Oct. 22, 1957 H. H. DUNN ET AL 2,810,165

SLUB MECHANISM AND SIGNAL GENERATOR THEREFOR

Filed May 11, 1955 3 Sheets-Sheet 1

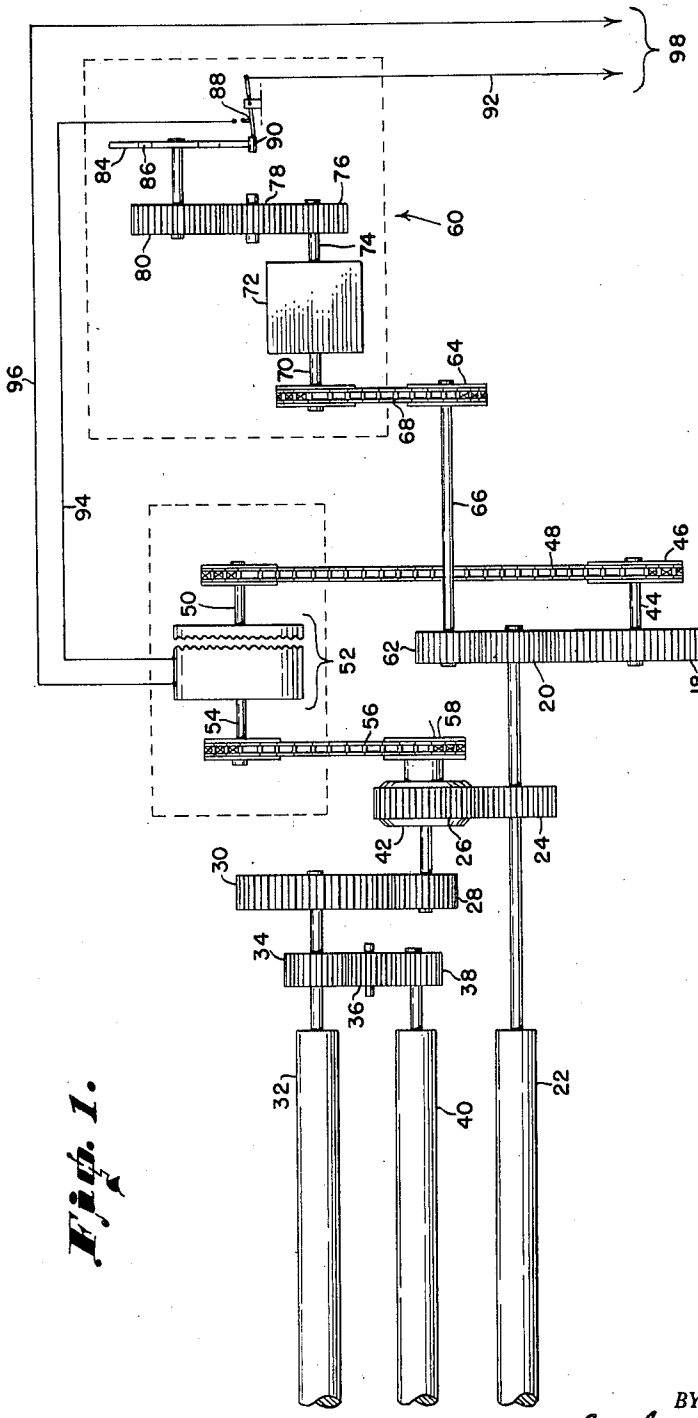


Fig. 1.

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Filed May 11, 1955 3 Sheets-Sheet 2

Fig. 2.

