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⑤④ Bag folding apparatus.

⑤⑦ An apparatus for use in connection with the folding of bags or sheets made from a flimsy material, comprising a feeding means (15) operable to discharge bags or sheets successively in a feed direction with each bag or sheet having a plurality of corrugated regions having grooves in the feed direction and undulations in a direction transverse to the feed direction. A receiving device (16) receives the bags or sheets from the feeding means. A fence (28) in or adjacent to the receiving device stops the movement of the bags or sheets along the feed direction.

In order to retain the stiffening effect of the corrugated regions on the bags or sheets until they are stopped by the fence, the receiving device includes means operable to maintain in each bag or sheet fed thereto at least some of the corrugated regions until the movement of that bag or sheet in the feed direction is stopped by the fence.

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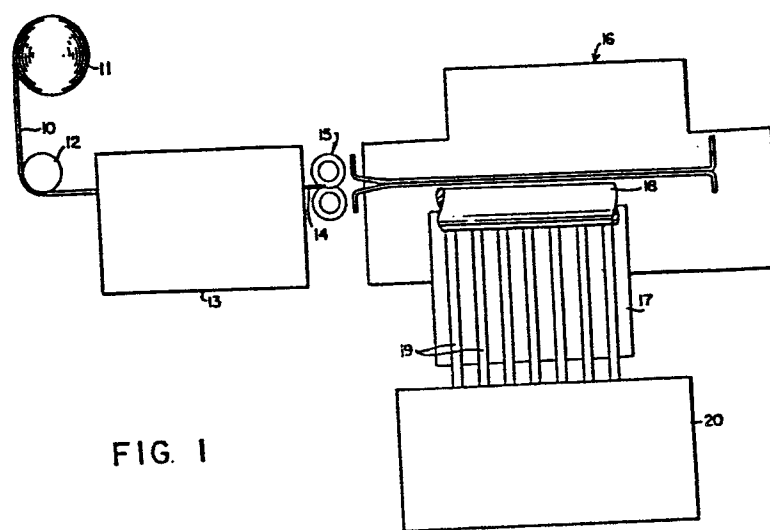


FIG. 1

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DESCRIPTION

"BAG FOLDING APPARATUS"

The present invention relates to a bag folding apparatus, and particularly to an apparatus for use in connection with the folding and packaging of bags made from a flimsy material, such as a plastics material.

The use of bags made of plastics material has found wide acceptance and a large commercial market has been developed. The physical differences between flimsy bags such as bags made from plastics and bags made from paper or cellulosic products has required the development of new machinery and equipment in order to produce plastics bags economically.

Generally, plastics bags can be made of film forming polymers such as polyethylene, polypropylene, and polyvinylchloride and the like and can be multilayered. In comparison to the paper or cellulosic counterparts the plastics bags have substantially poor structural rigidity, are thinner, and have much lower surface friction characteristics.

Generally, the manufacturing of plastics bags starts with a plastics film which is formed into separate bags and these bags are then folded and packed into boxes which will eventually be purchased by the consumers.

In a typical production system, the plastics bag is formed and then discharged into a receiving region from which the final folding operation proceeds. Each bag is discharged into the receiving region in a

substantially flat state and slides into the region until a barrier generally referred to as a fence prevents further sliding of the bag. When the bag comes to rest, it must be in substantial alignment with the fence.

5 It has been found that poor alignment of the plastics bag in the receiving region can interfere with subsequent operations and thereby reduce production efficiency. Poor alignment tends to occur frequently for the plastic bags in known apparatus because the
10 leading edge of the bag which is to be stopped by the fence has poor structural rigidity so that this leading edge can sometimes be distorted. Another cause of poor alignment is that the bags are delivered to the receiving system such that the leading edge is not square with the
15 feed direction. In order to attempt to obviate such problems, it is known to provide a plurality of corrugations in each bag prior to the bag entering the receiving system, such corrugations extending in the direction of feeding of the bags to the receiving system.
20 These corrugations are intended to stiffen the leading edge of the bag thereby allowing it to square up when it strikes the fence.

