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Calvert et al.

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[45] **Sept. 17, 1974**

[54] **ARTICLE HANDLING MACHINE**

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[73] Assignee: **The Mead Corporation,** Dayton, Ohio

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[21] Appl. No.: **355,522**

[52] **U.S. Cl.** **198/30,** 198/32, 198/34

[51] **Int. Cl.** **B65g 47/26**

[58] **Field of Search** 198/30, 185, 32, 34

[56] **References Cited**

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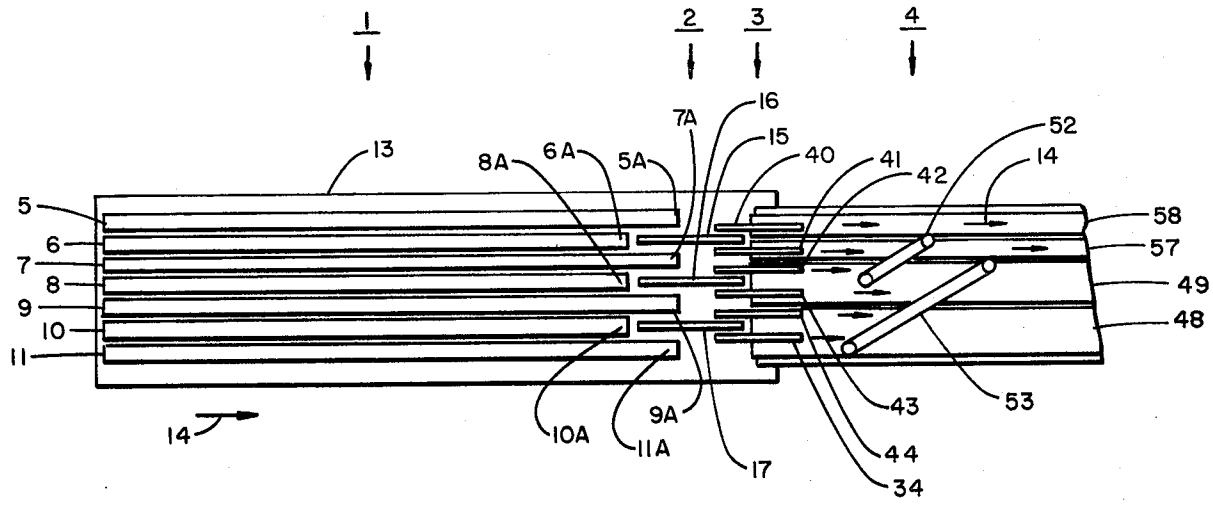
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Attorney, Agent, or Firm—Walter M. Rodgers

[57] **ABSTRACT**

An article handling machine receives a plurality of rows of articles moving at a given velocity and effects a reorientation of the rows of articles into a lesser number of rows in a controlled and orderly fashion. Metering means receives the articles from a plurality of conveyor means and regulates the movement thereof in sequence in a predetermined manner and accelerating means engages the articles and substantially increases the velocity of movement thereof thereby increasing the space between the articles. Converger means then engages the articles and imparts transverse movement thereto relative to the direction of movement imparted by the accelerating means so as to cause the articles to accummulate in sequence on an outfeed conveyor.

