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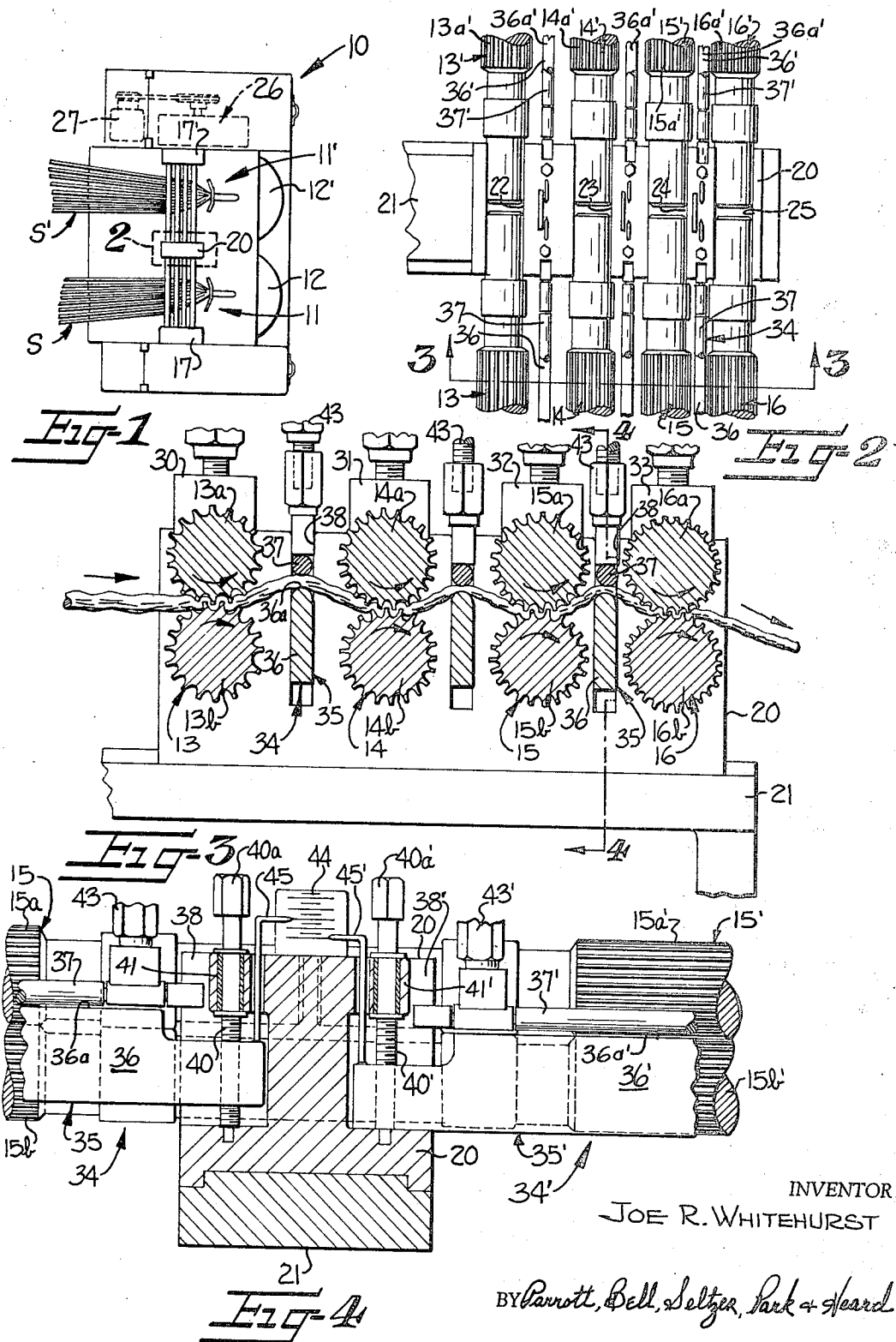
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3,409,946

