

[72] Inventors **Willard J. Ganga**
Merrillville, Ind.;
Anthony M. Longhi, Thornton, Ill.
 [21] Appl. No. **804,637**
 [22] Filed **Mar. 5, 1969**
 [45] Patented **June 15, 1971**
 [73] Assignee **United States Steel Corporation**

[56]

References Cited

UNITED STATES PATENTS

1,900,252	1933	Morgan	83/288
3,178,974	1965	Roess	83/292X
3,299,757	1967	Schumacher et al.	83/293
3,382,112	1968	Oxley et al.	266/23(M)UX
3,415,150	1968	Krueger	83/319

Primary Examiner—Andrew R. Juhasz

Assistant Examiner—James F. Coan

Attorney—Walter P. Wood

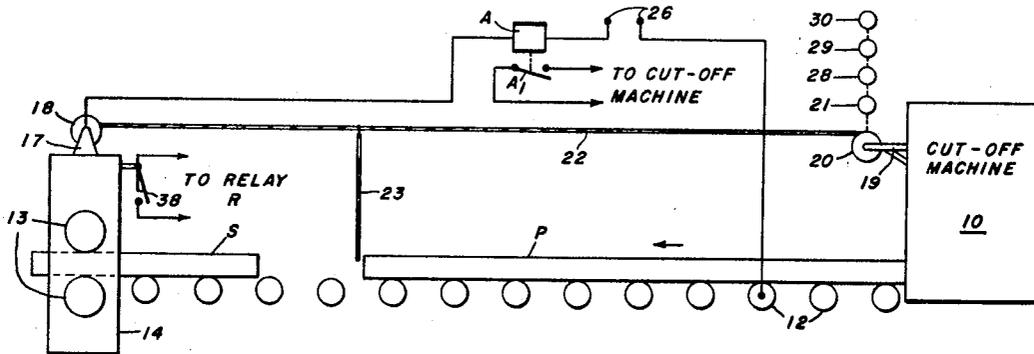
[54] **GAGE FOR CONTROLLING LENGTH OF SEGMENTS CUT FROM A LONGER PIECE**
 7 Claims, 2 Drawing Figs.

[52] U.S. Cl. 266/23,
 33/147, 33/148, 83/156, 83/287, 83/292, 83/370

[51] Int. Cl. B23k 7/02,
 B26d 5/38

[50] Field of Search 266/23 M,
 23 A; 164/70; 83/370, 363, 286, 287, 288, 293,
 156, 292; 33/147 L, 148 A

ABSTRACT: A gage for controlling the length of segments cut from a longer piece, particularly a continuously cast steel product. The gage includes a spring-loaded drum, a cable wound around the drum and extending over the product to the cutoff machine, and a rod freely suspended from the cable into the path of the piece. When the leading end of the piece abuts the rod, the cutoff machine starts and travels with the piece as it makes a cut, while the cable winds on the drum.



