# United States Patent

**Fedrigo**

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[54] **FEED DEVICE FOR A METAL STRIP**


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[51] **Int. Cl.** .....**B65h 17/22**

[58] **Field of Search**.....226/179, 183, 187, 188, 194



[56] **References Cited**

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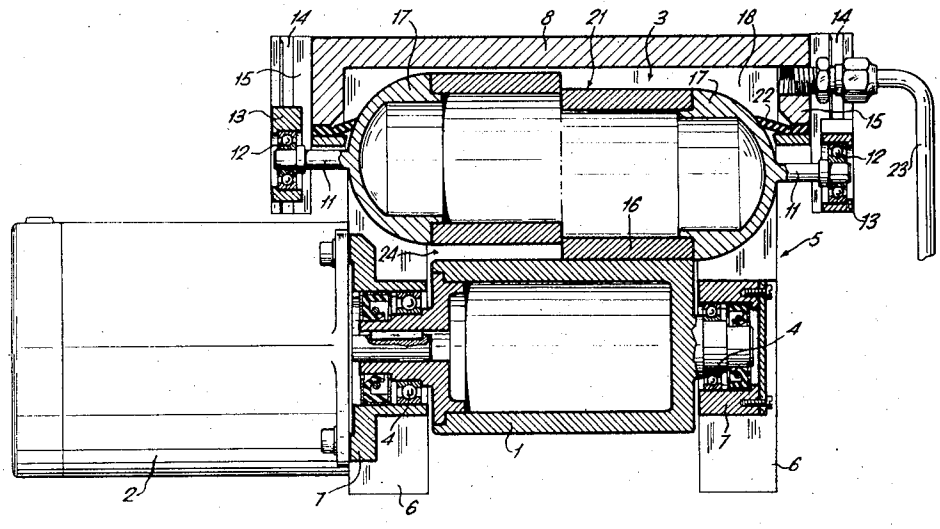
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[57] **ABSTRACT**

A device for feeding a metal strip to a numerically controlled tool, blanking press or the like is disclosed comprising a pair of rollers between which the strip is nipped and fed forward by applying rotational drive to the rollers. Compressed air, acting upon the upper surface of one of the rollers urges the rollers together, creating the nipping pressure. A stepping electric motor provides the rotational drive which causes the feed movement of the strip.