APPARATUS FOR DRAFTING TEXTILE FIBROUS STRANDS

Filed July 5, 1966

3 Sheets-Sheet 1



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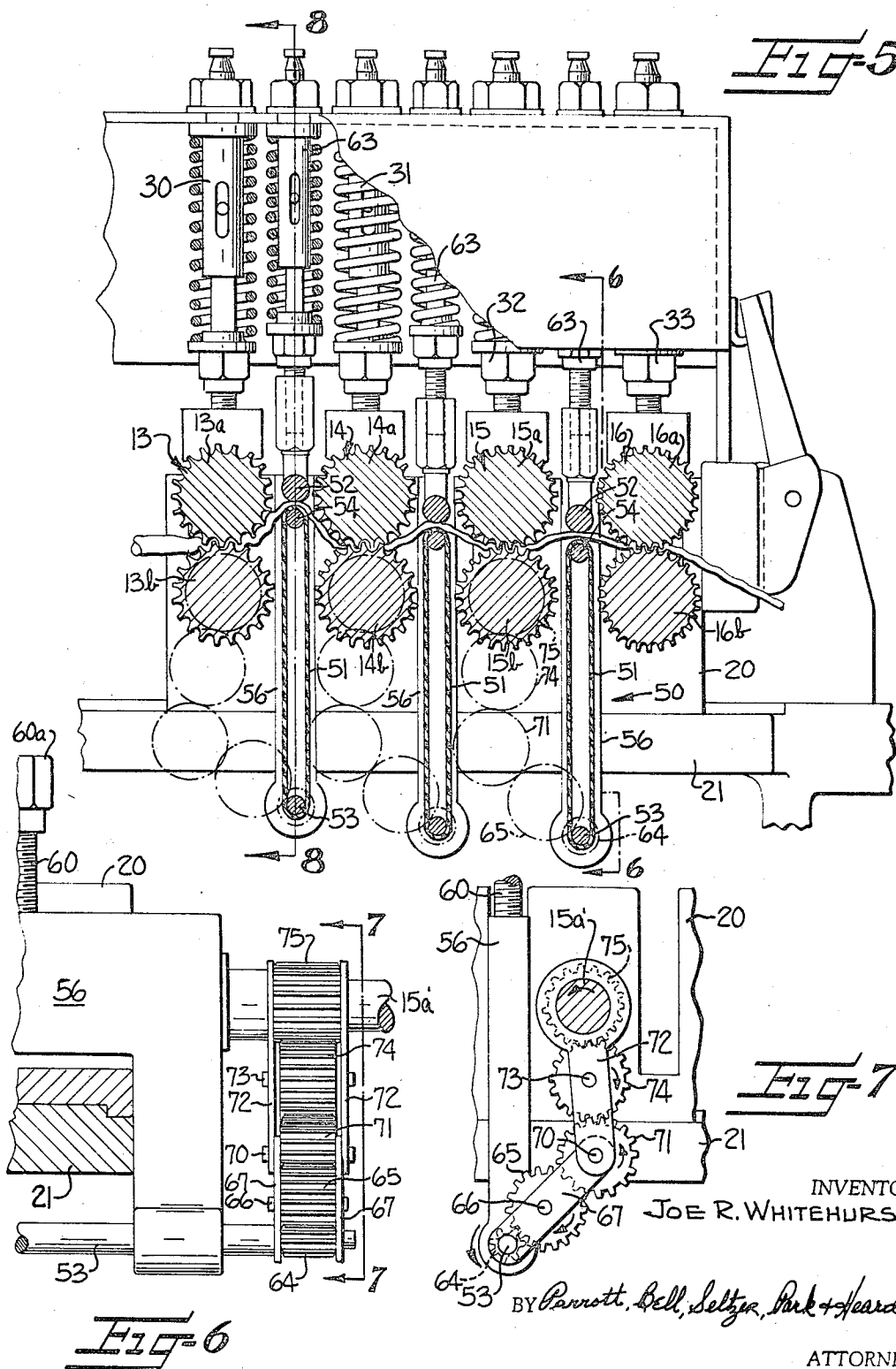
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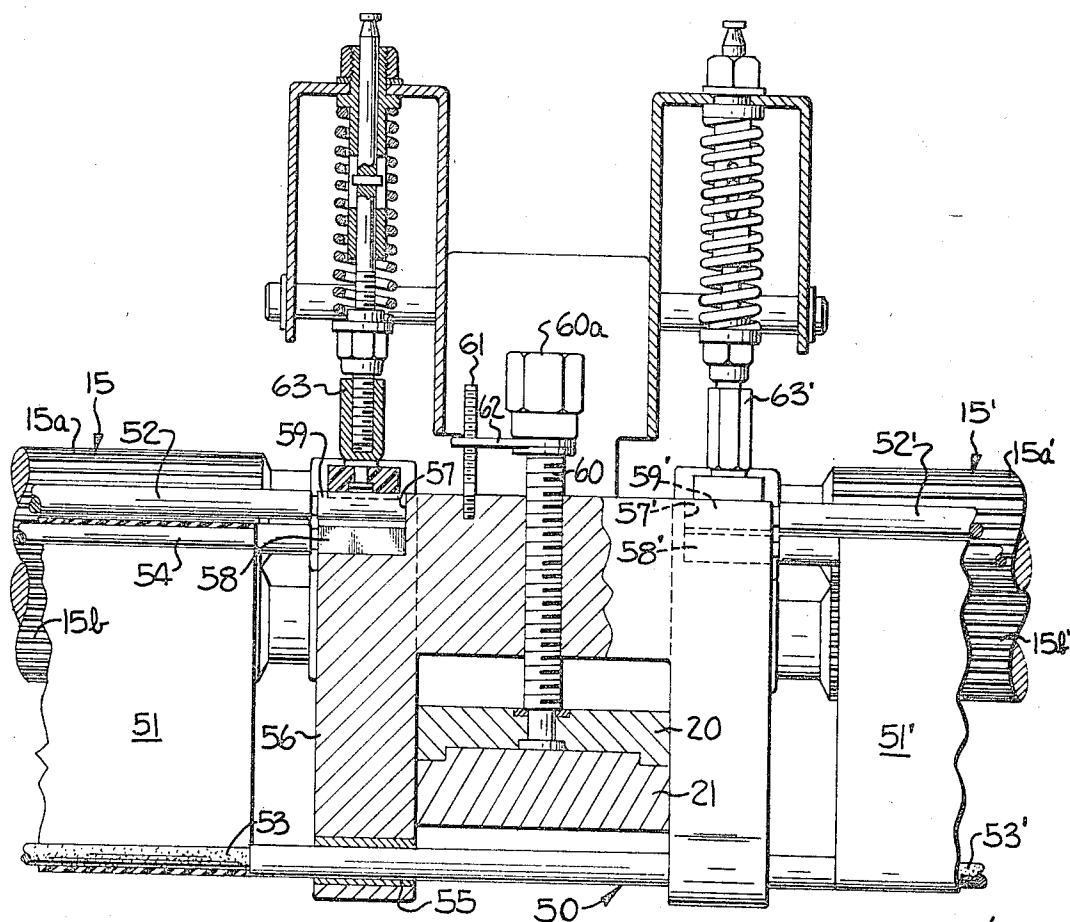