 This problem of poor alignment is particularly prevalent when the bags have a relatively large dimension
25 in the feed direction. It has been found that a large plastic bag which has been folded one time before being discharged even with corrugated regions, can become misaligned because of the poor retention of the corrugated regions during the movement of the bag into
30 the receiving region.

 It is an objective of the present invention to overcome this problem and thereby improve the production efficiency and economy for bags or sheets made of flimsy material such as plastics.

35 It is to be understood that the invention is not intended, however, to be limited to bags and that the

invention can also be used in connection with sheets of flimsy material and the like.

5 In accordance with the present invention, there is provided an apparatus for use in connection with the folding of bags or sheets made from a flimsy material, comprising feeding means operable for discharging bags or sheets successively in a feed direction with each bag or sheet having a plurality of corrugated regions having grooves in said feed direction and having undulations
10 in the transverse direction, receiving means operable to receive the bags from the feeding means and to maintain in each bag or sheet fed thereto at least some of the corrugated regions at least until each of the bags stops its movement along the feed direction, and a
15 fence in or adjacent the receiving means for stopping the movement of each of the bags or sheets along said feed direction.

Preferably, the feeding means comprising a pair of shafts and a plurality of spaced tyres mounted on the
20 shafts and positioned to cooperate with each other to provide the plurality of corrugated regions in each bag fed therethrough and to move that bag in the feed direction.

The receiving means preferably includes a plurality
25 of upper rods and a plurality of lower rods which cooperate with each other to maintain in each of the bags at least some of the corrugated regions at least until each of the bags stops its movement along said feed direction.

30 The invention is described further hereinafter, by way of example, with reference to the accompanying drawings, in which:-

Fig. 1 diagrammatically shows the overall arrangement of a bag making machine together with a folding
35 and packaging apparatus;

Fig. 2 is a plan view of an apparatus in accordance

with the present invention with portions removed;

Fig. 3 is a partial side elevational view of the apparatus of Fig. 2 with portions removed;

5 Fig. 4 is a cross-sectional view of the apparatus along the section line 4-4 of Fig. 2;

Fig. 5 is a cross-sectional view of the apparatus along the section line 5-5 of Fig. 2 with portions removed and illustrates a plastics bag being corrugated;

10 Fig. 6 is the same cross-sectional view as Fig. 4 with additional portions removed and illustrates a plastics bag in the initial stages of being transferred for subsequent folding and packaging; and

Fig. 7 is the same as Fig. 6 but shows the plastics bag in a subsequent position of being transferred.

15 Fig. 1 shows a complete system for producing folded and packaged bags from a roll of plastic film. For the embodiment shown, plastics film 10 in the form of a roll 11 is moved around a roller 12 into a bag making machine 13. The plastics film 10 on the roll is prefolded
20 longitudinally.

It is to be understood that the plastics film 10 could be supplied from an extruder and thereafter prefolded prior to entering the bag making machine 13. The plastics film 10 can also be supplied from other
25 known means such as from a roll without the film having a fold and prefolding the film prior to its entering the bag making machine 13.

Typically, the bag making machine 13 can be a Model 208 Polyethylene Bag Making Machine manufactured
30 by G. T. Schjeldahl Company in combination with a Model Accu-Folder Folding Machine manufactured by FMC Corporation.

The machine 13 produces a bag 14. The bag 14 is longitudinally folded with the crease being the leading
35 edge. The crease, however, is usually not well defined due to the characteristics of the plastics film. The

bag 14 moves through a feeding means such as a corrugating roller 15 into a receiving means 16. The bag 14 comes to rest in the receiving means 16 in a generally flat condition and thereafter is removed from below, such as shown by bag 17, by nip rollers 18 in combination with belts 19 for additional processing and packaging by apparatus 20.