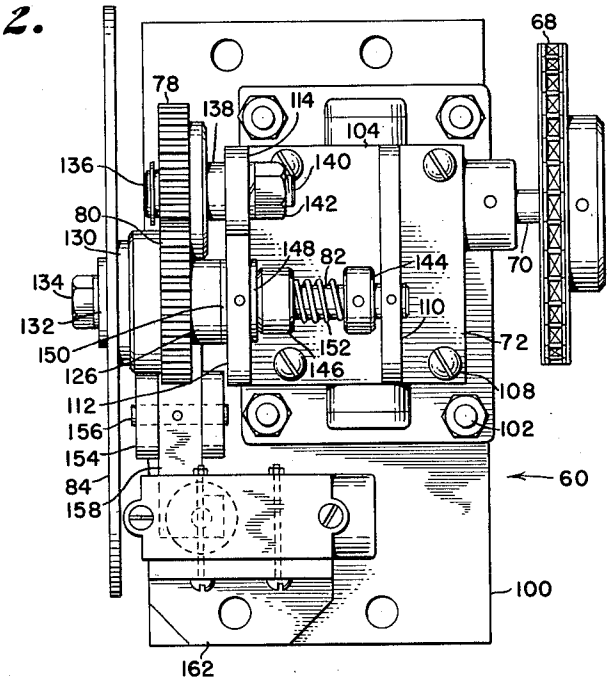
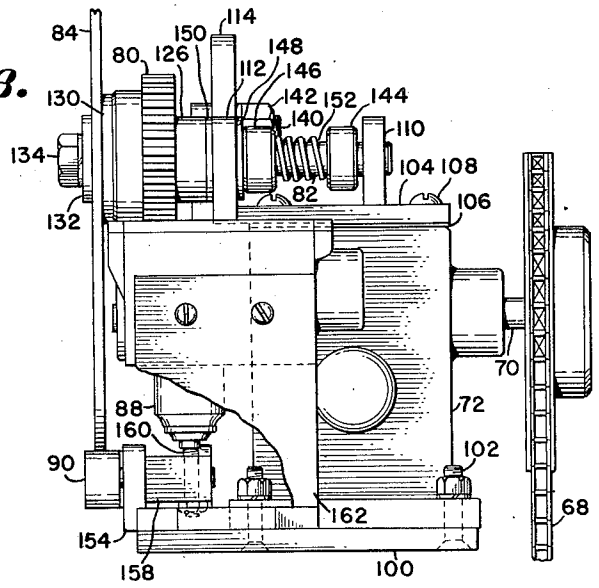


Fig. 3.



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Filed May 11, 1955 3 Sheets-Sheet 3

Fig. 4.

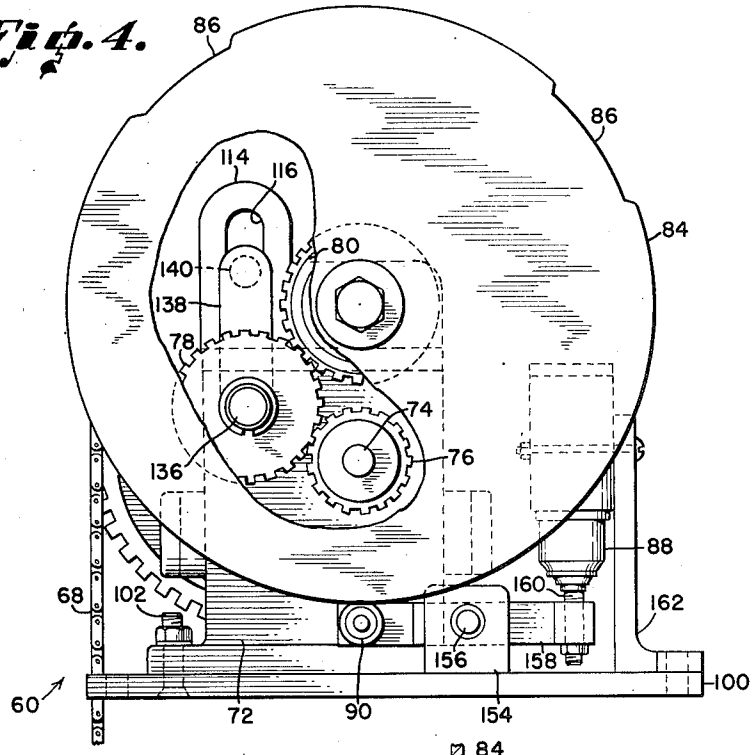


Fig. 5.