FIG-8

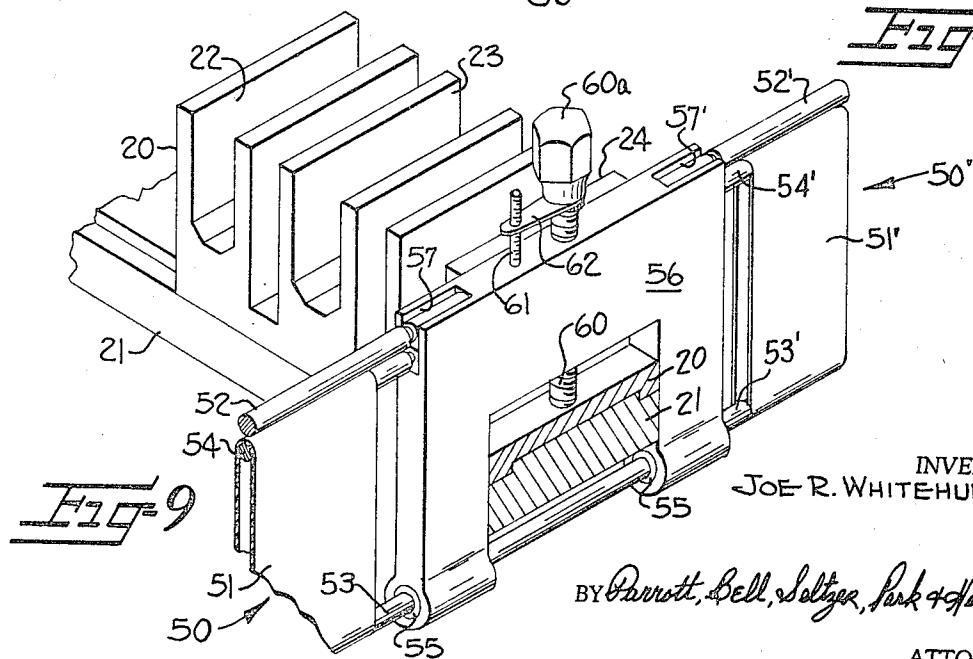


FIG-9

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## APPARATUS FOR DRAFTING TEXTILE FIBROUS STRANDS

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### ABSTRACT OF THE DISCLOSURE