**3 Claims, 3 Drawing Figures**



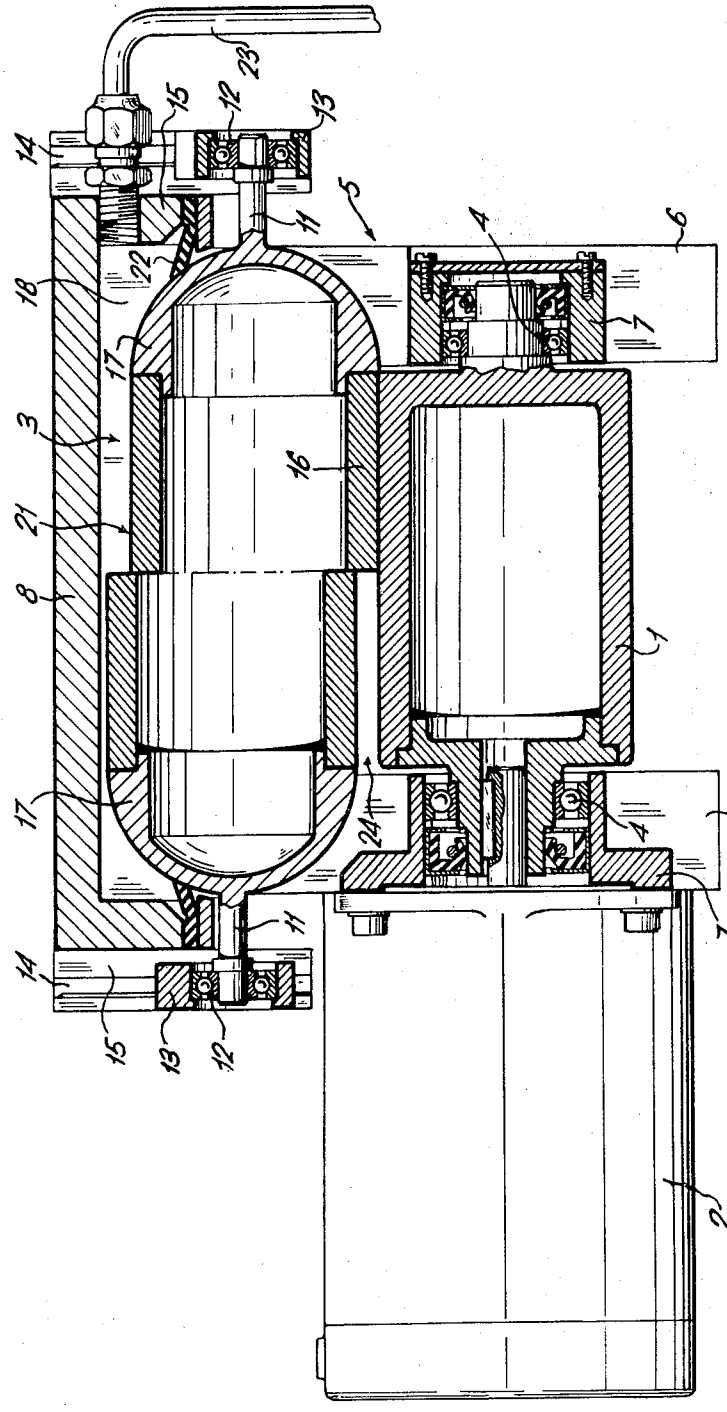



FIG. 1

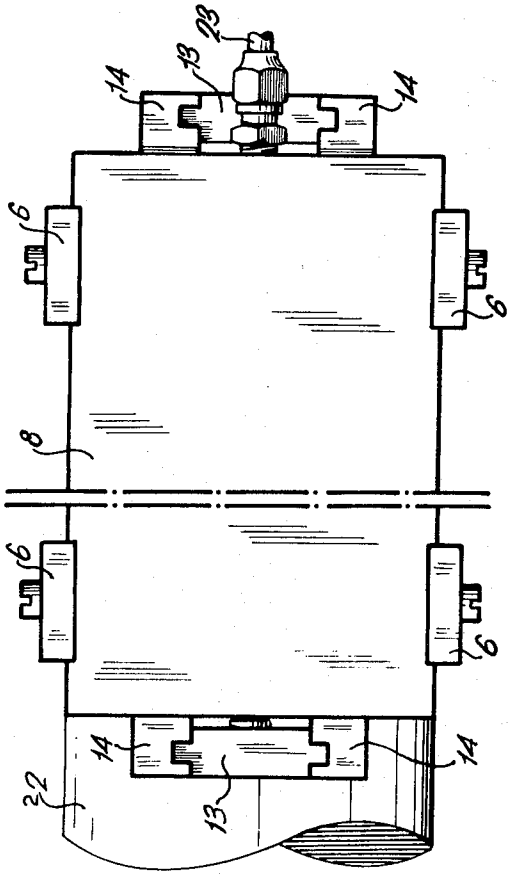



FIG. 3

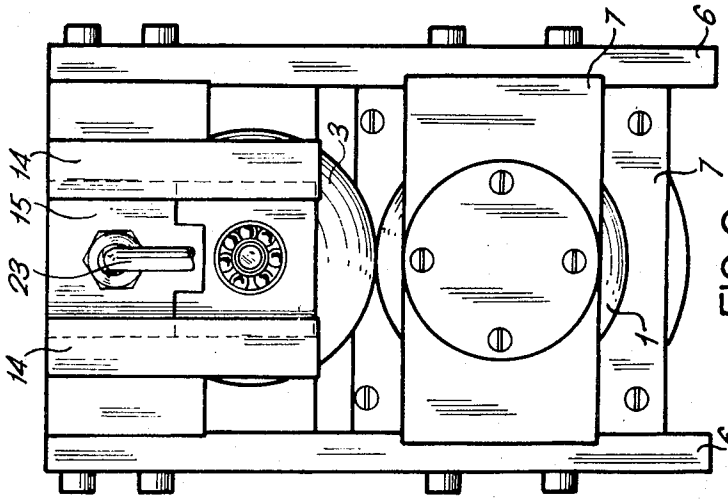



FIG. 2

# FEED DEVICE FOR A METAL STRIP

## CROSS REFERENCE TO A RELATED APPLICATION

Applicants claim priority from corresponding Italian Pat. Application Ser. No. 53752-A/69, filed Oct. 20, 1969.