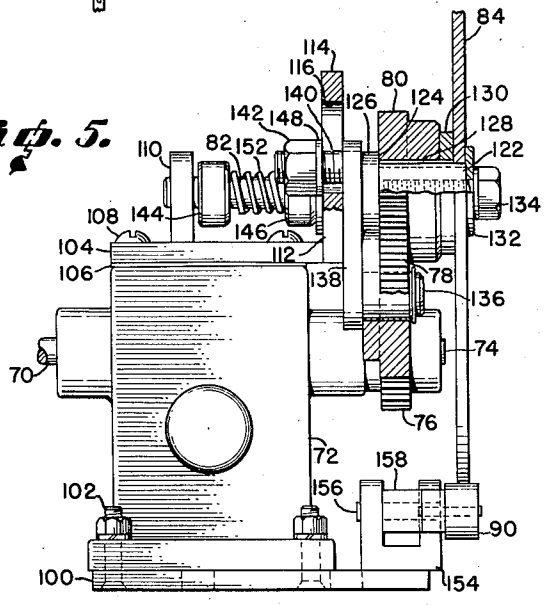
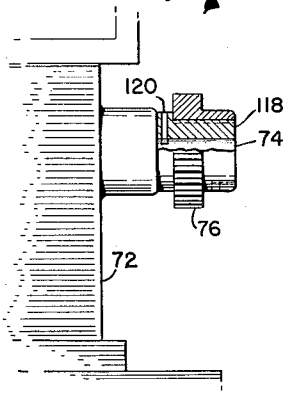


Fig. 6.



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SLUB MECHANISM AND SIGNAL GENERATOR THEREFOR

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7 Claims. (Cl. 19—143.5)

This invention relates to slubbing mechanisms, and in particular to an improved signal generator therefor. In general the invention relates to spinning frames in which the usual crown gear is provided with an overrunning clutch, and an alternate drive which includes a magnetic clutch is provided to the crown gear overrunning clutch. The novel signal generator of the invention controls the operation of the magnetic clutch.

A principal object of the invention is to provide improved slubbing mechanisms for spinning frames. A related object is the provision of a simple, sturdy and versatile signal generator for actuating the slub mechanism.

A further object of the invention is to provide a signal generator incorporating a disc cam pattern control, constructed and mounted for quick and easy removal and replacement.

Another object is to provide a signal generator including a change gear constructed and mounted to facilitate quick and simple substitution, whereby complete versatility is effected.

Other objects of the invention are to provide a signal generator unit for spinning frame slub mechanisms which is reliable, compact, smooth and positive in operation, and requires a minimum of service and repair. Further objects will be in part evident and in part pointed out hereinafter.

The invention and the novel features thereof may best be made clear from the following description and the accompanying drawings, in which:

Figure 1 is a diagrammatic representation of a spinning frame incorporating the present invention;

Figure 2 is a top plan view of a preferred embodiment of the signal generator;

Figure 3 is an end elevational view of the signal generator of Figure 2, looking toward the bottom end thereof;

Figure 4 is a side elevational view of the device of Figure 2, looking toward the left-hand side thereof, with the cam disc partially broken away to show the drive thereto;

Figure 5 is an end elevational view of the device of Figure 2, looking toward the top end thereof, with the cam disc, change gear and associated elements partly sectioned to show the manner of assembly, and

Figure 6 is a partial elevational view similar to Figure 5, illustrating further details.

Referring to the drawings in detail, in Figure 1 is shown the main drive or cylinder shaft 10 of a spinning frame, adapted to drive both sides thereof in conventional manner. While only one side of the frame is illustrated, it will be understood that the opposite side is similar. The cylinder shaft 10 through its cylinder gear 12 drives the jack gear 14, and its associated twist change gear 16 drives the intermediate gear 18 of the frame. The intermediate gear 18, as is customary, drives the front roll drive gear 20, thereby directly rotating the bottom front roll 22. From the front roll gear 24, power is transmitted through crown gear 26, draft change gear 28 and the back roll drive gear 30 to drive the back roll 32, and this drive is transmitted through back roll gear 34 and idler 36 to the intermediate roll gear 38 and intermediate roll 40.