Apparatus for varying the effective length of a drafting zone to accommodate a wide range of staple length fibers without changing the spacing between the drafting elements, such as spaced sets of drafting rolls, defining the drafting zone, which apparatus includes deflecting means adjustably positioned between the sets of drafting rolls for engaging and laterally deflecting the textile material being drafted, and wherein the deflecting means comprises a pair of cooperating members forming a nip with one of the same preferably being driven at a speed intermediate the respective speeds of the sets of drafting rolls.

The present invention relates to a textile fibrous strand processing apparatus, and more particularly to such an apparatus wherein textile fibrous strands are drafted in at least one drafting zone and wherein the effective length of the drafting zone may be varied without changing the spacing between the drafting means defining the drafting zone.

Conventional textile processing machines for drafting fibrous strands are well known and include at least two spaced apart cooperating sets of drafting means defining a drafting zone therebetween to draft textile fibrous strands passing therebetween. Such conventional strand processing machines suffer from at least one major deficiency which causes acute problems in both the manufacture and operation thereof. In this respect, it is frequently desirable or necessary to vary the effective length of the drafting zone defined by the sets of drafting means for various reasons, such as varying fiber length in the various fibrous strands to be processed.

To provide for this variance in the effective length of the drafting zone between the sets of drafting means, conventional strand processing machines are manufactured with an extra long bedplate and the sets of drafting means are adjustably mounted thereon in such a manner that the spacing therebetween and hence the length of the drafting zone may be varied. This extra long bedplate and adjustable mounting for the sets of drafting means necessitates additional parts and labor in the manufacture of these conventional strand processing machines and hence the machines are more expensive. Additionally, such machines occupy excessive floor space due to the extra long bedplate which is undesirable for obvious reasons.

Further, the adjustment of the spacing between the sets of drafting means on such conventional strand processing machines is quite time consuming and laborious and results in a considerable loss of production since the operation of the machine must be stopped for a considerable period of time to perform this adjustment. This loss of production and the time and labor involved in adjusting the sets of drafting means adds considerably to the cost of operation of the textile machine.

With the foregoing in mind, it is an object of the present invention to provide novel textile fibrous strand processing apparatus utilizing at least two spaced apart cooperating sets of drafting means defining a drafting zone therebetween for drafting a strand passing there-

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between and wherein the effective length of the drafting zone may be quickly and easily varied to accommodate a wide range of fiber lengths without changing the spacing between the sets of drafting means.

A more specific object of the present invention is to provide a fibrous strand processing apparatus of the character described wherein the effective length of the drafting zone is increased by deflecting the strand laterally of the plane in which the drafting means lie to increase the length of travel thereof between the drafting means and wherein the strand is confined in this deflected path of travel to prevent disruption of the strand.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds when taken in connection with the accompanying drawings, in which:

FIGURE 1 is a fragmentary top plan view of a textile fibrous strand processing machine incorporating the present invention;

FIGURE 2 is a greatly enlarged, fragmentary top plan view of the portion of the machine within the box 2 in FIGURE 1 with portions removed and broken away for clarity;

FIGURE 3 is an enlarged sectional view taken substantially along line 3—3 in FIGURE 2;

FIGURE 4 is a fragmentary sectional view taken along line 4—4 in FIGURE 3;

FIGURE 5 is an enlarged fragmentary sectional view similar to FIGURE 3 of a modified form of the fibrous textile strand processing machine incorporating the features of the present invention;

FIGURE 6 is a fragmentary sectional view taken substantially along line 6—6 in FIGURE 5;

FIGURE 7 is a fragmentary sectional view taken substantially along line 7—7 in FIGURE 6;

FIGURE 8 is a fragmentary sectional view taken substantially along line 8—8 in FIGURE 5; and

FIGURE 9 is a fragmentary isometric view of a drafting roll supporting block of the machine shown in FIGURE 5 with the drafting rolls removed and illustrating the manner in which the strand deflecting means of the present invention is mounted thereon.

