Jan. 11, 1966 G. HABERSTROH 3,228,599

REVERSE-TRANSPORT SYSTEM FOR INFORMATION-CARRYING BANDS

Filed Oct. 28, 1963 2 Sheets-Sheet 1

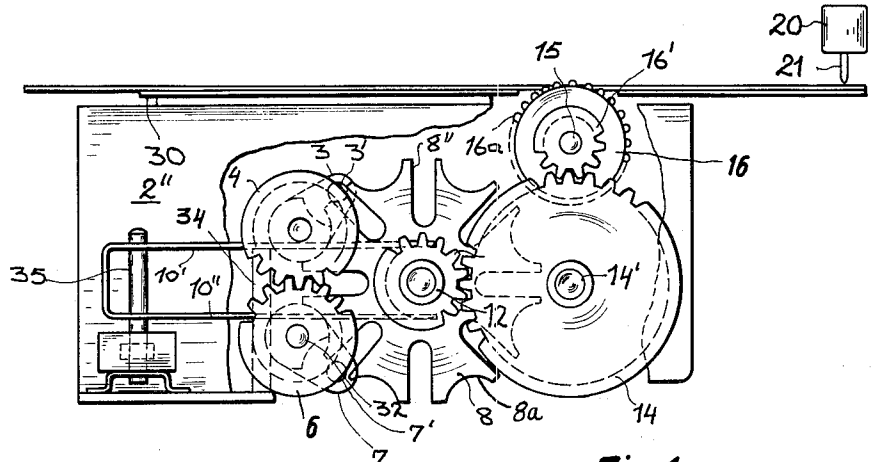


Fig. 1

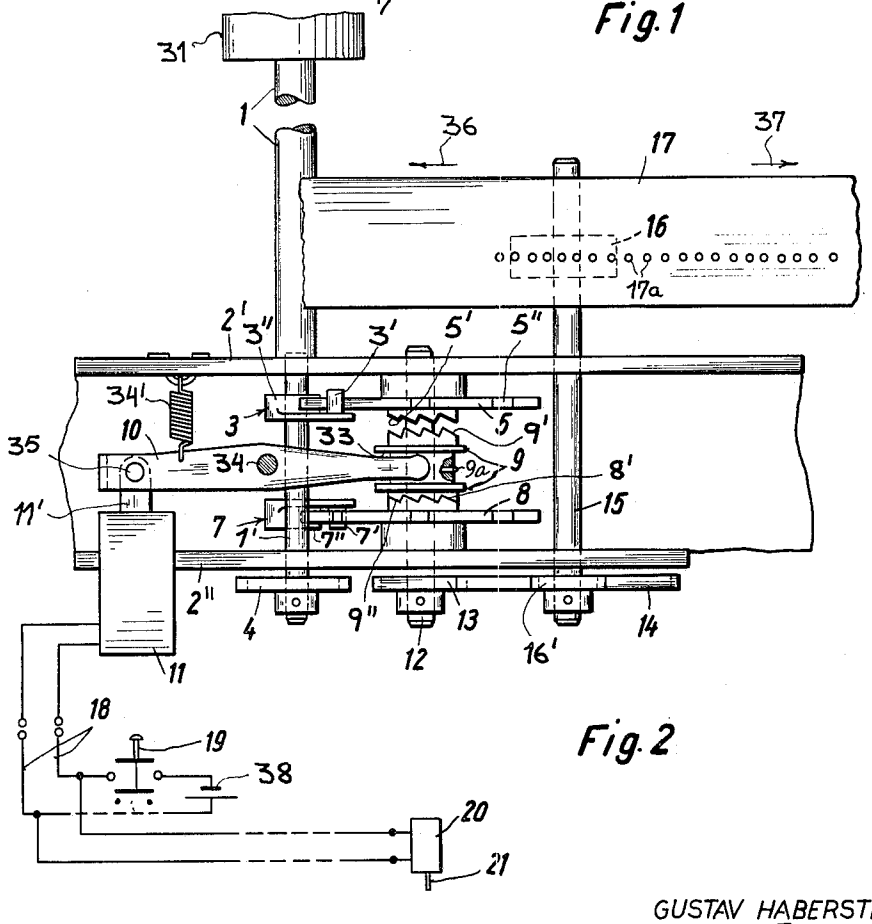


Fig. 2

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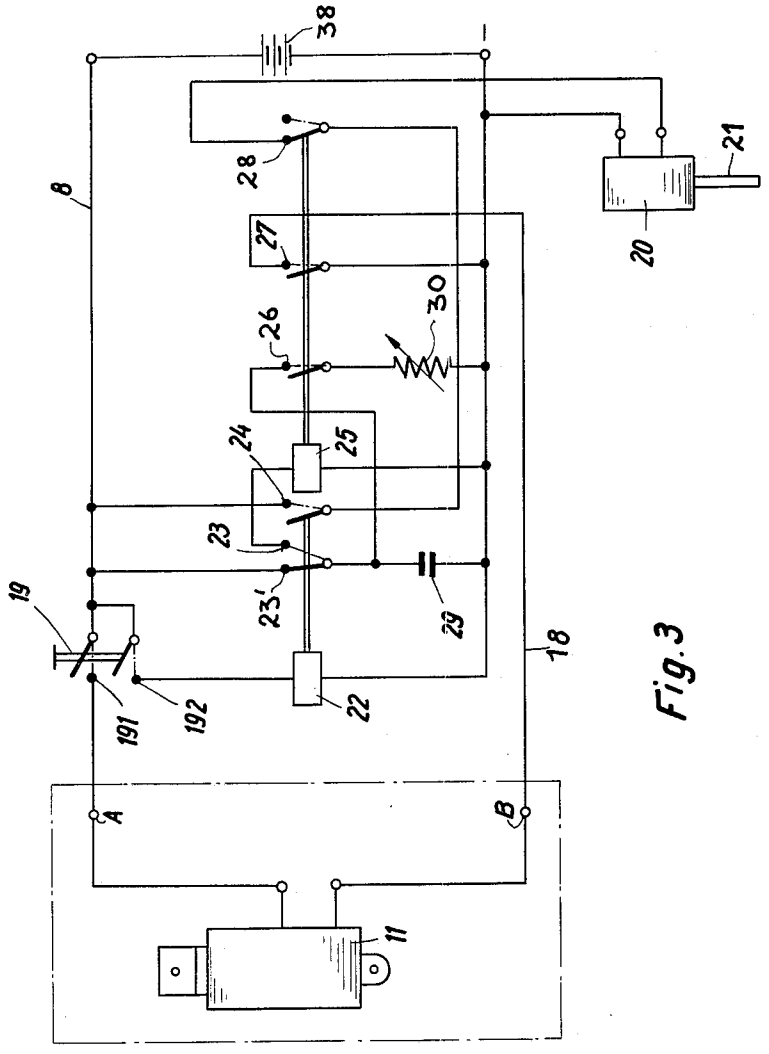


Fig. 3

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REVERSE-TRANSPORT SYSTEM FOR INFORMATION-CARRYING BANDS

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6 Claims. (Cl. 234—129)

My present invention relates to drive and correction mechanism for information-carrying bands and especially to perforated strips of the type which are punched in response to key-operated devices and remote actuating systems.

Information-carrying bands of this character are usually displaced via a drive mechanism having reversal capabilities to facilitate the overperforation or correction of an error or to permit perforation of a region which has inadvertently failed to be punched properly. Known strip perforators of this type have the important disadvantage that there is no assurance that only a single erroneous perforation will be corrected since almost invariably these perforators couple the punching mechanism for the overperforation or reperforation to the reverse-drive means; it is clear, therefore, that as long as the reverse-drive means remains operable in these devices, the error punch will operate upon the information-carrying strips. Analogous difficulties are prevalent with other types of information carriers.

It is the principal object of the present invention, therefore, to provide in a strip perforator having error-correction or marking means, mechanism for preventing undesirable overpunching of the strip.