The mechanism described in the preceding paragraph is conventional and well known. According to our present invention, however, an overrunning clutch 42 is incorporated into the crown gear 26, and an alternate drive to the overrunning clutch is provided. Preferably, the alternate drive is taken from intermediate gear 18, through shaft 44 and sprocket 46. The drive sprocket 46 is engaged by a chain 48 to a similar sprocket fixed on the input shaft 50 of an electromagnetic clutch 52, and the output shaft 54 of this clutch is engaged by its sprocket and chain 56 to a sprocket 58, engaged to the overrunning clutch 42 and adapted to drive through it, when electro-magnetic clutch 52 is energized and engaged, the draft change gear 28 at a speed greater than that ordinarily imparted to it by gear 24 and crown gear 26. As will be readily understood, temporary energization of the electro-magnetic clutch 52 will be effective to momentarily speed up back roll 32 and intermediate roll 40, as compared to their normal rotational speeds, to thereby make a slub in each yarn between intermediate roll 40 and the front roll 22.

To operate and control the electro-magnetic clutch 52 in predetermined manner relative to the frame drive, a novel signal generator indicated generally as 60 is provided. The signal generator is driven by a signal unit drive gear 62, engaged in the preferred embodiment to the front roll drive gear 20, as shown. Gear 62 drives sprocket 64 through a shaft 66, and the rotation of sprocket 64 is transmitted through chain 68 to a sprocket fixed on the input shaft 70 of a gear reducer 72. The signal unit gear reducer may be of conventional type, having a reduction ratio for example of 50 to 1. The output shaft 74 of the gear reducer mounts an output gear 76, which is engaged through an idler gear 78 to a change gear 80 mounted on a suitably supported cam shaft 82. The cam shaft 82 carries a cam disc 84, provided with one or more edge slots 86. A switch 88 operated by a cam follower 90 in contact with the peripheral edge of the cam disc 84 is adapted to close a circuit through conductors 92, 94 and 96, from a suitable power source 98 to the electro-magnetic clutch 52. The power may be, for example, 90-volt direct current, and may be derived from rectifiers or otherwise.

Details of the signal generator 60 are illustrated in Figures 2 to 6. As there shown, the unit comprises a base plate 100, adapted to be mounted at any convenient place on the frame, and preferably at the head end thereof. The gear reducer 72 is rigidly mounted on the base plate, as by bolts 102. A cam shaft bearing bracket 104 is mounted directly atop the gear reducer, preferably with an intervening gasket 106, by means of screws 108 or in similar conventional fashion. The bracket 104 carries an upstanding bearing lug 110, and at its opposite edge another bearing lug 112, which is formed however with a vertically extended portion 114 in which is cut the vertically extending slot 116. Lugs 110 and 112 are apertured in alignment, and rotatably support thereby the cam shaft 82, which is disposed, as shown, in parallelism to and directly above the gear reducer output shaft 74. The cam shaft, it will be noted, extends outwardly beyond the end of output shaft 74.

As shown in Figure 6, the gear reducer output shaft 74 carries a bushing 118, fixed thereto as by pin 120, on which an output gear 76 is non-rotatably mounted. Preferably the output gear 76 is mounted in conventional manner for easy removal and replacement. Referring to Figure 5, the cam shaft 82 outwardly of lug 112 is formed into an enlarged section 122, which terminates

inwardly at shoulder 124 of its integral collar 126. Change gear 80 is mounted on the enlarged section 122 of the cam shaft, against the shoulder 124, whereby when collar 126 abuts lug 112 it is aligned with the output gear 76. The change gear 80 is readily removable axially, but prevented from rotation relative to the cam shaft as by a key 128. Beyond the change gear, the cam shaft section 122 carries a cam spacer 130, the cam disc 84 and a retainer washer 132. A cap screw 134 engaged to the outer end of the cam shaft bears against the retainer washer 132, and maintains the assembly in firm engagement with the shoulder 124.