Referring more specifically to the drawings and particularly to FIGURE 1, a textile fibrous strand processing machine 10, in the form of a drawing frame, is shown and is illustrative of the machines with which the present invention is concerned. It should be understood that while the present invention is illustrated and described in connection with the drawing frame 10, it is not restricted thereto, but may be utilized with any textile fibrous strand processing machine which includes a plurality of sets of drafting means defining a drafting zone therebetween, such as a drawing frame, roving frame and spinning frame.

Machine 10 comprises a two-delivery drawing frame having two drafting mechanisms 11, 11' to which textile fibrous strands S, S' are delivered for drafting, and also having coiler mechanisms 12, 12', for condensing the drafted strands into sliver form and for coiling the same in suitable receptacles, such as sliver cans. Drafting mechanisms 11, 11' comprise a plurality of spaced apart sets of drafting means 13, 14, 15, 16, and 13', 14', 15', 16', respectively. As illustrated in the drawings, these sets of drafting means comprise top and bottom fluted drafting rolls, the rolls of the drafting mechanism 11 being referred to as 13a, 13b; 14a, 14b; 15a, 15b; and 16a, 16b, and only certain rolls of drafting mechanism 11' being shown in the drawings, namely rolls 13a', 14a', 15a', 15b'; and 16a'.

Conventionally, the sets of drafting means 13, 13'; 14, 14'; 15, 15'; 16, 16' are disposed in parallel relation

and are supported for rotation in suitable end bearing blocks 17, 17' and a medial bearing block 20, all of which are carried by a bedplate 21 of the machine 10. These bearing blocks include upwardly opening grooves, such as grooves 22, 23, 24 and 25 in bearing block 20 (FIGURES 2 and 9), in which the ends of the sets of drafting rolls 13, 13'; 14, 14'; 15, 15'; 16, 16' are respectively disposed. Conventionally, the drafting mechanisms 11, 11' have the bottom drafting rolls of each of the sets formed as portions of a shaft which extends between the end bearing blocks 17, 17'. All of these shafts are connected to and driven by a conventional drive mechanism 26 which is driven by a motor 27.

The drafting mechanisms 11, 11' usually have individual or separate top rolls which are freely rotatable relative to the bottom rolls, and means 30, 31, 32, and 33 are provided for respectively weighting the top rolls 13a, 14a, 15a, 16a to urge the same against the bottom rolls with predetermined pressure to provide the desired interaction between the sets of rolls. These weighting means are provided at each end of the top rolls and may be in any desired form but are illustrated as adjustable, spring biased weighting means.

Conventionally, adjacent sets of drafting means in each drafting mechanism are spaced apart a predetermined distance to define drafting zones therebetween which progressively decrease in length from the rear sets of rolls 13, 13' to the front sets of rolls 16, 16' (FIGURE 3). However, it should be understood that, in accordance with the present invention, adjacent sets of drafting means may be spaced in this conventional manner (FIGURE 3) or may be spaced apart the same distance (FIGURE 5) since the effective length of the drafting zone is no longer wholly dependent upon the spacing between the adjacent sets of drafting means.

In this latter respect, the present invention provides means 34, 34' for substantially increasing the effective length of each drafting zone to accommodate a wide range of fiber lengths without changing the spacing between the sets of drafting means. Such a means 34 or 34' is disposed in each drafting zone defined by adjacent sets of drafting means 13, 14; 13', 14'; 14, 15; 14', 15'; 15, 16; 15', 16'; and comprises strand deflecting means 35 or 35' for deflecting the strands S or S' passing through the drafting zones laterally of the predetermined plane in which the sets of drafting means conventionally are disposed. Each of the strand deflecting means 35 or 35' is first illustrated in the form of an elongate nose bar member 36 or 36', including a rounded upper strand engaging edge 36a or 36a' and a rotatable roller 37 or 37' cooperating with the strand engaging edge 36a or 36a' of nose bar 36 or 36' to define a strand gripping nip therebetween. Nose bar 36 or 36' and roller 37 or 37' are mounted for vertical adjustment at their opposite ends in upwardly opening grooves 38 or 38' (FIGURE 4) formed in the bearing block 20, and in similar grooves (not shown) formed in the bearing blocks 17, 17', with respect to the sets of drafting means.

