

Nov. 5, 1963

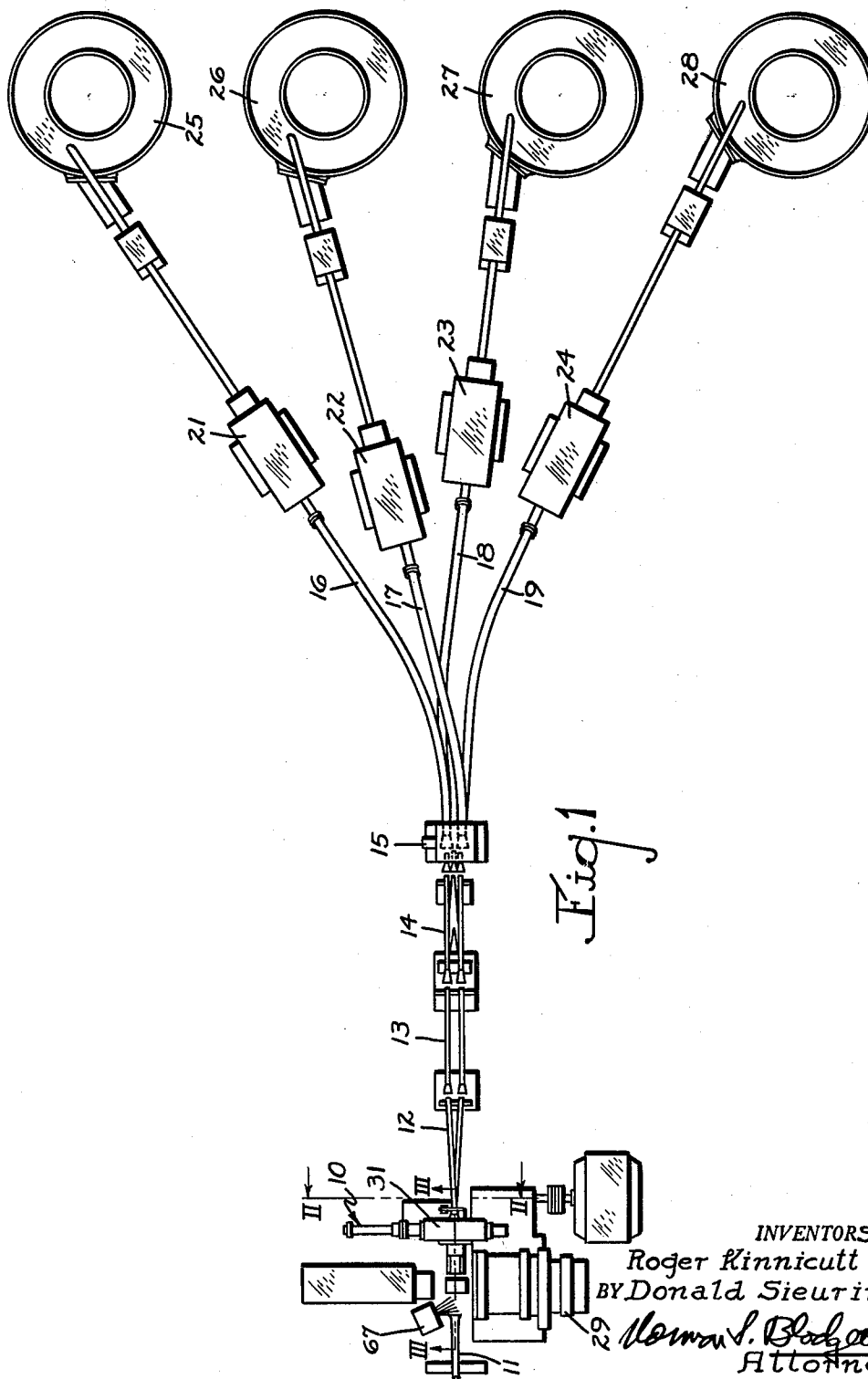
R. KINNICUTT, JR., ETAL

3,109,340

SEVERED PRODUCT SWITCHING MEANS

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3 Sheets-Sheet 1



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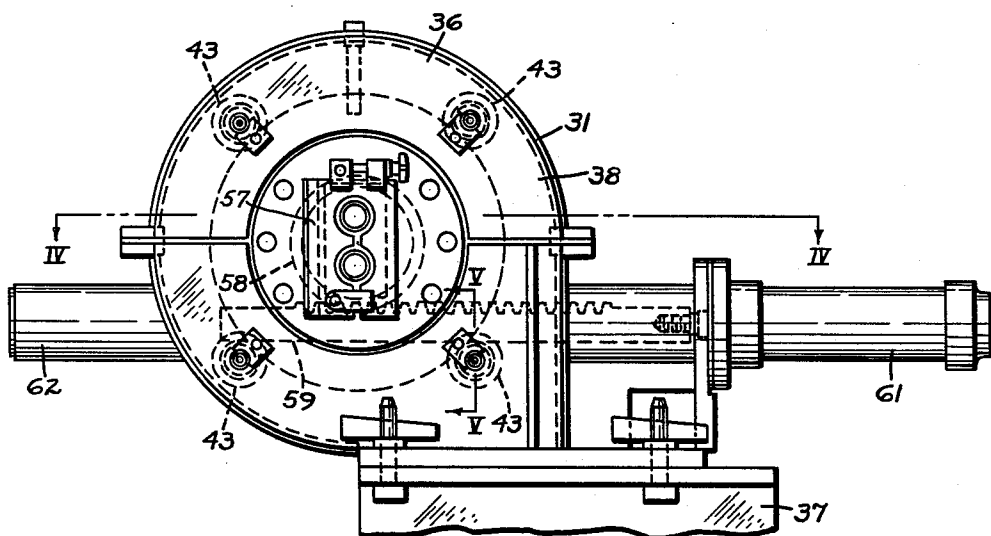