The output gear 76 and change gear 80 are both engaged by idler gear 78, which is rotatably mounted on stub shaft 136 of the swing bracket 138. The swing bracket is adjustably mounted by means of its offset stud 140 which extends through slot 116 of lug portion 114, and may be fixed to the lug portion in a variety of positions as by nut 142. This versatile mounting of the swing bracket, it will be evident, permits vertical adjustment of the stud 140 within slot 116 and lateral swinging movement of the bracket thereabout as well, whereby the stub shaft 136 and idler gear 78 may be adjustably positioned with complete freedom, and secured in desired position to engage any required combination of output and change gears.

Between lugs 110 and 112 the cam shaft 82 carries a fixed collar 144 and a longitudinally movable but preferably non-rotatable collar 146. Between collar 146 and the adjacent lug 112 is interposed a friction disc 148, and a similar friction disc 150 is mounted on the cam shaft immediately on the other side of the lug 112, between the lug and the shaft collar 126. A coil spring 152 compressed between collars 144 and 146 maintains firm contact between collar 146, friction disc 148 and lug 112, and urges the cam shaft inwardly, that is to the right as shown in Figure 2, thereby maintaining firm contact between shaft collar 126, friction disc 150 and lug 112.

Immediately below the cam disc the base plate 100 mounts an inverted U-shaped bracket 154, which supports the pivot pin 156 of rocker arm 158. One end of the rocker arm carries the follower 90, and the opposite end is engaged to switch 88. The switch 88 conveniently may be a conventional micro-switch, incorporating means resiliently urging its arm 160 outwardly, whereby the follower 90 is maintained in firm contact with the periphery of cam disc 84. As shown in Figures 2, 3 and 4, the switch 88 is supported by a bracket 162 mounted on the base plate of the unit.

In operation, the front roll 22 is driven by the cylinder shaft 10, through gears 12, 14, 16, 18 and 20. From this drive path, the drive is transmitted to the back roll 32 through gears 24, 26, 28 and 30, and the back roll drive is utilized to turn the intermediate roll, by means of gears 34, 36, and 38. The drawing rolls are driven at predetermined different speeds, the rotational speed of the intermediate roll 40 exceeding that of the back roll 32 to effect drafting therebetween, and the rotational speed of front roll 22 exceeding that of the intermediate roll, so that further drafting is effected between the intermediate and front rolls.

The slubbing mechanism includes an alternate, parallel drive to the drafting rolls 32 and 40, taken in this case from the intermediate gear 18, and transmitted through shaft 44, sprocket 46, chain 48, electro-magnetic clutch 52, chain 56 and sprocket 58 to the overrunning clutch 42. The sprockets 46 and 58 are sized so that the drive to the overrunning clutch exceeds in speed that normally imparted to crown gear 26 by the front roll gear 24, whereby the alternate drive is adapted, when electromagnetic clutch 52 is energized and engaged, to drive rolls 32 and 40 through overrunning clutch 42 at a speed exceeding that normally imparted to these rolls by the crown gear.

The front roll 22 of the frame runs at constant speed at all times, and periodic speeding up of the rolls 32 and 40, it will be understood, is effective to temporarily cause reduction in draft between rolls 40 and 22, and thereby form thick places or slubs in the yarn. The length of each slub is determined by the time interval during which the back rolls are rotated at abnormal speeds, that is by the length of the intervals during which the alternate drive is effective, and the diameter of each slub is determined by the extent of increase in back roll speeds as related to their normal speeds. The frequency of occurrence of the slubs and the intervals therebetween are determined by the operation of the alternate drive, in particular the electro-magnetic clutch thereof. The actuation of the electro-magnetic clutch is of course effected by the signal generator 60.

The signal generator, as illustrated, is driven by the front roll drive gear 20, through gear 62, shaft 66, sprocket 64 and chain 68. The chain 68 drives gear reducer 72, whereby the drive speed is greatly reduced. The gear reducer drives output gear 76, and through idler gear 78 the change gear 80, cam shaft 82 and the cam disc 84. As will be evident, a single revolution of the cam disc 84 represents the drafting of an extended length of yarn.