Each end of nose bar 36 or 36' includes an internally threaded opening therein through which penetrates a threaded shaft 40 or 40' mounted for rotation at its lower end in the bearing blocks 17, 17' and 20 and in a suitable bearing 41 or 41' (FIGURE 4) at its upper end also carried by the bearing blocks. The upper end of shaft 40 or 40' is formed into a hexagonal head 40a or 40a' which is adapted to receive a suitable wrench thereon for rotation of the shaft relative to the nose bar 36 or 36'. Upon such rotation of the shaft 40 or 40', nose bar 36 or 36' and roller 37 or 37' are moved upwardly or downwardly with respect to the bearing blocks and the sets of drafting means to vary the amount that the strands are deflected to thereby vary the effective length of the drafting zone.

Suitable weighting means 43 or 43' is provided at each end of roller 37 or 37' for applying downward pressure

thereto to press the roller against the nose bar 36 or 36' to provide the desired gripping action on the strands passing therebetween. Weighting means 43 or 43' may be of any character, but is illustrated as an adjustable, spring biased weighting means similar in construction to weighting means 30-33 for the top drafting rolls. The weighting force applied to roller 37 or 37' should be such that fibers may slip therebetween without breakage since there must be a slip draft between the roller 37 or 37' and nose bar 36 or 36'.

To aid in the adjustment of strand deflecting means 35, 35', bearing block 20 has a scale 44 mounted thereon between the drafting mechanisms 11, 11' and between adjacent sets of drafting means. Scale 44 is calibrated in any desired manner to indicate the amount of deflection that is being performed on the strands passing between the sets of drafting means. An indicating or pointing element 45, 45' is carried by each of the nose bars 36, 36' and cooperates with the scale 44 to indicate this amount of deflection.

Referring now to FIGURES 5-8, a modified form of strand deflecting means 50 or 50' is shown in connection with a strand processing machine which is substantially the same as that described above and will not, therefore, be redescribed in connection with this embodiment. The primary difference between this strand processing machine and that shown in FIGURES 1-4 is that the adjacent sets of drafting means are illustrated as being spaced the same distance apart as opposed to the progressively decreasing spacing shown in FIGURE 3.

Strand deflecting means 50 or 50' comprises a pair of rotatable members 51, 52 or 51', 52' mounted in the bearing blocks 17, 17' and 20. Lower member 51 or 51' comprises an elongate apron rotatably supported at its upper end on shaft 54 or 54' and at its lower end on shaft portion 53 or 53' (FIGURE 9). Shaft portions 53 and 53' are preferably portions of a shaft which extends the full length of both drafting mechanisms 11, 11' and is rotatably mounted in suitable bearings 55 carried by the bifurcated lower end of a mounting member 56. Mounting member 56 has upwardly facing slots 57, 57' in the upper corners thereof in which are mounted suitable bearings 58, 59; 58', 59' which rotatably journal one end of the upper shafts 54, 54' and upper rotatable member 52, 52' which are preferably in the form of freely rotatable rollers. Similar mounting members (not shown) will be provided at the bearing blocks 17, 17'.

Mounting member 56 has an internally threaded opening therein in which is disposed a threaded shaft 60 rotatably mounted at its lower end in bearing block 20. The upper end of shaft 60 is in the form of a hexagonal head 60a for rotation thereof and vertical adjustment of the mounting member and hence the strand deflecting means. A scale 61 is carried by mounting member 56 for movement therewith and a stationary pointer 62 is carried by shaft 60. Pointer 62 cooperates with scale 61 to indicate the position of the strand deflecting means.

A suitable weighting means 63 or 63' is provided for each end of the upper rollers 52 or 52' to press the same into engagement with the upper end of apron 51 or 51'. These weighting means 63, 63' may be of any character but preferably are adjustable, spring biased weighting means. As with weighting means 43, 43', weighting means 63, 63' should provide a slip draft between aprons 51, 51' and rollers 52, 52'.