From Figs. 2 and 3, it can be seen that bags can be moved by a conveying system 22 to corrugating rollers 15 into a plurality of upper rods 23 and a plurality of lower rods 24. An adjusting system 21 allows the groups of rods to be moved vertically to obtain a predetermined spacing at a predetermined height. Each rod position within its group is adjustable. Each of the corrugating rollers 15 comprises a drive shaft 25 and tyres 26.

Generally each of the tyres 26 is an annular ring of an elastic material and each tyre 26 frictionally engages the respective shaft 25. The material can be a plastics material such as polyurethane or a rubber-like material or the like. The tyres 26 are grouped in clusters and serve to grip and remove bags from the conveying system 22 when the corrugating rollers 15 are driven. Each group of tyres 26 forms a corrugated region in a bag passing between the corrugating rollers 15.

As used herein, the term "corrugated region" refers to a physical variation in the film as shown in Fig. 5 which shows four such "corrugated regions".

The corrugated regions provide good structural rigidity to the bag so that when the leading edge contacts the barrier, the bag resists deformations which would tend to misalign the bag. The corrugated regions improve the rigidity of the leading edge as well as the rigidity of the overall body of the bag so that the bag misalignment is corrected when it strikes the barrier.

From Figs. 2 and 3, it is evident that the invention is not directed to a system requiring bags to be stacked in the receiving region.

5 The interaction between a bag 27 and the tyres 26 can be seen by reference to Figs. 4 and 5. The relationship between the rods 23 and 24 with respect to the tyres 26 can be seen by reference to Fig. 4.

10 Generally, the end portions of the upper rods 23 near the corrugating rollers 15 are positioned to extend to approximately the lower extremities of the tyres 26 on the upper rod 25. Similarly, the end portions of the lower rods 24 near the corrugating rollers 15 are positioned to be near the upper extremities of the tyres 26 on the lower rod 25..

15 Fig. 6 shows a plastics bag after it has come to rest after sliding between the rods 23 and 24 to a barrier such as fence 28. The fence 28 is a linear arrangement of fixed vertical cylinders as shown in Figs. 2 and 3.

20 The bag 27 is moved towards pinch rollers 18 by an air knife device 30. Generally, an air knife comprises a linear arrangement of air nozzles which provide a blast of air for, in this instance moving a plastics bag towards the pinch rollers 18. A typical
25 air knife is described in U.S. Patent No. 3,918,698.

For a bag removal system using an overheated air knife and pinch rollers, it is preferable to define a corrugation in the bag to correspond to the space
30 between the pinch rollers and generally to extend towards the pinch rollers. As shown in Fig. 6, it is preferable to have a rod 31 above the bag 27 and tending to deform the bag 27 towards the rollers 18.

Fig. 7 shows the plastics bag 27 after it has been engaged by the nip rollers 18 and is being pulled
35 downward between belts 19.

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CLAIMS

1. An apparatus for use in connection with the folding of bags or sheets made from a flimsy material, comprising a feeding means (15) operable to discharge
5 bags or sheets (14) successively in a feed direction with each bag or sheet (14) having a plurality of corrugated regions having grooves in said feed direction and having undulations in the transverse direction, a receiving device (16) operable to receive said bags
10 or sheets from the feeding means (15), and a fence (28) in or adjacent the receiving device (16) for stopping the movement of each of the bags or sheets (14) along said feed direction, characterised in that the receiving device (16) includes means (23,24) operable
15 to maintain in each bag or sheet (14) fed thereto at least some of said corrugated regions, at least until the movement of that bag or sheet in the feed direction is stopped by the fence (28).

2. An apparatus as claimed in claim 1, wherein
20 said feeding means (15) comprises a pair of corrugating rollers.

3. An apparatus as claimed in claim 2, wherein each of said corrugating rollers comprises a drive shaft (25) and a plurality of tyres (26) axially mounted
25 on each of said shafts, said tyres being positioned on said shafts to cooperate to interact with each bag or sheet fed therethrough to form said corrugated regions.