A more general object of this invention is to provide improved error-correction means for modifying the information carried by a continuous strip wherein the aforementioned disadvantages of earlier devices are obviated.

Still another object of this invention is to provide an improved drive mechanism for strip-information carriers with capability of reverse displacement thereof.

These and other objects which will become apparent hereinafter have been attained, in accordance with the present invention, in an error-correction system for perforated and other strip- or band-information carriers which is based upon a principle deviating sharply from that prevalent hitherto in earlier devices of this type. Whereas, in such earlier devices, the error-correction element, which in the case of a perforating apparatus is an overperforating punch or the like, was so coupled with the reverse-drive mechanism so as to operate repeatedly as long as the drive was operative, the system of the present invention involves the actuation of the reverse-drive means from the error key or actuator with the marking means (i.e. the error-correction punch or similar device) triggered in response to the actuator and decoupled from dependent operation by the drive means. Thus, in accordance with this invention, if the strip perforator is provided with an error key, the latter controls the reverse-drive means and does not operate the error key as required in earlier structures. In this manner it is possible also to prevent an immediate overperforation upon initiation of the return movement of the strip.

According to a more specific feature of this invention, the actuating member is a switch which energizes a relay or the like via a time-delay network (i.e. a resistor-capacitor time-constant circuit) which, in turn, operates the reverse drive immediately upon actuation but delays operation of the marking means until the elapse of a period equal to the time constant of this network. Accordingly, the relay controlled by the time-constant

network may have a first set of contacts through which the capacitor discharges when the relay is energized and a second set of contacts for initiating operation of the return-drive means. The relay means may be further provided with a third set of contacts in series with the marking means which open upon energization of the relay means but which close upon decay of the capacitor potential to provide the impulse necessary to operate the marking means and overperforate the strip in the desired manner. Advantageously, a further relay is provided by means of which the capacitor is connected to a source of charging current in an inoperative position of the actuating key or switch and which disconnects the capacitor from this source upon operation of the switch.

I have found that it is important for the proper functioning of the error-correction means that the reverse-drive means and the forward-drive means be constructed so as to ensure positive displacement of the sprocket wheel in engagement with the strip. Such conditions are met when the drive means includes a pair of oppositely rotating coaxial maltese or Geneva wheels with clutch means for selectively coupling these wheels with the driving sprocket. Advantageously, each of the Geneva wheels is provided with a respective toothed face engageable with complementary faces upon an axially displaceable clutch element keyed to a shaft upon which the Geneva wheels are rotatable under the constraint of their respective operating members. The latter are displaceable in opposite directions and can be coupled together for concurrent rotation by reversing-gear means. The operating means for the clutch can then include a solenoid actuated via the aforementioned relay means upon operation of the actuating switch.

The above and other objects, features and advantages of the present invention will become more readily apparent from the following description, reference being made to the appended drawing in which:

FIG. 1 is a side-elevational view partly broken away of the drive means of the present invention;

FIG. 2 is a plan view of the driving mechanism; and

FIG. 3 is a circuit diagram of the return and marking system.

In FIGS. 1 and 2 I show the drive means of a strip perforator having a table or platform **30** upon which the perforated strip is displaced by a sprocket wheel **16** whose pins **16***a* engage the aperture **17***a* of the perforated strip. Table **30** has affixed thereto a pair of support wheels **2'**, **2''** constituting the machine housing, a shaft **1** being journaled in these wheels and being coupled to a continuously operable motor **31** which is energized via the usual starting circuit not further illustrated. Shaft **1** is provided with an extension **1'** to which is rigidly fixed a Geneva actuator **3** intermediate the wheels **2'**, **2''**, and a pinion **4** externally of the compartment formed by the wheels. Another shaft **32**, parallel to and below shaft extension **1'**, carries another Geneva actuator **7** and a gear **6** meshing with gear **4** and thus driven in the opposite sense. Geneva actuator **3** drives a Maltese or Geneva wheel **5** which is axially fixed to but rotatable upon a support shaft **12** journaled between the wheels. A further Geneva or Maltese wheel **8** is displaced by actuator **7** and is likewise mounted upon shaft **12** for free rotation thereon while being axially fixed to this shaft. The latter carries a pinion gear **13** which meshes with an idler **14** journaled upon its shaft **14'** and engages a driven gear **16'** on shaft **15**. This shaft carries the sprocket wheel **16**.