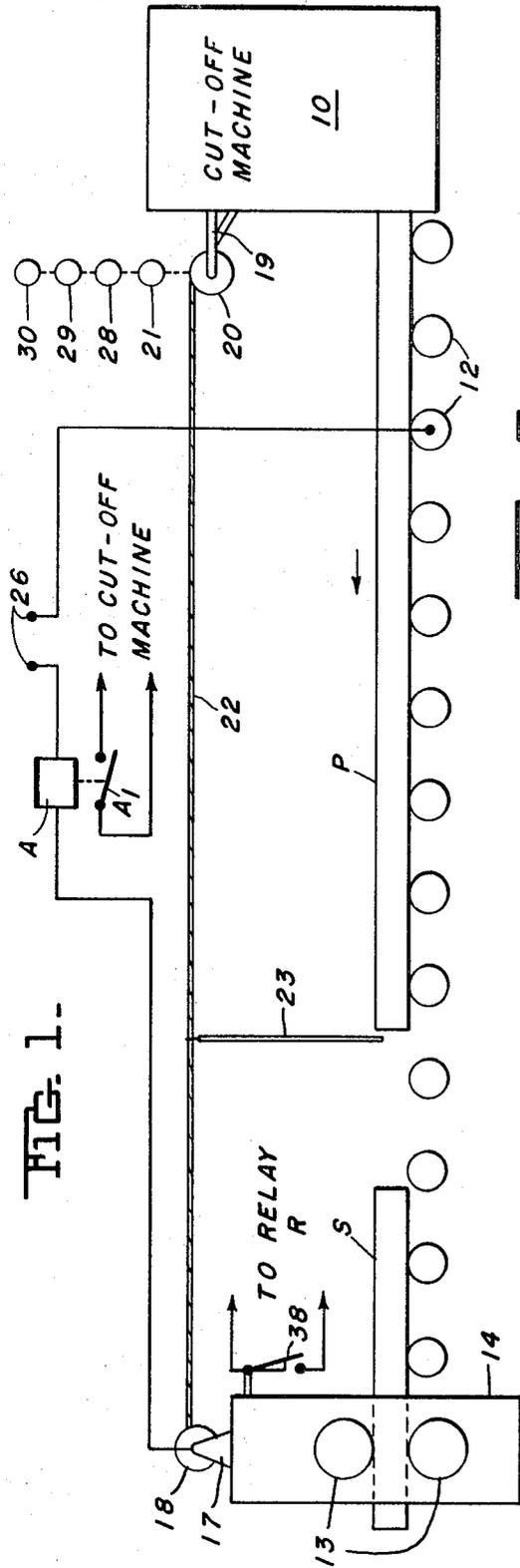
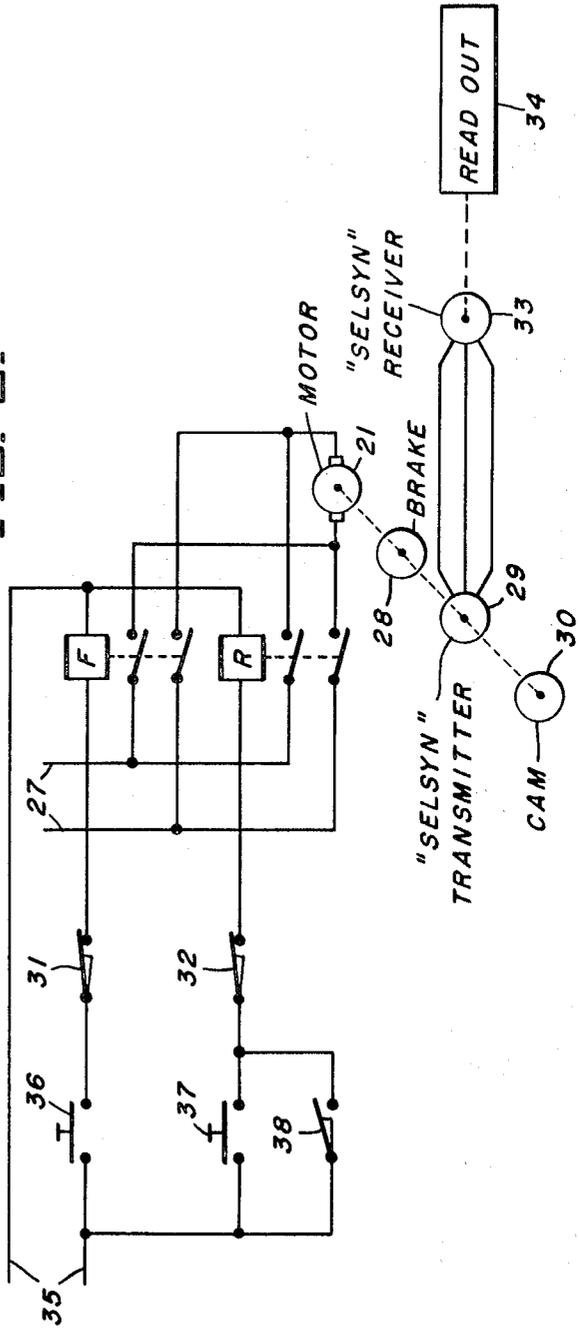


FIG. 2-



INVENTORS.
 WILLARD J. GANGA and
 ANTHONY M. LONGHI
 By *Halter P. Wood*
 Attorney

GAGE FOR CONTROLLING LENGTH OF SEGMENTS CUT FROM A LONGER PIECE

This invention relates to an improved gage for controlling the length of segments which a traveling cutoff machine cuts from a longer piece.