4. An apparatus as claimed in claim 1, 2 or 3

wherein the receiving device (16) comprises a plurality of upper rods (23) and a plurality of lower rods (24), said rods (23,24) being positioned generally along said feed direction and with respect to at least some of said corrugated regions to maintain said corrugated regions at least during the movement of said bags or sheets in said feed direction.

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10
5. An apparatus as claimed in claim 4, wherein said receiving device further comprises an adjusting means operable for changing the relative vertical positions of said plurality of upper rods and said plurality of lower rods.

15
6. An apparatus as claimed in claim 4 or 5, wherein said fence is positioned to provide a barrier to the movement of said bags or sheets fed to said receiving device whereby said bags or sheets come to rest in a predetermined position.

20
7. An apparatus as claimed in claim 5 or 6, wherein each said bag or sheet fed to the receiving device comes to rest above a set of nip rollers (18) and below an air knife (30) operable to force a stream of air against a generally imaginary straight line along said bag or sheet to move said bag or sheet towards the nip rollers (18).

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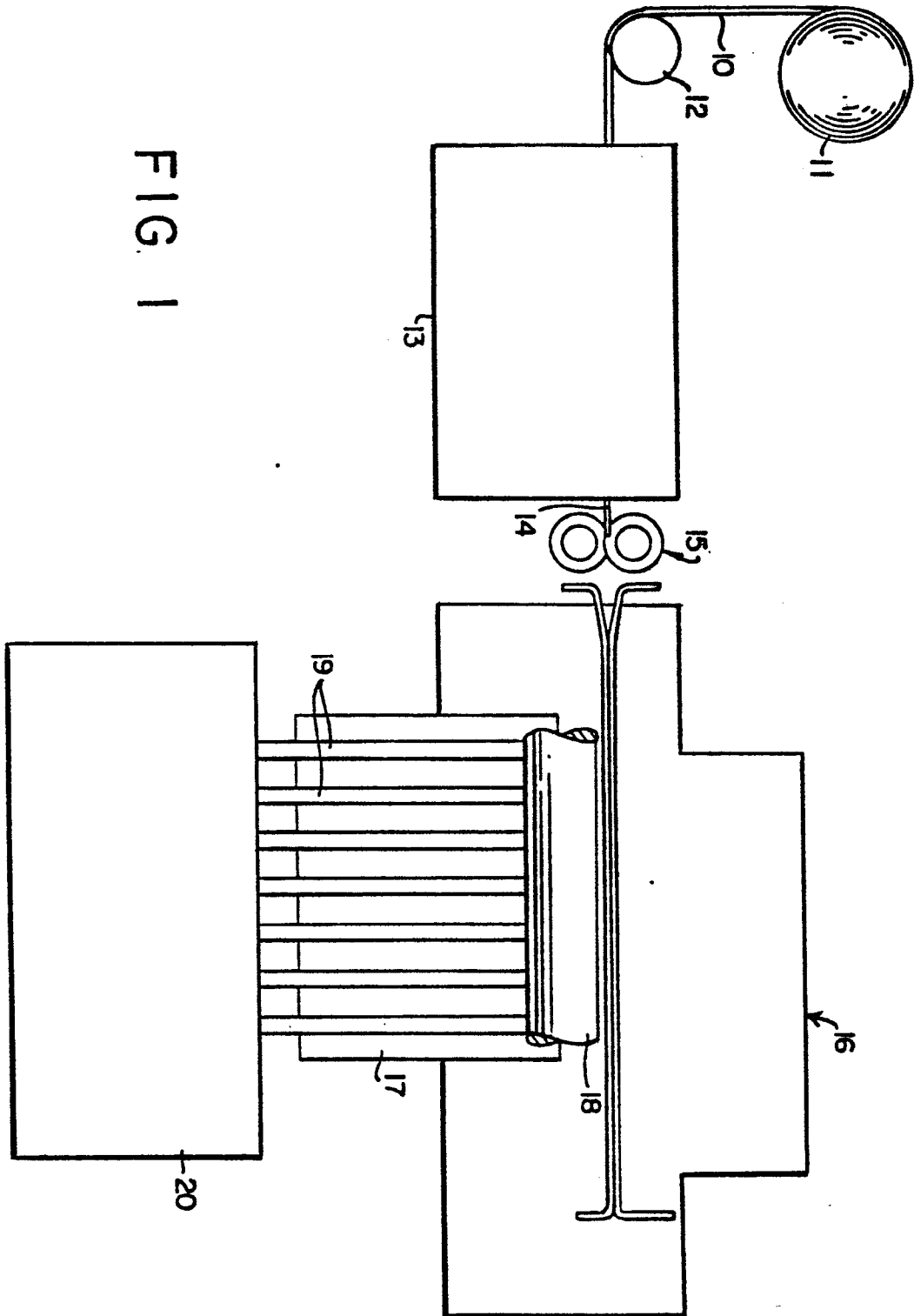


