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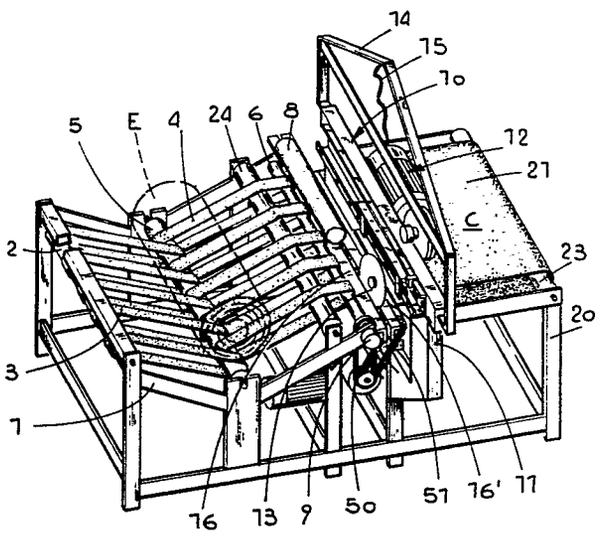
(54) Automatic, programmable, machine for cutting flexible material transversely.

(57) The subject of the invention is a light weight metal structure designed to infeed and cut transversely flexible material E in the form of rolls, and it comprises: an unwinding unit of cradle or V conformation that extends along two adjacent, inclined, planes constituted by two sets of belts, each of which encompasses at least two parallel rollers, one of which, 2 or 6, placed at one extremity of the cradle and the other, 5, being a common roller placed centrally at a lower level, the unwinding of the roll being programmable; a transverse cutting unit B able to cut, preferably in the two directions, over a predetermined witdh; a driven frame C for the removal of the cut pieces and, possibly, a bench for amassing the cut pieces.



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Automatic, programmable, machine for cutting flexible material transversely

Despite the cutting of flexible material formed into rolls, such as single or sandwich type plastic foam, fabrics or sheets of plastic, being a very commonplace operation, it is one that presents difficulties, especially for small firms, since it either has to be done manually, at a low output and with the use of a lot of labour, or else by the machines currently available on the market that are designed to cut the material in large quantities and, generally, are very expensive.

The object of the invention is, therefore, to provide an automatic, programmable, machine for cutting transversely flexible material formed into rolls, the cost of which is limited in comparison with the efficiency achievable there with.

Another object of the invention is to enable the cutting length to be programmed and to be precise.

These and other objects too are all attained with the machine in question for cutting transversely flexible material formed into rolls, characterized by the fact that it comprises : at least one unwinding unit of cradle or V conformation that contains the material to be cut and is provided with an electronic circuit for programming the unwinding of the material; at least one rotating disc unit, placed above the material to be cut and provided both with a traversing and a cutting drive synchronized with the programme for the unwinding of the material so as to automatically cut the latter into pieces of the required length; at least one frame, placed downstream of the cutting unit, for the removal of the cut pieces, this having a belt

driven in synchrony with the unwinding of the material; and at least one bench for amassing the cut pieces, variable in position with respect to the removal frame and set up to stack the cut pieces one on top of the other since it can be synchronized with the exiting of the pieces from the removal frame.

It is obvious from the foregoing that with the cutting machine in question high productivity is achieved since it is fully automatic and the presence of the electronic programming circuit, in combination with an incremental angular transducer (encoder) allows, as will be made clear in the ensuing text, the cutting length which, furthermore, is extremely precise, to be programmed in an exact manner. In addition, it is possible for the cut pieces to be counted and to be stacked in an orderly fashion.

The various parts of the drive mechanism can, furthermore, all be synchronized through the said electronic programming circuit so as to give the cutting machine maximum overall efficiency.

Further characteristics and advantages of the cutting machine according to the invention will become more apparent from the detailed description that follows, illustrated purely as an unlimited example on the accompanying drawing, in which :

- Figure 1 shows, in an axonometric view, the cutting machine forming the subject of the invention;
- Figure 2 shows, again in an axonometric view, the transverse cutting unit of the machine depicted in Figure 1.

With reference to the above mentioned figures, the cutting machine in question is constituted by a number of separate

stations, in such a way as to facilitate also the transportation of the complete assembly.