## BACKGROUND OF THE INVENTION

This invention relates to a device for feeding a metal strip to a numerically controlled tool, blanking press or the like, including a pair of rollers defining a nip through which the strip is caused to pass and wherein pressure applied by the rollers to the strip to transmit feed movement thereto can be generated and relieved in a very short time.

For feeding a metal strip in blanking presses, use is normally made of devices comprising a pair of rollers through the nip of which the strip is passed. The feed pressure is usually generated by springs which urge one of these rollers against the other. The feed movement of the strip, which takes place discontinuously or stepwise, is obtained by energizing actuating means which cause one of the rollers to rotate through a desired angle. These actuating means, normally of a mechanical kind, are driven by the main motor of the machine through an appropriate transmission.

The feed devices of the prior art of the kind described suffer however from some drawbacks. First of all, a delay occurs between the instant when a feed control signal is sent to the actuating means and that when these means are effective to cause the strip to feed forward. This delay, which varies depending on the kind of actuating means utilized, is essentially due to the inertia of the various components of the actuating means. Moreover, the adjustment of the feed movement of the strip is rather delicate and requires direct manual intervention by the operator. Further, the construction requirements of the actuating means render the feed device rather complex and of dimensions scarcely suited for its incorporation in some kinds of machine tools. Finally, the overall dimensions of the device and the aforementioned delay between the instant when a control signal is sent to the device and the instant when the latter attains the operating conditions desired, prevent satisfactory application of the feed devices of the prior art to numerically controlled machine tools.

The object of the present invention is to avoid the disadvantages enumerated above.

## SUMMARY OF THE INVENTION

In accordance with the present invention a device for feeding a strip of work material through a numerically controlled tool, blanking press or the like is provided including a pair of rollers, one roller being radially movable with respect to the other. Means are provided to apply compressed air against one side of the movable roller urging it towards the other roller, thereby applying feed pressure to the strip of material. Rotational drive is applied to the rollers to feed the material to the press. In a particularly useful embodiment the compressed air is fed inside a chamber whose wall is formed in part by the surface of the movable roller.



## DESCRIPTION OF THE DRAWINGS

For a better understanding of the present invention one particular embodiment thereof will now be described, by way of example, with reference to the accompanying drawings, wherein:

FIG. 1 shows a vertical section of the device embodying the invention, wherein the upper roller (namely, the idle roller) has been drawn in two different positions, corresponding to the upper extreme of its stroke (left-hand half of the roller) and to the lower extreme of its stroke (right-hand half of the roller),

FIG. 2 shows a right-hand side view of the feed device of FIG. 1, and

FIG. 3 shows a plan view of the feed device of FIG. 1.

## DETAILED DESCRIPTION OF THE INVENTION

With reference to the drawings, the strip feed device essentially comprises a driving roller **1** (FIG. 1), a stepping electric motor **2** which drives the roller **1**, and an idly driven roller **3** which is supported for free rotation and for moving towards and away from the first roller **1**.

The driving roller **1**, preferably comprising a hollow cylinder, is supported, by means of bearings **4**, on the support **5** of the device which comprises in turn — in the case of the example illustrated — two pairs of vertical members or uprights **6**, to which two lower crosspieces **7** and an upper plate **8** are secured. The stepping motor **2** is fastened to a flange provided in the crosspiece **7**, and is connected to the roller **1** by means of a key or spline, as clearly shown in FIG. **1**.

The driven roller **3** has stub shafts **11** at its ends journalled in bearings **12** mounted in slides **13**, which are movable in vertical guides or ways **14** formed in side flanges **15** of the upper plate **8**. In the example shown, the roller **3** comprises a hollow cylindrical portion **16** and two end caps **17**, from which the stub shafts **11** protrude.