Fig. 2

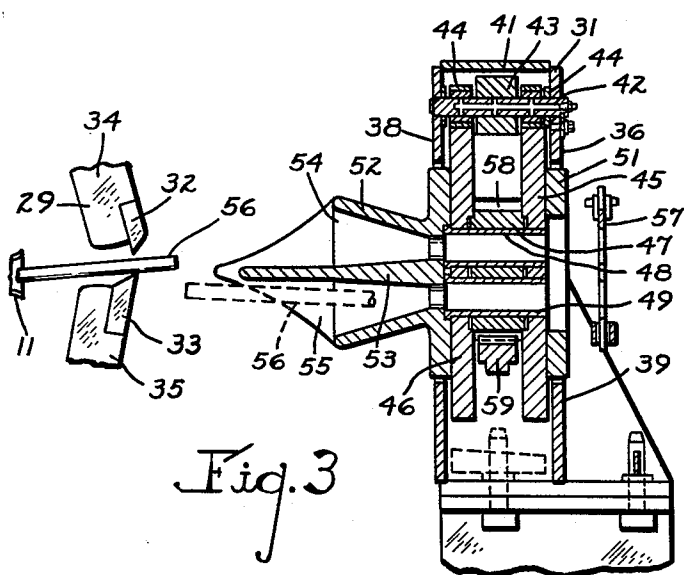


Fig. 3

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3 Sheets-Sheet 3

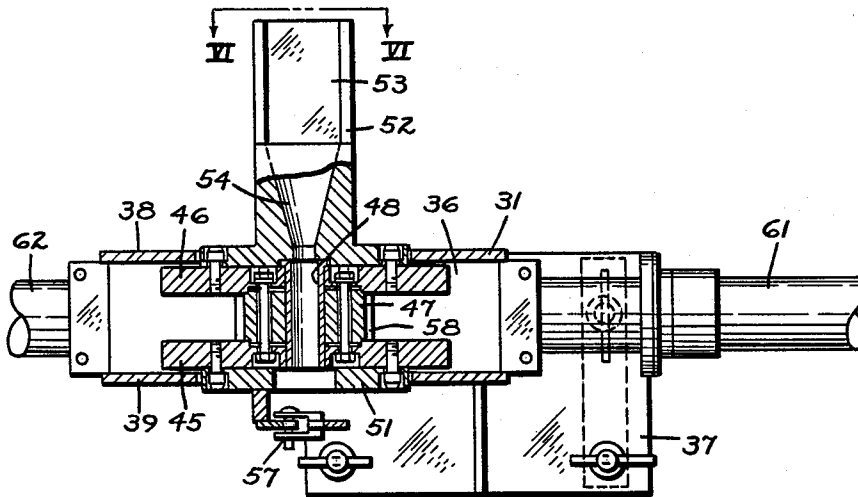


Fig. 4

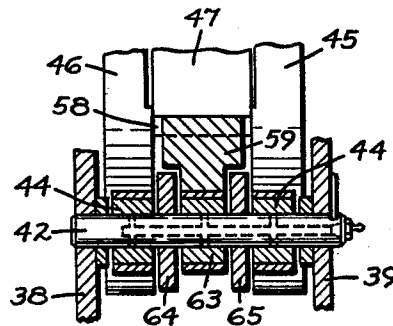


Fig. 5

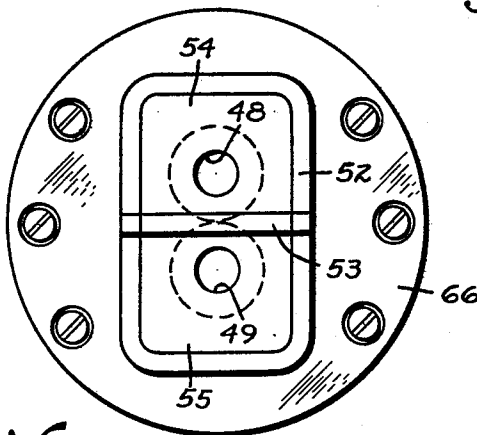


Fig. 6

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SEVERED PRODUCT SWITCHING MEANS

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1 Claim. (Cl. 83-105)

This invention relates to switching means, and more particularly to apparatus arranged to cause the rolled product of a rolling mill selectively to enter any one of a number of paths.

In the operation of a rolling mill, it is quite often necessary to cause an extremely long piece of product to be divided and passed to a plurality of disposal apparatus. In the rolling of rod, for instance, the rod leaves the last roll stand in extremely long lengths which are much greater than could be accommodated by an ordinary reel. It is also sometimes necessary to produce coils of rod of a weight less than the weight of the billet or bar from which the rod was rolled. For these reasons it becomes necessary to sometimes cut the rod into shorter lengths and to cause each length to pass to a specific reel. It is normal practice to coil the entire product of a mill by the use of several reels, but it is necessary that the lengths of the rod pass to one reel after another in succession and that a length be introduced again to the first reel of a series only after the other reel of the series have been successively used. By that time the first reel has coiled its length of rod, has discharged it, and is ready for another rod. Apparatus has been conceived and built in the past to direct divided lengths of rod to various reels but, as the speed of rolling mills increased, it becomes more and more difficult to so direct the rod. Attempts to solve the problem have been very complicated and expensive. These and other difficulties experienced with the prior art devices have been obviated in a novel manner by the present invention.