The said stations consist of : a unit A for unwinding the material E that is wound around itself to form a roll; a transverse cutting unit B; a frame C for the removal of the cut pieces; and a bench for amassing and stacking the cut pieces, not illustrated but only described herein.

In particular, the unwinding unit A is of cradle or V conformation, so as to keep the material E evermore in position whilst being unwound.

The said unit comprises a supporting frame 1 on which is placed, going from the entry point to that where the cut pieces exit, a feed roller 2, a middle or central roller 5, placed lower down than the roller 2, a roller 24 placed at the same height as the roller 2, downstream of the roller 24, and a discharge roller 6 that is operated by a geared motor 7 via a transmission chain 50. All the aforementioned rollers are positioned parallel to one another. Two sets of unwinding belts, 3 and 4, respectively, encompass, one set intercalated with the other, the rollers 2 and 5, and the rollers 5 and 6, respectively.

Along the lower bifurcations, the belts 3 and 4 are guided, at least in the region of the rollers, by needle bearings in a comb configuration, while the upper bifurcations are able to slide on suitable underneath supporting surfaces.

Neither the guide combs nor the supporting surfaces have been illustrated, so as to simplify and render more clear the other characteristics of the cutting machine.

The roller 6 thus carries all the other rollers in rotation.

The roller 24 is a supplementary roller whose purpose is to cause the material E to be straightened and orientated before it arrives at the cutting unit B.

Another supplementary roller is constituted by a roller 8 that can be adjusted in height or be placed simply resting on the roller 6, the task of this being to guide the material E, to ensure that the direction of this be correct and to prevent displacements thereof at the time the cutting operation is in progress.

The unit B is provided with a movable transverse cutting assembly, comprising a movement device 12 that enables a cutting disc 13 to traverse, in both directions, along two fixed guides 16 and 16' that support the material E and are in contrast with the cutting disc 13.

More particularly, the cutting unit B has an upper frame 14 of portal conformation, and this carries a cable 15, wound in the form of a helical spring, that supplies the electricity to the cutting unit.

The frame 14 is provided, furthermore, with a fixed beam 10, supported by a pair of stanchions 11, on the upper part 10' of which slides, resting thereon, a friction wheel 35 that has a high friction coefficient and is operated by a reduction unit connected to a motor, the former 34 and the latter 33 together constituting the aforementioned movement device 12.

The motor 33 also actuates an electric motor 31 that drives the cutting disc 13.

The complete cutting unit comprising the motor 33, the reducer 34 and the friction wheel 35, as well as the elec-

tric motor 31 and the cutting disc 13, is carried by a support 30 that is displaced with the movement device 12.

The said cutting unit is guided by the rollers 36 and 36' that are pivotally integral with the support 30 and rest on the upper edge of a fixed section 37 integral with the beam 10.

On to the rollers 36 and 36' is discharged the part of the overall weight that it is not wished to apply to the friction wheel 35. The latter ensures the operation being silent and makes certain the stoppage of the machine should unexpected obstacles be encountered along the cutting path.

A runner 38, fixed to the supports of the rollers 36 and 36' at a height above these, acts as a linear cam in respect of a pair of microswitches 39 that are mounted on the upper edge of the section 37 in a way whereby suitable adjustments may be made to the spacing of one from the other in keeping with the width of the material to be cut; the purpose of this being to cause, in the two directions, the cutting unit to be brought to a halt.

The frame C for the removal of the cut pieces, located downstream of the cutting unit B, is provided with a frame 20 that comprises a belt 21 mounted in an endless fashion around a roller 22 operated, through a chain 51, by the geared motor 7, and around an end roller 23.

In place of the removal frame C, or downstream thereof, the aforementioned bench for amassing and stacking the cut pieces can be placed.

It is most important that note should be taken of the fact that the automatic cutting machine is provided with an el-

ectronic circuit for programming at least the unwinding of the material E. The said electronic circuit comprises an angular transducer (encoder) 9 which, in the case under consideration, is connected to the discharge roller 6 of the unwinding unit A and counts the revolutions and the angles made by this; the said transducer then supplies the electronic circuit with the data needed to achieve an overall synchronization of the movements and, in particular, to stop the unwinding compatibly with a cut-off length that is predetermined and can be programmed using, for example, a digital counter.