The Geneva wheels **5**, **8** are provided with respective annular toothed faces **5'**, **8'** selectively engageable by respective faces **9'**, **9''** of a clutch member **9** which is keyed by a pin **9***a* to shaft **12** for axial displacement there-

on but which rotatably entrains this shaft. An annular groove 33 in this clutch member receives the arms 10', 10'' of a bifurcated lever 10 fulcrumed on a pin 34 to the machine housing. Lever 10 is biased by a spring 34' in the clockwise direction (FIG. 2) so as to maintain clutch 9 in engagement with Geneva wheel 8 during the normal or forward operation of the perforator. A solenoid 11 has an armature 11' articulated via a pin 35 to the lever 10 for displacing clutch 9 into engagement with Geneva wheel 5.

Each of the actuators 3, 7 carries a respective pin 3', 7' receivable successively in the radial slots 5'', 8'' of the respective Geneva wheels 5 and 8, the arms of which are concave (as shown at 8*a* for the wheel 8) and have a curvature corresponding to that of the locking-disk portions 3'', 7'' of the actuators. Thus each revolution of one of the actuators 3, 7 causes engagement of one of the slots 5'', 8'' of the respective Geneva wheel by a pin 3', 7' to step the wheel through an angle of 45°, the disk portions 3'', 7'' blocking displacement of the wheels until the pins again enter the respective slots.

In the normal course of operation it may be assumed that the strip 17 is to be displaced in the direction of arrow 36. In this case sprocket 16' is rotated counterclockwise (FIG. 1) by gear 14 which in turn is rotated clockwise by the counterclockwise rotation of shaft 12 and gear 13 thereon. The counterclockwise rotation of shaft 12 is effected by the counterclockwise rotation of Geneva wheel 8 which is repeatedly stepped in this sense by actuator 7 and is coupled with the shaft 12 via clutch member 19. Concurrently, actuator 3 continuously steps Geneva wheel 5 in the clockwise sense so that energization of solenoid 11 by, say, depression of switch 19 of a circuit 18, rotates lever 10 counterclockwise and brings clutch member 9 into engagement with Geneva wheel 5. The latter thus entrains shaft 12 in the clockwise sense to rotate gears 14 and 16' in counterclockwise and clockwise directions, respectively, thereby displacing strip 17 with a stepped motion in the direction of arrow 37. Circuit 18 is shown to be provided with a direct-current source 38 and to be coupled with the solenoid 20 of punch 21. The actual circuit is illustrated in FIG. 3.

The marking and reversing drive system comprises the actuating key 19 which is coupled to a pair of normally open switch contacts 191 and 192. Switch 191 is connected in series with the direct-current source 38 and solenoid 11 via its terminals A, B, the latter being returned to a set of switch contacts 27 of a relay 25 and thence to the source 38. Switch 192 connects a relay 22 across source 38, the relay 22 having a first set of contacts 23' which are normally closed and connect a capacitor 29 across the battery 38 for charging. A further contact 23, engageable by the armature of set 23' when relay 22 is energized, is in series with the first relay means 25 of the present invention and thus serves as a means for connecting capacitor 29 thereacross. The second set of contacts 24 of relay 22 is connected in series with contacts 28 of relay 25 and the solenoid 20 of punch 21 across the battery 38.

The first relay means 25 has a first normally open set of contacts 26 in series with a variable resistor 30 through which capacitor 29 can discharge in a resistance/capacitance time-constant network, and a second normally open set of contacts 27 which, as previously mentioned, serves for energizing solenoid 11. The third set of contacts 28 is normally closed.