It is, therefore, an outstanding object of the invention to provide a switching means for reliably introducing successive lengths of product of the rolling mill into various paths.

Another object of this invention is the provision of a switching means consisting of a shear and switch so related as to give accurate placement and introduction of successive lengths of rolling mill product to desired paths.

A further object of the present invention is the provision of a switch of simple and rugged construction for introducing the front ends of lengths of rolling mill product into desired paths.

It is another object of the instant invention to provide a switch of simple and rugged construction which may be readily manufactured from easily obtainable materials and any standard manufacturing processes.

Another object of the invention is the provision of apparatus for cutting rapidly moving lengths of material and directing the parts into desired paths.

With these and other objects in view, as will be apparent to those skilled in the art, the invention resides in the combination of parts set forth in the specification and covered by the claim appended hereto.

The character of the invention, however, may be best understood by reference to one of its structural forms, as illustrated by the accompanying drawings in which:

FIG. 1 is a plan view of a portion of the rolling mill incorporating the principles of the present invention;

FIG. 2 is an elevational view of the switch of the present invention taken along the line II—II of FIG. 1;

FIG. 3 is a vertical sectional view of the apparatus taken along the line III—III of FIG. 1;

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FIG. 4 is a horizontal sectional view of the switch taken along the line IV—IV of FIG. 2;

FIG. 5 is a sectional view of a portion of the invention taken along the line V—V of FIG. 2; and

FIG. 6 is an enlarged elevational view of a portion of the switch taken along the line VI—VI of FIG. 4.