Preferably, shaft portions 53 and 53' are driven and in turn positively drive the aprons 51, 51' and preferably have roughened surfaces engaging the aprons to insure this positive drive. To drive these shaft portions, a drive train (FIGURE 7) is provided thereto from the lower drafting means of the set of drafting means immediately behind the strand deflecting means 50, 50'. This drive train includes a gear 64 mounted on shaft portion 53 and meshing with a gear 65 mounted on a stub shaft 66. Stub shaft 66 is journaled at its opposite ends in the medial

portion of a pair of levers 67 pivotally mounted at one end on shaft 53 and carrying another stub shaft 70 at the other end thereof. Stub shaft 70 carries another gear 71 thereon which meshes with gear 65 and also pivotally connects the pair of levers 67 to one end of another pair of levers 72. The pair of levers 72 are pivotally mounted at the other end thereof on the lower drafting means and journal a stub shaft 73 in the medial portion thereof which carries a gear 74. Gear 74 respectively meshes with gear 71 and a drive gear 75 carried by the lower drafting means. The described lever and gear arrangement permits the aprons 51, 51' and the shaft portions 53, 53' to be adjusted vertically while still maintaining the driving relationship thereto.

The size of the gears are such that shaft portion 53 is driven from the lower drafting means to drive the aprons 51, 51' at a speed corollated to the speed of the drafting means. In this respect, the surface speeds of the drafting means progressively increase from rear to front to provide the desired draft, and preferably, the aprons 51, 51' are driven at a surface speed greater than the surface speed of the drafting means from which it is driven by an amount equal to one-half the difference in the surface speed of this drafting means and the next adjacent drafting means toward the front of the machine.

It is noted that in the embodiment illustrated in FIGURES 5-9, the deflecting means for both the drafting mechanisms 11, 11' are adjustable vertically as a unit. However, it should be understood that the same may be independently mounted, as are the deflecting means illustrated in FIGURES 1-4, and in such an arrangement, shaft portions 53, 53' would be unconnected and drive mechanisms would be provided to each shaft portion.

In the drafting of textile fibrous strands, the length of a drafting zone between adjacent sets of drafting means is primarily dependent upon the staple length of the fibers in the strands, with the length of the front drafting zone usually being slightly greater than the longest length of fibers in the strands and the lengths of the other drafting zones progressively increasing from front to rear of the machine. As stated above, the lengths of the drafting zones have heretofore been dependent solely upon the spacing between the adjacent sets of drafting means. With the present invention, the lengths of the drafting zones are determined independently of the spacing between the adjacent sets of drafting means.

In this respect, the strand deflecting means are adjusted vertically relative to the sets of drafting means by rotating the threaded shafts 40, 40' or 60 to a predetermined height, as indicated by scales 44 or 61, which height, along with spacing between the adjacent sets of drafting means, will provide the desired effective lengths of the drafting zones for the staple length fibers in the strands to be processed. The strands are then processed in the normal manner and are laterally deflected between the adjacent sets of drafting means by the strand deflecting means 35, 35' or 50, 50' with rollers 37, 37' or 52, 52' serving to maintain the strands in contact with the nose bar members or aprons and to prevent fly-off from or disruption of the strands being deflected.

If fibrous strands of a different staple length are desired to be processed, the lengths of the drafting zones may be readily changed by vertical adjustment of the strand deflecting means without varying the spacing between the adjacent sets of drafting means.

It is, therefore, believed apparent that a novel textile fibrous strand processing machine is provided wherein the effective lengths of the drafting zones between adjacent sets of drafting means may be varied to accommodate a wide range of fiber lengths without varying the spacing between the sets of drafting means and without the problems and lost time involved with conventional strand processing machines.

In the drawings and specification, there have been set forth preferred embodiments of the invention, and al-

though specific terms are employed they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being defined in the claims.

What is claimed is:

1. In a textile fibrous strand processing machine having at least three serially arranged, spaced apart cooperating sets of drafting means disposed in parallel relation and defining a plurality of successive drafting zones therebetween, each of said drafting zones lying in a predetermined plane and being of a predetermined length; the improvement which comprises means for substantially increasing the effective lengths of the drafting zones to accommodate a wide range of fiber lengths without changing the spacing between the sets of drafting means, said means comprising deflecting means disposed between adjacent sets of drafting means in each of said drafting zones for engaging and deflecting the strand laterally of the predetermined plane of each drafting zone to lengthen the path of travel of the strand between said sets of drafting means, each of said deflecting means comprising a pair of cooperating members defining a strand gripping nip therebetween, weighting means operatively associated with said pair of members for urging the same toward each other with sufficient force to provide the desired gripping action on the strand while permitting a slip draft through the nip thereof, means mounting each of said deflecting means for adjustment relative to and independently of said sets of drafting means and independently of the other deflecting means to selectively vary the amount the strand is deflected in each drafting zone and thus the amount the effective length of each drafting zone is increased to accommodate the wide range of fibers without changing the spacing between the sets of drafting means, and indicating means operatively associated with each of said strand deflecting means for indicating the position of the strand deflecting means relative to said predetermined plane for facilitating adjustment of said strand deflecting means to the proper position to obtain the correct effective distance between the adjacent sets of drafting means.