Although our invention is not thus limited, our gage is particularly useful as applied to a machine which cuts segments of a specified length from a much longer continuously cast steel product (slab or billet). The original casting, which may be several hundred feet long, is reheated immediately following the casting operation, and thence travels through a series of roll stands. After emerging from the last of these stands, the product is cut into shorter segments, for example 18 or 36 feet long. The cutoff machine commonly includes a carriage equipped with either cutting torches or a circular saw. The carriage is clamped to the product and travels therewith as the torches or saw make their cut. Initially the carriage is stopped and its clamps are disengaged from the product while a length of product equal to the desired length of segment passes. After completion of each cut, the clamps are released, and the carriage returns to its starting position. The clamps are operated hydraulically, and the hydraulic mechanism is actuated through an electric switch. Reference can be made to McDermott U.S. Pat. No. 3,227,432 for a showing of a machine of this type equipped with torches, or to Krueger U.S. Pat. No. 3,415,150 for a showing of a machine equipped with a saw.

As explained in the Krueger patent, it is known to use a heat detector to determine when the desired length of a continuously cast product has passed the carriage. The heat detector automatically operates the switch which starts the cutoff machine. We have observed that the heat detector is not sufficiently accurate to enable the machine to cut segments of uniform length. The difficulty likely is due to variations in the temperature of the product. It is known also to use a limit switch for controlling similar operations where the piece is cold, for example in cutting cold-reducing tubing, as shown in Edwards et al. U.S. Pat. No. 2,340,870. However, a limit switch is impractical for engagement by a piece which is at a high temperature.

An object of our invention is to provide an improved gage which is of simplified construction, yet is accurate and reliable for use with pieces at a high temperature.

A further object is to provide an improved gage of the foregoing type which is readily adjustable for cutting segments of different lengths.

A more specific object is to provide an improved gage which comprises rather simply a spring-loaded drum, a cable wound on the drum and extending over the piece to a motor-driven drum on the cutoff machine, a rod freely suspended from the cable into the path of the piece and suitable electric controls.

In the drawing:

FIG. 1 is a diagrammatic side elevational view of a portion of a cutoff machine and adjacent parts equipped with our gage; and

FIG. 2 is a wiring diagram of the electric circuit.

FIG. 1 shows the carriage 10 of a traveling cutoff machine, which may be of either the torch type or the saw type. An elongated piece P, which may be at a high temperature and is to be cut into segments S of a specified shorter length, travels through the carriage from right to left. The cutoff machine may be constructed and operate as shown and described in the aforementioned McDermott or Krueger patents; hence we have not repeated the showing. Conveyor rollers 12 support the piece P and segments S on the exit side of carriage 10. A set of conventional power-driven pinch rolls 13 are journaled in a housing 14 and propel the segments as they leave the rollers 12.

In accordance with our invention, the top of the pinch roll housing 14 carries bearings 17 in which we journal a spring-loaded drum 18. The exit side of the carriage 10 carries bearings 19 in which we journal a drum 20 driven by a reversi-

ble electric motor 21. We extend a flexible electrically conductive cable 22 between drums 18 and 20. Drum 18 has sufficient capacity that the entire cable can wind on it, and preferably drum 20 is of the same size. We freely suspend an electrically conductive rod 23 in the path of the piece P as it travels beyond carriage 10. We operate motor 21 to adjust the cable to a position such that the leading end of the piece abuts the rod when the desired length of segment S has passed the carriage. Thereupon the cutoff machine starts its cut. The spring-loaded drum 18 takes up the cable 22 while the carriage approaches the pinch rolls 13 during the cutting operation. The carriage pulls the cable back when it returns to its starting position, so that rod 23 also returns to its starting position. Since the rod is freely suspended, it does not interfere with movement of segments S as they pass on their way to the pinch rolls 13.

Although we may simply observe when the piece P abuts rod 23 and start the cutoff machine manually, we prefer to equip the gage with means for starting the operation automatically. To accomplish this we connect the coil of a relay A to cable 22 and to one side of a suitable power source 26. We connect one of the conveyor rollers 12 to the other side of this power source. The relay has a set of normally open contacts A₁, which we connect to cutoff machine. When the piece P abuts the rod, it completes a current path through the relay coil, whereupon contacts A₁ close and start the machine. The two drums 18 and 20 of course are electrically insulated from the other parts. Preferably relay A is equipped with a suitable timer (not shown) to deenergize it automatically when the cutoff machine starts, and reset it automatically in time for the next operation. Meanwhile the cutoff machine makes its cut and the carriage returns to its starting position.