The microswitches 39 are also interlocked to the said electronic circuit and to the data provided by the transducer 9 and only upon completion of the infeeding of a fresh piece to be cut do they give the consent to the cutting unit to operate, in the reverse direction to the previous one, and thus to proceed with another cutting operation.

The said amassing bench can be fixed, in either a flat or a cradle conformation, at a lower level than the removal frame C, with the possibility existing to position it suitably in accordance with the length of the cut pieces. Alternatively, it can be constituted by a carriage that can be positioned and is provided with a transverse bar able to amass the cut pieces thereon. It can also be constituted by a carriage able to stack the cut pieces with an automatic reciprocating movement, that can be linked to and rendered synchronous with the exit of the cut pieces.

As stated previously, the removal frame C can also be directly substituted by the amassing bench which, in such a case, would be constituted by an inclined platform having terminal stop means.

The cutting machine forming the subject of the invention can also be connected operationally to other units able to carry out, for example, longitudinal slitting operations on the material E, as well as shearing or other operations upstream or downstream of the transverse cutting operation, without in any way deviating from the framework of protection afforded to the invention as described above and claimed below.

Claims:

1. Automatic, programmable, machine for cutting transversely flexible material formed into rolls, characterized by the fact that it comprises : at least one unwinding unit A of cradle or V conformation that contains the material E to be cut and is provided with an electronic circuit for programming the unwinding of the material; at least one transverse cutting unit B having a rotating disc 13, placed above the material E to be cut and provided both with a traversing and a cutting drive synchronized with the programme for the unwinding of the material E so as to automatically cut the latter into pieces of the required length; at least one frame C, placed downstream of the cutting unit B, for the removal of the cut pieces, this having a belt 21 driven in synchrony with the unwinding of the material; and at least one bench for amassing the cut pieces, variable in position with respect to the removal frame C and set up to stack the cut pieces one on top of the other since it can be synchronized with the exiting of the cut pieces from the removal frame C.

2. Automatic cutting machine according to Claim 1, wherein the unwinding unit A comprises at least three rollers 2, 5 and 6 on parallel axes, the middle one 5 of which, placed at a lower level to form the cradle, is connected to each of the others through flat, intercalated, belts 3 and 4 that cross one with the other on the middle roller 5, the lower part of the said belts being guided laterally before encompassing the roller concerned.

3. Automatic cutting machine according to Claim 2, wherein the unwinding unit A is provided, at the top, with a movable roller 8, parallel with the rollers 2, 5 and 6, placed in contrast with the roller 6, with the material E tightly

up against the belts 3 and 4, passing in between the roller 8 and the roller 6, and is also provided on the exiting side from the unwinding unit A, upstream of the roller 8, with another roller 24 parallel with the roller 6, the latter being driven and placed virtually at the same height as the roller 24.

4. Automatic cutting machine according to Claim 1, wherein the said electronic circuit is interlocked to an incremental angular transducer 9 connected to the discharge roller 6 of the unwinding unit A, and the transducer counts the revolutions and the angles made by the roller and supplies the electronic circuit with the data required to stop the unwinding compatibly with the predetermined cut-off length that can be programmed with a digital counter.

5. Automatic cutting machine according to Claim 1, wherein the cutting unit B comprises a cutting disc 13 that is given a rotatory drive in both directions and belongs to a movable cutting assembly that slides supported by a horizontal beam 10 placed above the material E to be cut, the movable cutting unit being able, through a reduction unit 34 connected to a reversible motor 33 that jointly operate a friction wheel 35 that has a high friction coefficient and rests operatively on the horizontal beam 10, to traverse bidirectionally, while the whole unit is guided by the rollers 36 and 36' that slide along a section 37 integral with the beam 10, with a runner 38, fixed to the supports of the said rollers, at a height above these, acting as a linear cam to cause the movable cutting unit to be brought to a halt, in the two directions, through corresponding microswitches 39 mounted on the section 37 and movable transversely thereon.

6. Automatic cutting machine according to Claim 1, wherein the cutting unit is interlocked to the electronic circuit

for programming the unwinding of the material E in such a way that, at each limit position, the unit comes to a halt until the programmed unwinding of the material to be cut has been concluded, after which the cutting operation is resumed with the traversing direction and that of rotation of the cutting disc being reversed, thereby eliminating the dead time that non-operative return traversing occupies.