Underneath the upper plate **8** a chamber **18** is provided, whose walls are formed by the lower surface of the upper plate **8**, by the inner surfaces of the side flanges **15** and by the upper surface **21** of the driven roller **3**. Between the surface **21** and the other surfaces of the chamber **18**, a sealing member **22** is provided, to make the chamber **18** air-tight. This chamber **18** is in communication with a source of compressed air (not shown) by means of a conduit **23**.

In FIG. **1**, the driven roller **3** is shown in its upper and lower extreme positions. When the roller **3** is in its upper extreme position, a space or nip **24** is left free, into which the metal strip (not shown) can be caused to pass.

As compressed air is fed to the chamber **18** through the conduit **23**, the driven roller **3** behaves as the piston of a pneumatic cylinder and, therefore, it is pushed toward the other roller, thereby exerting on the latter — or upon the metal strip in the nip **24** between the two rollers — a pressure which is a function of the pressure of the air in the chamber **18**. When the pressure in the chamber **18** is released, then no noticeable pressure is exerted on the metal strip in the nip between the rollers. When the roller **3** is displaced relative to the roller **1**, it is guided by the slides **13** which slide inside the guides **14**.

In order to feed forward a desired length of the metal strip disposed between the rollers, compressed air is fed to the chamber **18** and, at the same time, current pulses are applied to the stepping motor **2**, to cause the driving roller **1** to rotate through a predetermined angle.

During rotation of the roller **1**, both rollers **1** and **3** will apply to the strip sufficient pressure to cause said strip to feed forward at a speed essentially corresponding to the tangential velocity at the surfaces of the rollers. Upon completion of the feed movement of the strip, the air pressure is relieved from the inside of the chamber **18**.

It will be apparent that, with the device of the present invention, a negligible interval of time is required between the instant when a control signal is sent for the feed movement of the strip and the instant when this movement actually starts. In fact, assuming that an electrically controlled valve (not shown) is inserted in the air supply conduit **23**, a negligible period of time is required between the instant when signals reach the valve and the stepping motor **2**, and the instant when a sufficient pressure is applied to the strip to avoid slipping of the latter during the rotation of the roller **1**.

Adjustment of the length of the strip fed forward is made by actuating the stepping motor **2** appropriately, the angle of rotation of the roller **1** and hence the length of the strip fed forward corresponding to the number of pulses sent to this motor.

Due to these favorable characteristics of the device in accordance with the present invention, and on account of the considerable simplicity of design and the comparatively small overall dimensions of the same, the device can be suitably utilized in machine tools with numerical control.

Obviously, the feed device of the present invention may also be utilized in apparatus or machines other than those mentioned above, such as blanking presses or the like, wherein it is simply required to intermittently feed forward a length of a strip of metal or of any other material.

As will be apparent, many modifications and variations can be introduced in the embodiment of the present invention described above, concerning both the shape and the arrangement of the various parts and components, without departing from the scope of the invention.

What is claimed is:

**1**. A feed device for a strip of working material of a blanking press or like, including a housing having a pair of guides and a pair of bearings vertically slidable thereon, a pair of rollers rotatably supported in said housing in a superimposed relationship, the upper roller of said pair having a pair of end stub shafts journalled in said bearings to be vertically movable and rotatable with respect to the lower roller, means including a compressed air supply for urging said upper roller toward said lower roller to grip the work strip in a nip between said rollers, said compressed air supply including a compression chamber formed in said housing and comprising a top wall, front and back walls, opposed side walls and a bottom wall including an upper surface portion of said upper roller, so that said upper roller is rotatable within said compression chamber, and driving means for imparting intermittent rotary motion to said rollers whereby the work strip may be moved.

**2**. A feed device as claimed in claim **1**, wherein said bottom wall also comprises a resilient sealing member adapted to maintain an air-tight seal between said upper surface portion of said upper roller and said front, back and side walls of said chamber.

**3**. A device as claimed in claim **1** wherein said driving means includes a stepping motor connected to one of the stub shafts of said upper roller and adapted to respond to a variable number of applied input pulses to drive said upper roller through a corresponding angle of rotation.

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