7 Claims, 8 Drawing Figures



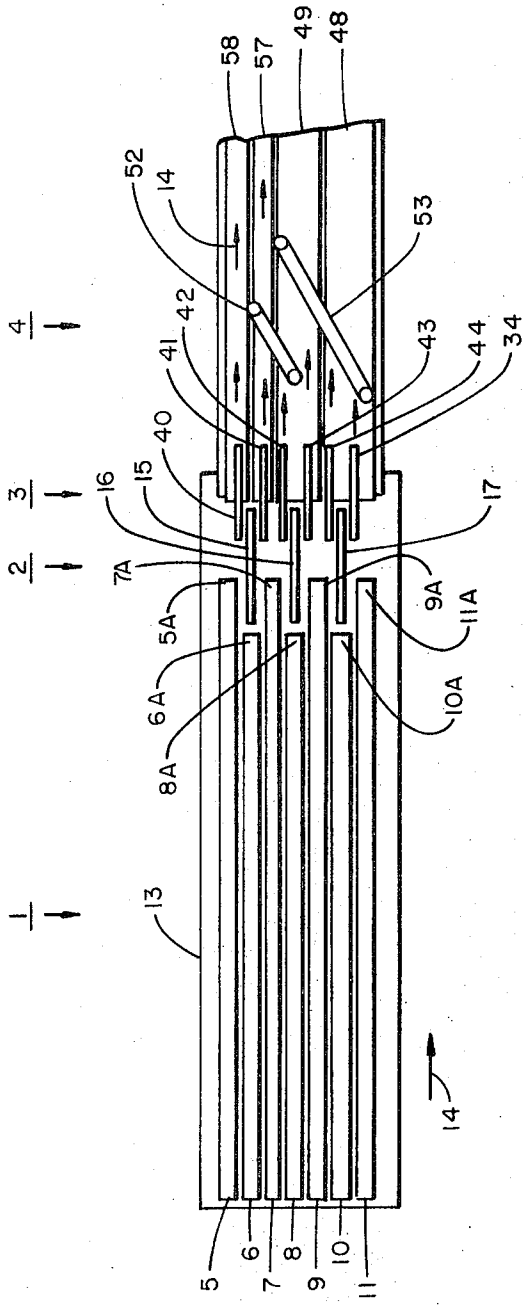

58
57
49
48
52
14
53
42
41
43
44
34
40
15
16
17
7A
9A
11A
5A
6A
10A
8A
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6
7
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11
14

FIG. 1

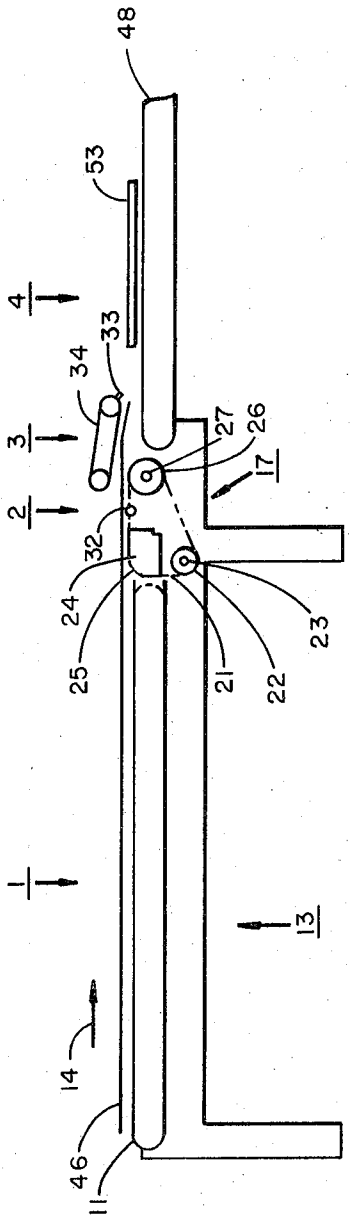

48
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33
34
27
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17
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24
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21
22
23
1
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3
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13
14
46
11