As the cam disc rotates, the follower 90 will enter and leave each dwell or slot 86 formed therein. As the follower enters each slot, resultant movement of the rocker arm 158 on its pivot 156 permits switch 88 to close, thereby energizing the electro-magnetic clutch 52, effecting engagement of the clutch and formation of a slub. As the follower 90 leaves each slot 86, the circuit through switch 88 is broken, and the electromagnetic clutch 52 is thereby disengaged. The length of each slub is accordingly controlled by the length of each cam slot 86, and the frequency of slub formation is controlled by the number of slots in the cam and their spacing. The cam disc accordingly constitutes a pattern control, and each complete revolution thereof represents a complete slub pattern, or a whole number of complete slub patterns.

The slub pattern effected by the signal generator may be readily altered by removing the cam disc 84, and replacing it with a similar disc having a distinctive slot pattern formed in the peripheral edge thereof. It is an outstanding feature of the present invention that this may be done with maximum ease, and very quickly. For such purpose it is required only that cap screw 134 be threaded out of the cam shaft enlarged section 122. The retainer washer 132 is thereby freed and may be removed, and the cam disc removed and replaced by another. Replacement of the retainer washer and the cap screw then returns the device to operative condition, and operation with a different slub pattern may proceed. The cam disc is of extremely simple design, and may be formed of a plate seven inches in diameter and one-eighth inch thick. Cutting of the cam slots 86 in the cam disc is a simple milling or machining operation.

The length of a slub cycle may be altered with comparable ease, since this requires no more than a substitution of a different sized change gear 80. To accomplish this, the idler gear may be disengaged by loosening nut 142, and swinging bracket 138 outwardly away from the change gear. The cap screw, retainer washer and cam disc may be removed as previously described, and the cam spacer 130 and change gear removed in similar fashion. A change gear of different diameter may then be positioned on the cam shaft enlarged section 122, the new change gear of course being engaged to the key 128 to prevent relative rotation thereof, and the cam spacer, cam disc, retainer washer and cap screw then replaced. Thereafter, the idler gear may be positioned in engagement with the new change gear and the output gear 76, and fixed in such adjusted position by tightening nut 142. For a greater range of slub cycle length, the output gear 76 may also be substituted by a comparable gear of

different diameter in similar fashion, the idler gear mounting being ideally adapted to facilitate this change also.

If it be desired to change the thickness of the slubs formed, this may be accomplished conveniently by suitably changing a drive sprocket of the alternate drive through the electro-magnetic clutch. For example, the drive sprocket **46** and the engaged sprocket on the clutch input shaft **50** may be removed and replaced by another pair, effective to change the drive ratio through the electro-magnetic clutch.

The spring **152**, in conjunction with the friction discs **148** and **150**, operates as a friction brake on the cam shaft, eliminating backlash which might result in jerky operation. In particular, this expedient maintains the cam follower **90** rolling, and prevents it from jumping into or out of the cam slots **86**.

The signal generator is both simple and sturdy, and capable of operating for extended periods with occasional lubrication and no other attention. Its simplified design results in low unit cost, and the power consumption thereof is negligible. The unit is extremely compact, being contained almost entirely within the confines of the cam disc, as best shown in Figure 4. The compact arrangement is made possible primarily by mounting the cam shaft on the gear reducer, and by extension of the cam shaft beyond the output shaft **74** of the gear reducer, whereby the gears **76**, **78** and **80** are disposed close together and beind the cam disc.

As previously indicated, the signal generator exhibits extreme versatility, and a wide range of slub patterns may be utilized at will through the maintenance of a small inventory of cam discs and change gears. The invention permits individual control for each spinning frame, whereby a plurality of slub patterns may be reduced simultaneously in a single mill. The slub pattern established by the cam disc is produced continuously and with outstanding uniformity, and the slubs formed in each cycle are of comparable uniform size.

It will thus be seen that there has been provided by this invention a structure in which the various objects hereinbefore set forth, together with many practical advantages, are successfully achieved. As various possible embodiments may be made of the mechanical features of the above invention, all without departing from the scope thereof, it is to be understood that all matter hereinbefore set forth or shown in the accompanying drawings is to be interpreted as illustrative, and not in a limiting sense.