Referring to FIG. 1, wherein are best shown the general features of the invention, a switch means, indicated generally by the reference numeral 10, is shown in use in conjunction with other elements of a rod rolling mill. For instance, a conduit 11 adapted to carry rod from the last stand of a rolling mill approaches one side of the apparatus. At the other side of the apparatus switch pipes 12 lead to intermediate pipes 13 which lead to another set of pipes 14. The pipes 14 terminate in a housing 15 which carries the entrance end of pipes 16, 17, 18 and 19 which lead through a cooling apparatus 21, 22, 23 and 24, respectively, to reels 25, 26, 27, and 28. The switching means 10 consists generally of a shear 29 and a switch 31. Referring to FIG. 3, it can be seen that the conduit 11 terminates close to the blades 32 and 33 which are mounted on knife holders 34 and 35 respectively, of the shear 29.

Referring to FIGS. 2, 3 and 4, which show the details of the switch 31, it would seem that the switch consists of a housing 36 mounted on a base 37. The housing consists of a front wall 38 and a rear wall 39 joined by a curved peripheral wall 41. Extending between the two walls at equally spaced points close to their peripheries are four shafts 42 on which are rotatably mounted wheels 43. On either side of each wheel 43 are mounted smaller wheels 44. Held within one group of smaller wheels is an internal disk 45, while a similar internal disk 46 is held within the other group of four smaller wheels. The large wheels 43 lie in the space between the two internal disks which are held in spaced parallel relationship. Held between the disks, which are provided with circular central apertures, is a switch body 47 having two bores extending therethrough, one bore having a sleeve 48 and the other bore having a sleeve 49. Fastened to the outwardly-facing surface of the internal disk 45 is a ring 51 which extends through and occupies the entire area of the aperture in the rear wall 39 of the housing. Fastened to the outwardly facing surface of the internal disk 46 is a horn 52 which is generally funnel-shaped and is provided with a central flat wall 53 which divides the horn into an upper passage 54 aligned with the sleeve 48 and a lower passage 55 aligned with the sleeve 49. The wall 53 extends well within the area subtended by the drums 34 and 35 of the shear 29 and the walls of the horn are cut back with a sweeping curve from the end of that wall to avoid the path of the knives 32 and 33 as the shear rotates. The line of rotation of the internal disks 45 and 46 with the sleeves 48 and 49 and the horn 52 is an axis parallel to and midway between the axes of the sleeves 48 and 49. As the apparatus is arranged in the figures, the passage 55 and the sleeve 49 are aligned generally with the path occupied by a rod as it goes through the shear when the shear knives are away from cutting position, i.e., with the rod 56 occupying the lower position resting on the lower surface of the conduit 11. Immediately after the rod is cut, the new front end will be supported in an upper position by the lower blade 33 and occupies the solid line position wherein it is aligned with the passage 54 and the sleeve 48. Also mounted on the ring 51 is a bracket 57 which supports the adjacent ends of the pipes 12.

The switch body 47 is formed with a pinion 58 whose teeth are engaged by the teeth of a horizontal rack 59 which is fastened to the piston of a horizontally-arranged, pneumatic linear actuator 61. The housing 36 is provided with an elongated chamber 62 adapted to receive

and enclose the end of the rack 59 in the extreme outer position of the actuator 61.

In FIG. 5 is shown a somewhat enlarged view of the section of one of the areas in the housing containing a shaft 42, particularly showing the method of lubrication and also the manner in which the rack 59 rests on a wheel 63 and is provided with grooves on its under side which are engaged by two large wheels 64 and 65. The small wheels 44 engage the internal disks 46 and 45 and between these disks lies the switch body 47 with its pinion 58 engaging the teeth on the rack 59.

FIG. 6 shows particularly well the appearance of the horn 52 which is integral with a disk 66 bolted to the internal disk 46. It is evident in this view that the cross section of the horn is generally rectangular with the long direction arranged vertically and with the wall 53 extending across its central portion.