2. In a textile fibrous strand processing machine having at least three serially arranged, spaced apart cooperating sets of drafting means disposed in parallel relation and defining a plurality of successive drafting zones therebetween, each of said drafting zones lying in a predetermined plane and being of a predetermined length; the improvement which comprises means for substantially increasing the effective lengths of the drafting zones to accommodate a wide range of fiber lengths without changing the spacing between the sets of drafting means, said means comprising deflecting means disposed between adjacent sets of drafting means in each of said drafting zones for engaging and deflecting the strand laterally of the predetermined plane of each drafting zone to lengthen the path of travel of the strand between said sets of drafting means, each of said deflecting means comprising a pair of movable cooperating members having their proximal surfaces movable in the direction of movement of the strand through the drafting zone and defining a strand gripping nip therebetween, weighting means operatively associated with said pair of members for urging the same toward each other with sufficient force to provide the desired gripping action on the strand while permitting a slip draft through the nip thereof, means mounting each of said deflecting means for adjustment relative to and independently of said sets of drafting means and independently of the other deflecting means to selectively vary the amount the strand is deflected in each drafting zone and thus the amount the effective length of each drafting zone is increased to accommodate the wide range of fibers without changing the spacing between the sets of drafting means, and driving means operatively connected to one of said cooperating members of each pair for driving the same so that its proximal surface moves at a speed greater than the speed of the rearward adjacent set of drafting

means but less than the speed of the forward adjacent sets of drafting means.

3. In a textile fibrous strand processing machine according to claim 2, wherein said cooperating members of each pair comprise a freely rotatable roller and an apron, two spaced rotatable shafts mounting said apron for movement thereon, and wherein said one cooperating member driven by said driving means is said apron, and said driving means operatively connects said apron to one of the sets of drafting means.

4. In a textile fibrous strand processing machine according to claim 3, wherein said driving means for each of said aprons includes a driving element carried by one of said drafting means, a driving element carried by one of the shafts mounting said apron, and means connecting said driving elements and permitting adjustment of said apron relative to said predetermined plane while still maintaining the proper driving connection between said apron and said drafting means.

5. In a textile fibrous strand processing machine according to claim 3, wherein said drive means for each of said aprons comprises a gear train including a first gear mounted on one of the drafting means of an adjacent set of drafting means, a second gear mounted on one of the shafts supporting the apron, and intermediate gears between said first and second gears providing the desired direction of movement of the apron and arranged to permit vertical adjustment of the apron while still maintaining the driving connection thereto.

6. In a textile fibrous strand processing machine having at least two spaced-apart cooperating sets of drafting means disposed in parallel relation and defining a drafting zone lying in a predetermined plane and of a predetermined length therebetween; the improvement which comprises means for substantially increasing the effective length of the drafting zone to accommodate a wide range of fiber lengths without changing the spacing between the sets of drafting means, said means comprising deflecting means disposed between the sets of drafting means for engaging and deflecting the strand laterally of said predetermined plane to lengthen the path of travel thereof between said sets of drafting means, said deflecting means

comprising a pair of cooperating members having movable proximal surfaces defining a strand gripping nip therebetween, drive means connecting one of said cooperating members to one of said sets of drafting means for driving the movable proximal surface thereof at a speed greater than the rearward adjacent set of drafting means but less than the speed of the forward adjacent set of drafting means, and means mounting said deflecting means for adjustment relative to and independently of said drafting means to vary the amount the strand is deflected and the amount the effective length of the drafting zone is increased to accommodate the wide range of fibers without changing the spacing between the sets of drafting means.

7. In a textile fibrous strand processing machine according to claim 6 including indicating means operatively associated with said strand deflecting means for indicating the position of the strand deflecting means relative to said predetermined plane for facilitating adjustment of said strand deflecting means to the proper position to obtain the correct effective distance between the sets of drafting means.

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