We claim:

1. A signal generator for spinning frame slubbling mechanism comprising a drive shaft, a cam shaft mounted parallel to said drive shaft and extended therebeyond, a drive gear mounted on said drive shaft, a cam gear mounted on said cam shaft in general alignment with said drive gear, an idler gear engaging said drive gear and said cam gear, a swing bracket mounting said idler gear for adjustable positioning thereof, a disc cam detachably mounted on said cam shaft between said cam gear and the extended end of said cam shaft, friction means effective to brake the rotation of said cam shaft and the associated disc cam, a switch, and switch actuating means engaging the periphery of said disc cam.

2. A signal generator for spinning frame slubbing mechanism comprising a gear reducer having input and output shafts, a bracket mounted on said gear reducer, said bracket having a vertical slot therein, a cam shaft rotatably mounted on said bracket parallel to said output shaft and extending therebeyond, a drive gear mounted on said output shaft, a cam gear mounted on said cam shaft in general alignment with said drive gear, a swing bracket, a stud extending from one end of said swing bracket adjustably positioned in said bracket slot, an idler gear mounted on the opposite end of said swing bracket engaging said drive gear and said cam gear, a disc cam detachably mounted on said cam shaft between said cam gear and the extended end of said cam shaft, an electric switch, and switch actuating means engaging the periphery of said cam disc.

3. A signal generator as defined in claim 2, including resilient means disposed between said bracket and said cam shaft, said resilient means being effective to maintain said cam shaft normally in extreme rearward position and to frictionally brake the rotation of said cam shaft and the associated disc cam.

4. In combination with a spinning frame, a drive for said spinning frame, a slubbing mechanism including a signal generator comprising a drive shaft connected to and driven by said spinning frame drive, a cam shaft mounted parallel to said drive shaft and extending therebeyond, a drive gear mounted on said drive shaft, a cam gear mounted on said cam shaft in general alignment with said drive gear, an idler gear engaging said drive gear and said cam gear, a disc cam detachably mounted on said cam shaft between said cam gear and the extended end of said cam shaft, a switch, and switch actuating means engaging the periphery of said disc cam.

5. In combination with a spinning frame, a drive for said spinning frame including intermediate and crown gears, a slubbing mechanism including an alternate drive between the intermediate and crown gears of said frame, an overrunning clutch in said crown gear, an electromagnetic clutch in said alternate drive, and a signal generator controlling the operation of said electro-magnetic clutch, said signal generator comprising a drive shaft connected to and driven by the spinning frame drive, a cam shaft mounted parallel to said drive shaft and extending therebeyond, a drive gear mounted on said drive shaft, a cam gear mounted on said cam shaft in general alignment with said drive gear, an idler gear engaging said drive gear and said cam gear, a disc cam detachably mounted on said cam shaft between said cam gear and the extended end of said cam shaft, a switch, and switch actuating means engaging the periphery of said disc cam.

6. In combination with a spinning frame, a drive for said spinning frame including intermediate and crown gears, a slubbing mechanism including an alternate drive between the intermediate and crown gears of said frame, an overrunning clutch in said crown gear, an electromagnetic clutch in said alternate drive, and a signal generator controlling the operation of said electro-magnetic clutch, said signal generator comprising a gear reducer having input and output shafts, said input shaft being connected to and driven by said spinning frame drive, a cam shaft mounted parallel to said output shaft and extending therebeyond, a drive mounted on said output shaft, a cam gear mounted on said cam shaft in general alignment with said drive gear, an idler gear engaging said drive gear and said cam gear, a swinging bracket mounting said idler gear for adjustable positioning thereof, a disc cam detachably mounted on said cam shaft between said cam gear and the extended end of said cam shaft, a switch, and switch actuating means engaging the periphery of said disc cam.

7. The combination as defined in claim 6, including friction means effective to brake the rotation of said cam shaft and the associated disc cam.

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