7. Automatic cutting machine according to Claim 1, wherein electricity is supplied to the cutting unit B by a cable 15 that is anchored high up, virtually in the centre of the cutting path and, at least in part, is coiled in the form of a helical spring.

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FIG1

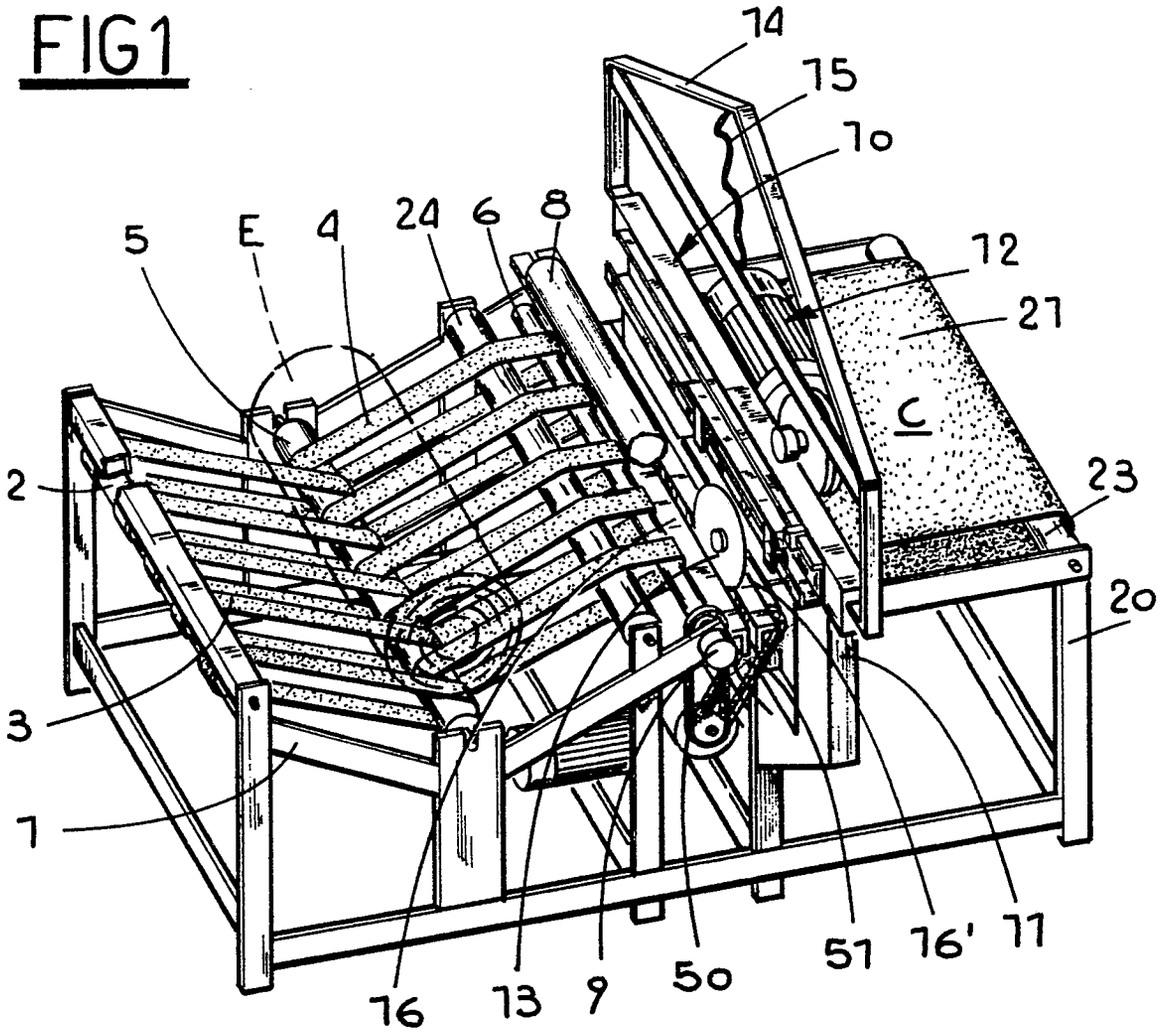

FIG2