, 88, the latter will be rotated in opposite directions to cause rotation in opposite directions of the sprocket wheels 60 and 62 through cooperation between the latter and the respective driving sprockets 64 and 66 and the sprocket chains 68 and 70. Since the sprocket wheels 60 and 62 are connected with the driving pulleys 44 and 48 through the respective shafts 56 and 58, the said driving pulleys will rotate in opposite directions and the portions of the endless belts 40 and 42 in frictional engagement with the material 34 will travel from right to left, as viewed in Figs. 1–4 in order to draw the material through the bore 28 and feed it through the bore 30 as the material is simultaneously twisted.

The present invention is particularly well adapted to the formation of substantially rigid stick material from a relatively narrow strip or strips of plastic film which are self-sealing under the application of heat and tension, such as shown in my copending application Serial Number 739,258, filed June 2, 1958, for Twisted Sticks and Method of Manufacture. In such case, the guide 122 may be a heated die member and the strip or strips 32 may be angularly fed thereto in the manner disclosed in said copending application and drawn therethrough under tension by the apparatus disclosed herein. However, the invention may be utilized for drawing and twisting various types of strip or strand materials as well understood by those skilled in the art. Reference will therefore be had to the appended claims for a definition of the limits of the invention.

What is claimed is:

1. Apparatus for drawing and twisting a relatively thin and narrow strip or strips to form a stick material, comprising a pair of spaced-apart rotatable shafts each provided with a bore for receiving said strip or strips, a pair of endles belts positioned between said shafts for frictionally gripping said strip or strips and for feeding the strip or strips through said bores and along a path between said bores, a frame, spaced-apart pulleys rotatably carried by said frame for supporting said belts, means for rotating said frame, pulleys and belts about said path to twist the strip or strips, and means for rotating said pulleys and belts to simultaneously draw the strip or strips through one of said bores and to feed the strip or strips through the other bore, including a pair of rotatable pulleys, a stationary pulley member and belt means connecting said pair of rotatable pulleys with said stationary pulley member.

2. Apparatus for drawing and twisting a relatively thin and narrow strip or strips to form a stick material, comprising a stationary frame, a movable frame having a pair of shafts rotatably mounted in said stationary frame, said shafts being provided with axially aligned bores through which said strip or strips are fed, a pair of endless belts carried by said movable frame and positioned to frictionally grip said strips, and means for rotating said belts to draw the strip or strips through one of said bores and feed the strip or strips through the other bore and for simultaneously rotating the belts about the path of movement of said strip or strips to twist the latter including a pair of rotatable pulleys carried by said movable frame, a stationary pulley member carried by said stationary frame, and belt means connecting the said stationary member and said rotatable pulleys.

3. Apparatus for drawing and twisting relatively thin and narrow strip or strips to form a stick material, comprising a stationary frame, a movable frame having a pair of shafts rotatably mounted in said stationary frame, said shafts being provided with axially aligned bores through which said strip or strips are fed along a path of movement, a pair of endless belts carried by said movable frame and positioned to frictionally grip said strip or strips, means for rotating said movable frame and belts about said path to twist the strip or strips, a pair of driving pulleys for simultaneously rotating said endless belts to draw the strip or strips through one of said bores and feed the strip or strips through the other bore, and means for rotating said driving pulleys including a pair of rotatable pulleys carried by said movable frame, a stationary pulley member carried by said stationary frame, and belt means connecting the respective pulleys.

4. Apparatus as set forth in claim 3 which comprises in addition, means carried by the movable frame for adjusting the frictional engagement between the endless belts and the strips.

5. Apparatus as set forth in claim 3 which includes in addition, a pair of sprocket wheels carried by said movable frame, and means rotatably connecting the respective sprocket wheels with the respective rotatable pulleys.

6. Apparatus for drawing and twisting a relatively thin and narrow strip or strips to form a stick material, comprising a stationary frame, a movable frame having a pair of spaced-apart shafts rotatably mounted in said stationary frame, each of said shafts being provided with a bore through which said strip or strips are fed, a pair of rotatable members carried by said movable frame and positioned between said shafts for frictionally gripping said strip or strips and for feeding the latter through said bores and along a path between said bores, means for rotating said movable frame and rotatable members about said path to twist the strip or strips, a pair of sprocket wheels rotatably carried by the movable frame and respectively connected with said rotatable members, and means for rotating said sprocket wheels and rotatable members to simultaneously draw the strip or strips through one of said bores and to feed the strip or strips through the other bore, including a pair of rotatable pulleys carried by the movable frame, a stationary pulley member carried by the stationary frame, an endless belt connecting said pair of rotatable pulleys with said stationary pulley member, and means including a pair of sprocket chains respectively connecting said pair of rotatable pulleys with said sprocket wheels.

No references cited.