With the circuit in the condition illustrated in FIG. 3, i.e. with the band 17 driven in the direction of arrow 36, switches 191 and 192 are open as are contacts 23, 24, 26 and 27 while relays 22, 25 and solenoids 11, 20 are de-energized. Contacts 23' and 28 are closed so that capacitor 29 is charged by battery 38.

When the key 19 is depressed, switches 191 and 192 are closed, the latter energizing relay 22 to close contacts 23 and 24 and open contacts 23'. Capacitor 29 then is

connected across relay 25 to energize the latter whereupon contacts 26 and 27 are closed while contacts 28 are opened. Solenoid 11 is thus immediately energized via switch 191 and contacts 27 while capacitor 29 commences to discharge through resistor 30 with a time constant of, say, 30 millisec. Clutch 9 is thus operated to reverse the direction of band feed.

When the voltage of capacitor 29 decays with the aforementioned time constant, relay 25 opens even though key 19 continues to be depressed so that contacts 26 and 27 open and deenergize solenoid 20. Contacts 28, however, close at this point and, via previously closed contacts 24, energize solenoid 20 to trigger the operation of the punch 21 to produce the desired overpunching. When key 19 is then released, the system is restored to its original condition as illustrated in FIG. 3. Band 17 is thus stepped for a period equal to the time constant. If switch 191 remains closed and the armature of contacts 23' is decoupled from relay 22 and is operated by relay 25, the strip 17 will be continuously stepped at a rate determined by the time constant as long as key 19 remains depressed.

The invention as described and illustrated is believed to admit of many modifications and variations within the ability of persons skilled in the art, all such modifications and variations being deemed to be included within the spirit and scope of the appended claims.

What is claimed is:

1. A strip perforator, comprising a housing; forward-drive means and reverse-drive means in said housing selectively engageable with a perforatable band for displacing same in mutually opposite directions, said band being perforated upon forward transport thereof; punching means on said housing for applying a corrective overperforation to said strip upon a reverse transport thereof; and manually controlled actuating means for initially decoupling said forward-drive means from said band and coupling said reverse-drive means therewith for the reverse transport of said band and subsequently operating said punching means, said actuating means including time-delay means connected with said punching means and an actuating member for energizing said time-delay means simultaneously with the coupling of said reverse-drive means with said band for operating said punching means upon the elapse of a time period determined by the delay time of said time-delay means; said actuating means further comprising relay means energizable under the contact of said time-delay means and circuit means connecting said relay means with said reverse-drive means and said punching means; said drive means including respective drive wheels coaxially mounted for rotation in opposite senses, a sprocket wheel engageable with said band and electro-magnetically operable clutch means for selectively coupling said sprocket wheel with said drive wheels, said relay means being provided with first normally open contact means for initiating a delay cycle of said time-delay means and with second normally open contact means for energizing said clutch means upon energization of said relay means.

2. A strip perforator as defined in claim 1 wherein said punching means is electromagnetically operable, said relay means being provided with third normally closed contact means open during energization of said relay means and closing upon the termination of said delay cycle for triggering said punching means.

3. A strip perforator as defined in claim 1 wherein said wheels form part of respective counter-rotating Geneva mechanisms for the stepwise displacement of said band.

4. A strip perforator as defined in claim 1 wherein said time-delay means comprises a resistance-capacitance network having a capacitive branch connected across said relay means.

5. In a strip perforator, in combination, a housing, a sprocket wheel engageable with a perforated band for

displacing same, and reversible mechanism for rotating said sprocket wheel in mutually opposite senses, said mechanism comprising a pair of coaxial counter-rotating Geneva wheels journaled in said housing at axially spaced locations, a shaft common to said wheels and rotatable relatively thereto, a clutch member keyed to said shaft and selectively engageable with said wheels for entraining said shaft therewith, respective Geneva actuators engageable with said Geneva wheels for the stepwise rotation thereof in said opposite senses, and transmission means connecting said shaft with said sprocket wheels.

6. The combination defined in claim 5, further comprising a motor connected with one of said actuators for

rotating same, and reversing-gear means interconnecting said actuators of concurrent rotation in opposite senses.

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