FIG. 1

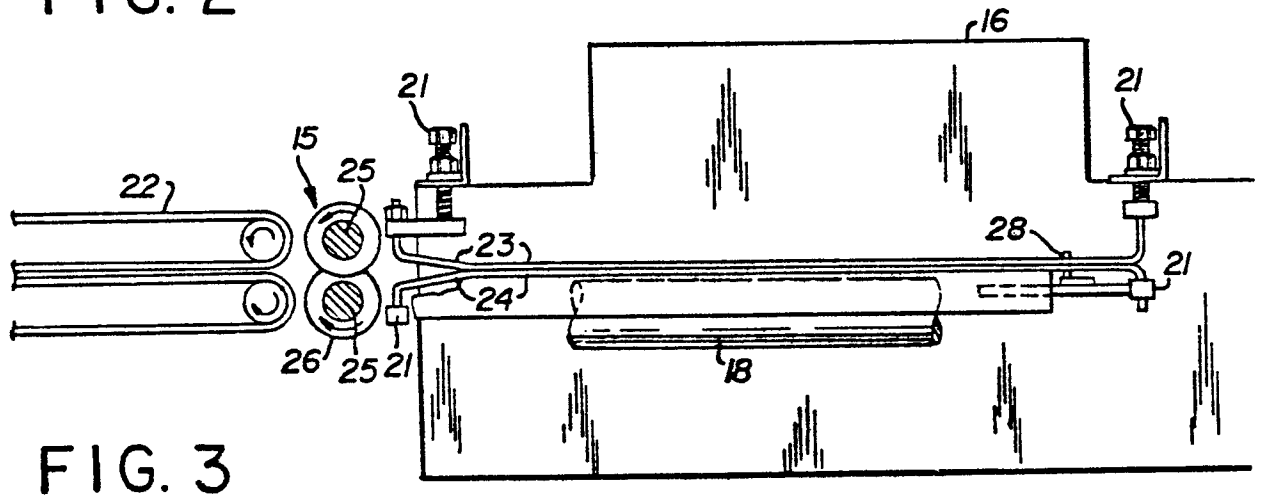