FIG. 2 shows our preferred circuit for motor 21. We connect the motor to a suitable power source 27 through normally open contacts of "forward" and "reverse" relays F and R respectively. When the "forward" relay F is energized, the motor runs in a direction to unwind cable 22 from drum 20 and allow the spring-loaded drum 18 to take up the cable, thus moving rod 23 toward the pinch rolls 13. When the "reverse" relay R is energized, the motor runs in a direction to wind cable 22 on drum 20, thus moving rod 23 toward the cutoff machine 10. The motor is equipped with a brake 28 which is applied or released automatically when the motor is deenergized or energized, as known in the art. The motor also drives a "Selsyn" transmitter 29 and a cam 30 for operating limit switches 31 and 32 hereinafter described. We connect the transmitter 29 to a "Selsyn" receiver 33, and connect the latter to a "readout" device 34, which shows the actual starting position of rod 23.

We connect the coil of the "forward" relay F across a suitable power source 35 in series with a normally open pushbutton switch 36 and the normally closed limit switch 31, which is operated by cam 30. Similarly we connect the coil of the "reverse" relay R across the same power source in series with a normally open pushbutton switch 37 and the normally closed cam-operated limit switch 32. When we wish to adjust the position of rod 23 in either direction, we close the appropriate switch 36 or 37 and thus energize the corresponding relay F or R and the motor 21. If we hold either switch closed too long, cam 30 opens the corresponding limit switch 31 or 32 to prevent rod 23 from hitting drum 18 or 20.

We mount a normally open limit switch 38 in a position to be engaged by rod 23 as it approaches the pinch rolls 13. We connect this limit switch in parallel with the pushbutton switch 37, which controls the "reverse" relay R. If rod 23 approaches the pinch rolls too closely during a cutting operation, it closes the limit switch 38 and thus energizes the "reverse" relay. Motor 21 operates to pull the rod away from the pinch rolls. At the conclusion of such a cutting operation, we operate the motor in the forward direction to reset the rod to its proper starting position, as indicated on the readout device 34.

From the foregoing description it is seen that our gage is of simple construction, yet it accurately signifies when the piece

is positioned to be cut. There is no reliance on heat detectors, which depend for their operation on the temperature of the piece. The rod is readily adjusted for cutting any length of segment, and it can withstand the necessary contact with a high-temperature piece.

We claim:

1. The combination, with a machine which cuts segments of a specified length from a longer piece, a conveyor for the piece and segments, and means for propelling the segments as they leave said conveyor, said machine including a carriage which is stopped initially as a length of piece equal to the segment length passes on said conveyor and which travels with the piece during each cutting operation and returns at the completion thereof, of a gage for controlling the segment length, said gage comprising a flexible cable, a first support for said cable mounted above said conveyor at a location spaced from said carriage, a second support for said cable mounted on said carriage, and a rod freely suspended from said cable into the path of the piece on said conveyor for contact by the leading end of the piece when a length thereof equal to the segment length passes said carriage, said first support including means for taking up said cable as said carriage approaches.

2. A combination as defined in claim 1 in which the means for taking up said cable includes a spring-loaded drum.

3. A combination as defined in claim 1 in which second support includes a drum journaled on said carriage and a reversible motor for driving said drum.

5 4. A combination as defined in claim 1 comprising in addition electric means connected to said rod and said conveyor for starting said machine automatically when the leading end of the piece abuts said rod.

5 5. A combination as defined in claim 1 in which said propelling means includes a set of power-driven pinch rolls and a housing in which said rolls are journaled, and in which the means for taking up said cable includes a spring-loaded drum journaled on said housing, and said second support includes a drum journaled on said carriage and a reversible motor for driving said second-named drum and thereby adjusting the position of said rod.

15 6. A combination as defined in claim 5 comprising in addition cam operated limit switches connected with said motor to prevent said rod from hitting either of the supports for said cable.

20 7. A combination as defined in claim 5 comprising in addition a limit switch operated by said rod as it approaches said housing to actuate said motor.

25

30

35

40

45

50

55

60

65

70

75