The operation of the apparatus will now be readily understood in view of the above description. A length of rod which has been finished in the rolling mill arrives at the apparatus through the conduit 11, the passing of its front end having been duly noted down-stream by suitable signal flag which started the shear 29 rotating. The presence of the front end of the rod 56 is duly noted by a photoelectric cell 67 which is located beside the shear and which is directed toward the end of the conduit 11. Since the blades of the shear have not yet entered the neighborhood of the rod, the rod rests on the lower surface of the conduit 11 and, therefore, passes through the shear into the lower passage 55 of the horn 52 of the switch 31. It passes then through the sleeve 49 onto one of the pipes 12. It should be noted that the upstream end of the pipes 12 are arranged vertically, one above the other, so as to align with sleeves 48 and 49. At the other end, the pipes 12 are spread apart and in the same horizontal plane and are aligned with parallel, generally-horizontal pipes 13. The pipes 13 are pivotally movable about their upstream ends and are moved by a hydraulic actuator in the usual way. In the uppermost position the pipes 13 are aligned with upper pipes 14, while in a lower position are aligned with a crop pipe. Each of the two upper pipes 14 is movable vertically by a suitable actuator and is able to direct rod to one of the pipes 16 and 18 or 17 and 19 leading to the reels 25 and 27 or 26 and 28. While the front end of the rod 56 is moving through the passage 55, the shear continues to rotate and, eventually, the blades 32 and 33 engage and cut the rod. This first cut would normally be a short length or "crop." Now, the lower blade 33, in reaching cutting position, presses against the underside of the rod 56 and passes it upwardly so that, when the cut is completed, the front end of the following length is on the level shown in solid lines, i.e., in alignment with the upper passage 54 of the horn 52. The rod, therefore, passes through the passage 54 and the sleeve 48 to the uppermost of the pipes 12 and, as viewed in looking from the shear toward the reels, it is switched to the left. If the rod 56 is extremely long, it may be cut into several lengths and between cuts the linear actuator 61 is set in motion to act through the rack 59 to rotate the whole internal apparatus including the horn 52 and the sleeves 48 and 49. Once the first cut has been completed, the operator (or, in some cases, automatic mechanism) will cause the linear actuator 61 to rotate the horn so that the passage 55 is uppermost and the passage 54 is in the low position. Since the blade 33 is out of the way by the time

the reversal is completed, the rod is free to move downwardly with its passage and, so, it occupies the dotted line position in FIG. 3. When the next cut is made, of course, the next piece enters the passage 53 which is now in the uppermost position and, after the rod is well introduced into the system through the switch, the switch is again reversed so that the passage 54 is uppermost again. Usually, a cut will be made of a short length at the front and a short length at the rear of the rod. These are known as "crops" and it is desirable to dispose of them. For that reason, the pipes 14 are inclined downwardly to align themselves with the crop pipe which underlies pipes 14 and the cropped front end goes through the crop pipe for disposal. The rest of the lengths of rod, however, are suitably directed toward the pipes 16, 17, 18 and 19 and toward their respective reels by manipulating the pipes 13 and 14. The operation of the shear, switch, and pipes may take place by use of photoelectric cells and other automatic apparatus, or it may be done by hand. It can be seen, however, that the use of the reels may take place in a predetermined sequential order with positive, accurate switching and with no danger of a rod being introduced into a pipe which already contains a rod or into a reel which has not yet discharged its coil.

It is obvious that minor changes may be made in the form and construction of the invention without departing from the material spirit thereof. It is not, however, desired to confine the invention to the exact form herein shown and described, but it is desired to include all such as properly come within the scope claimed.

The invention having been thus described, what is claimed as new and desired to secure by Letters Patent is:

Apparatus for shearing into a plurality of separate pieces an elongated product running at high speed and for switching said pieces alternately into separate paths comprising, a conduit for delivering said elongated product along a pass line, a switch body having two spaced parallel bores extending therethrough, means normally positioning said body with said bores one above the other, means mounting said body for rotation about an axis above and parallel to the extension of said pass line and longitudinally spaced from the delivery end of said conduit, a pair of funnel-shaped guides attached to said body and diverging from the input ends of said bores toward said conduit, said guides having a common horizontal wall in line with said axis of rotation, a rotary shear positioned between said conduit and said tubular guides for severing said product, the lower blade of said shear after a cut is made elevating the free end of said product to a position above said horizontal wall and into the upper one of said guides, and means for rotating said body and said guides through 180° first in one direction of rotation and then in the opposite direction after each successive cut of said product by said shear to deliver the free cut end of said product to the upper one of said guides and running the product after said 180° rotation through the lower one of said guides and said bores.

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