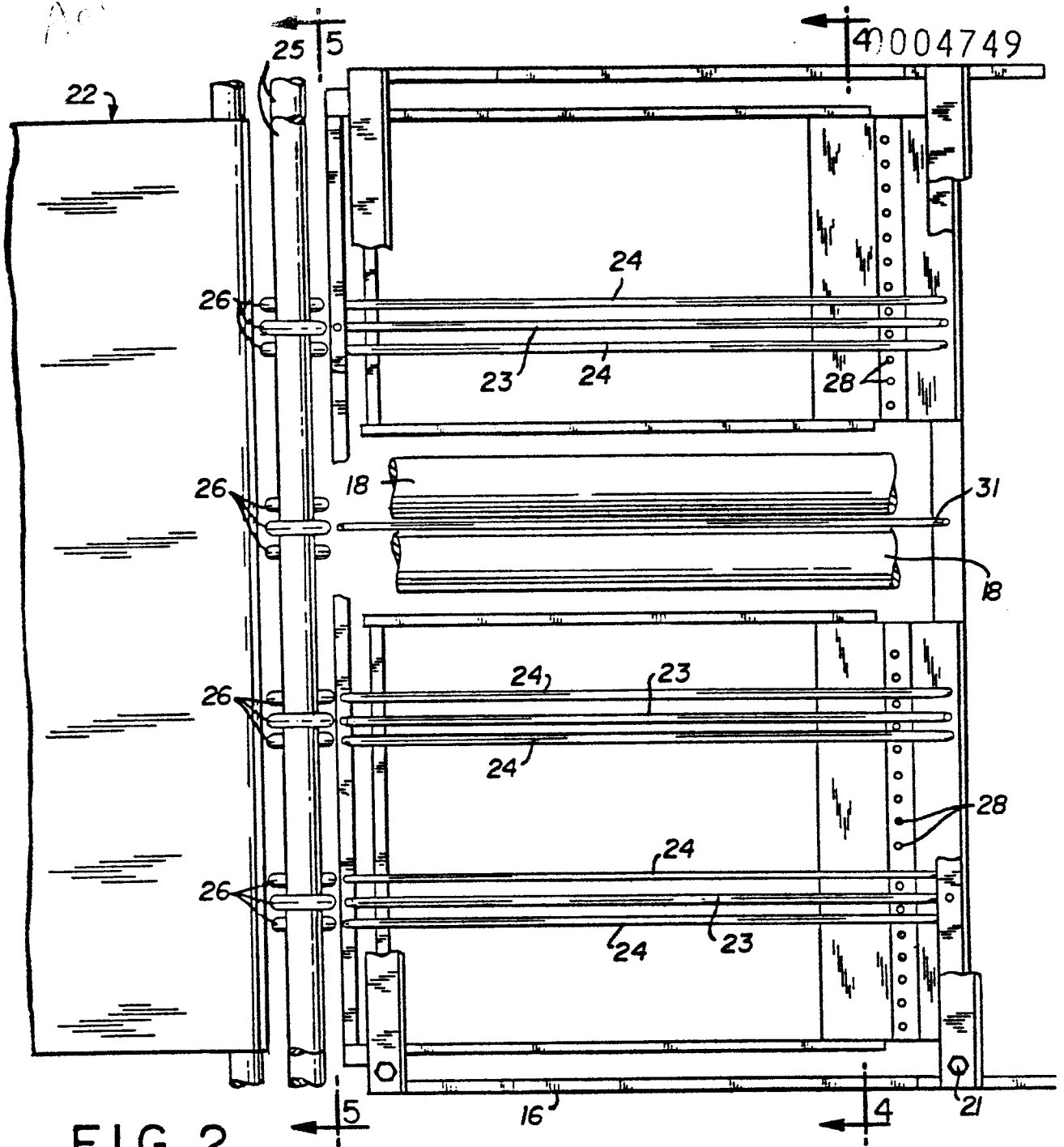


FIG. 4

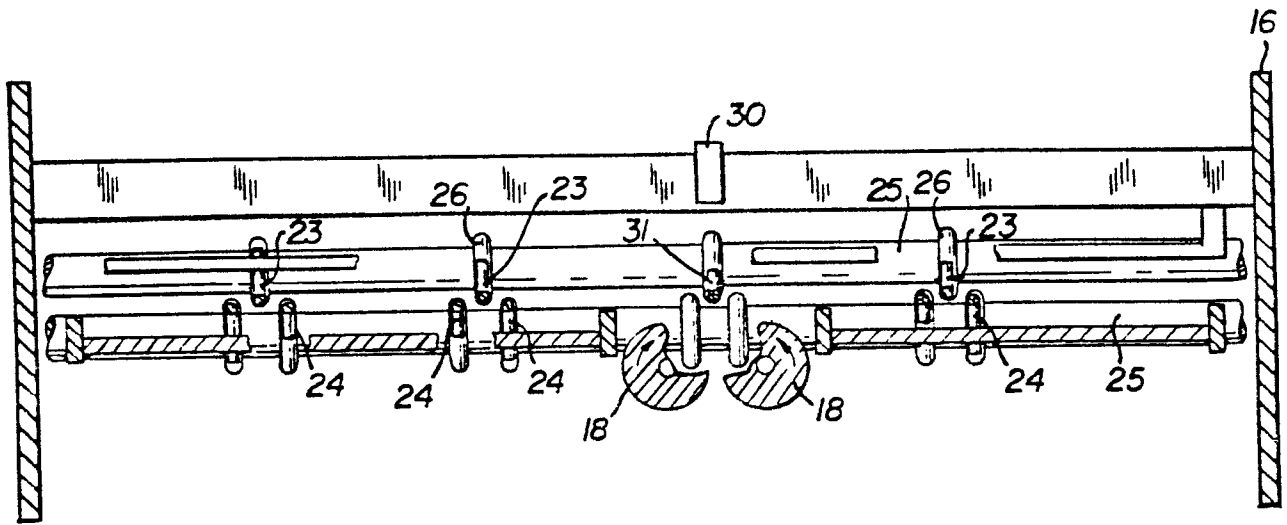


FIG. 5

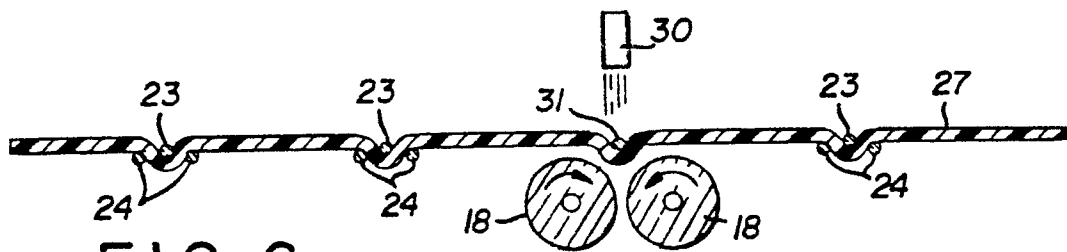
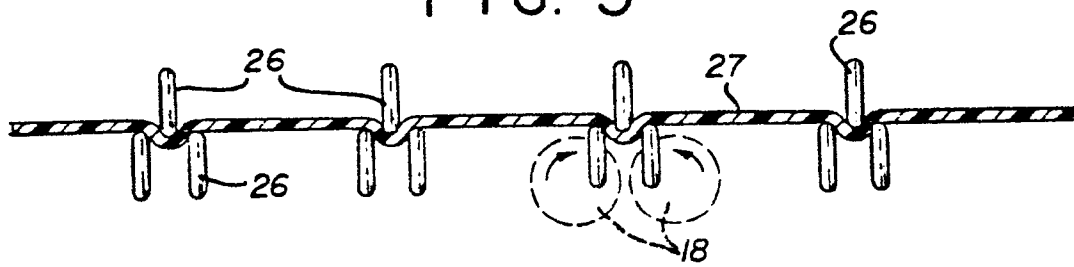


FIG. 6

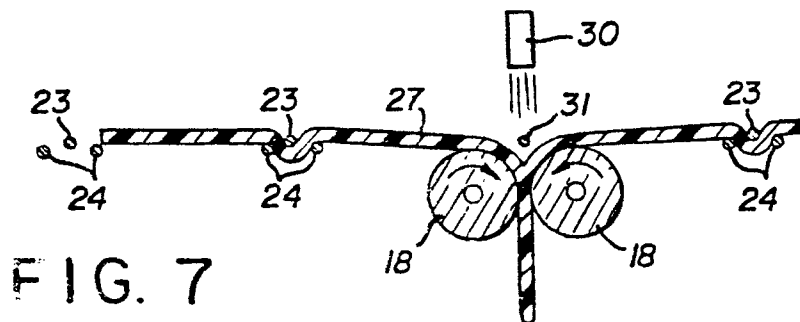


FIG. 7