FIG. 2

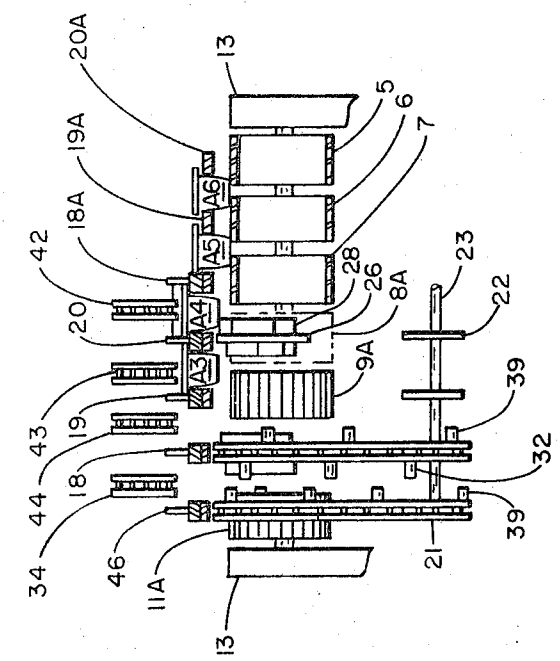


FIG. 4

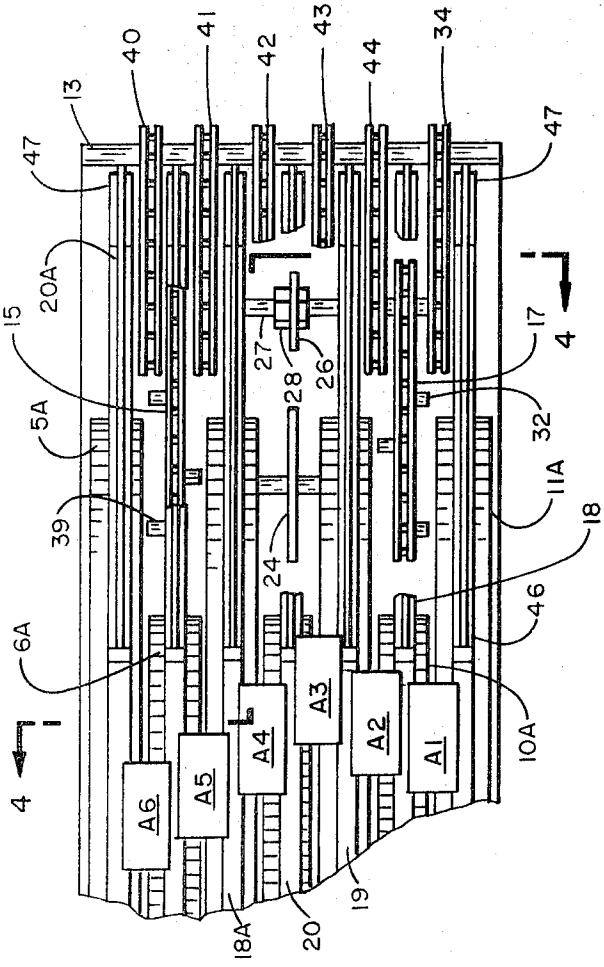


FIG. 3

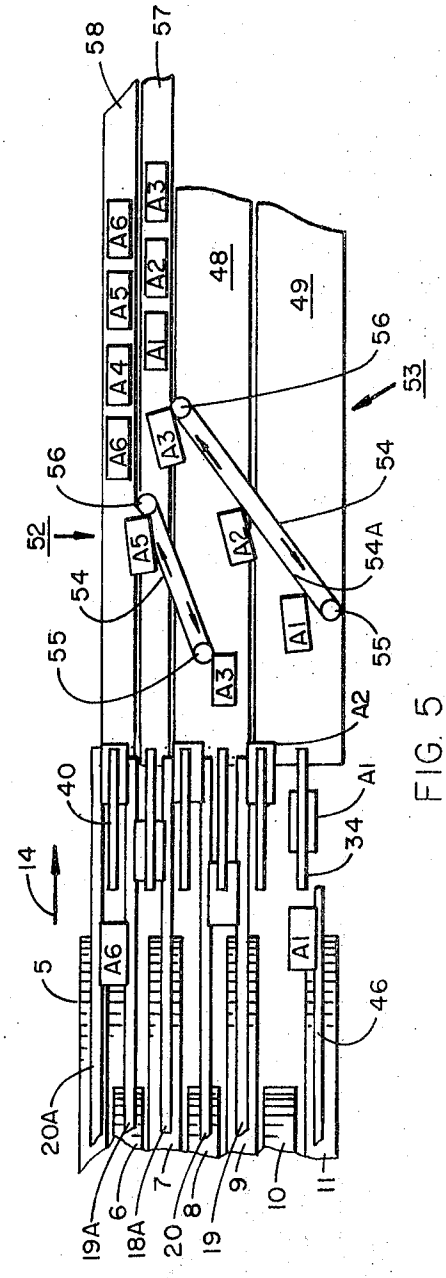


FIG. 5

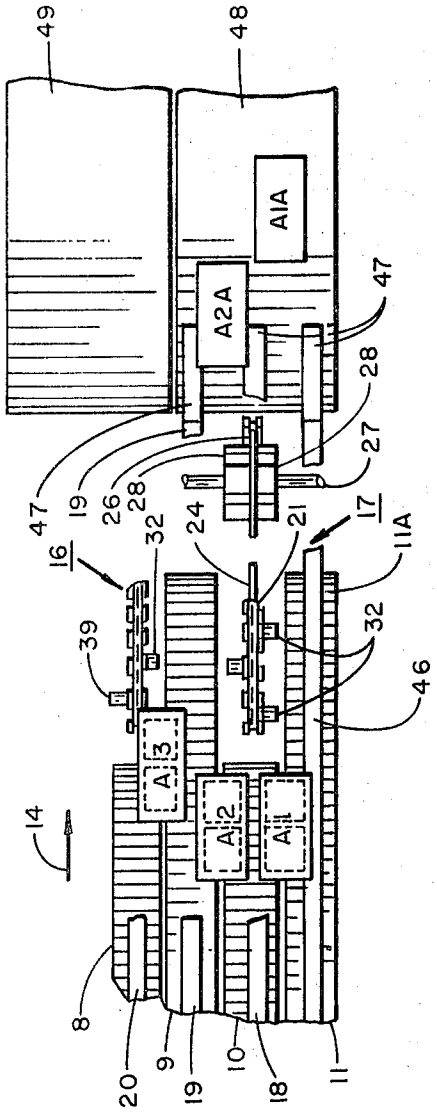


FIG. 6

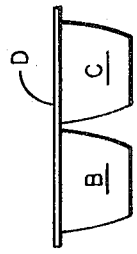


FIG. 8

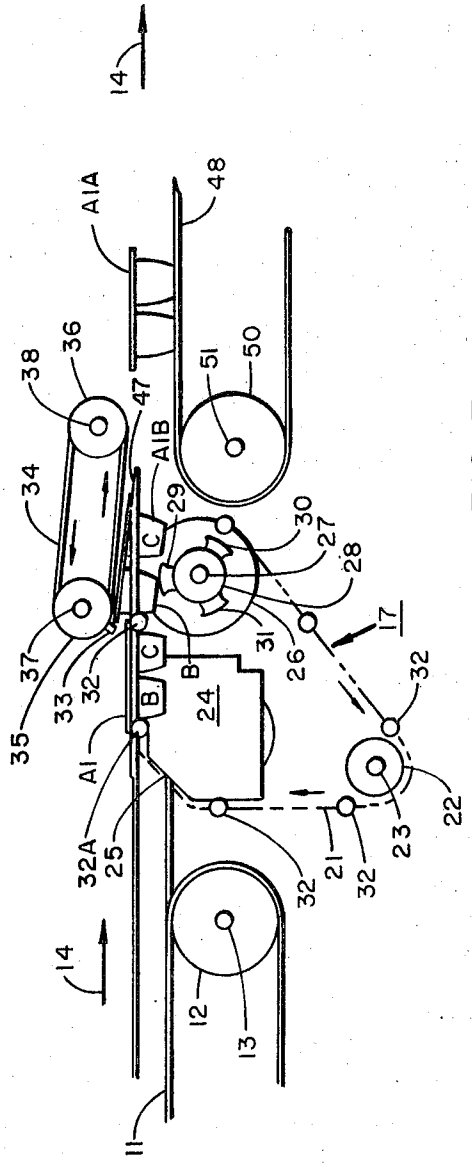


FIG. 7

ARTICLE HANDLING MACHINE

Packaging machines of the type which form individual containers and subsequently fill and seal such containers with a product frequently are arranged so that the filled containers are disposed in a number of rows. In order to provide for the storage, handling and shipment of such primary containers, it is desirable to arrange such containers in a secondary package of some sort such, for example, as a wrapper-type package. Toward this end, the several rows of primary packages must be converted into a lesser number of rows in order to facilitate the packaging of the primary containers in the secondary package.

An article handling machine constructed according to this invention may include suitable metering means for receiving a plurality of rows of primary packages and for regulating the rate of flow and the spacing of such packages. The velocity of movement of the packages is greatly accelerated and the spacing therebetween is increased by suitable accelerating means following which converger means engages the accelerated and spaced packages and imparts movement thereto in a direction which is transverse to that in which the articles are moved by the accelerating means so as to deposit the primary packages on a single outfeed conveyor thereby consolidating the primary packages into a single row.

For a better understanding of the invention reference may be had to the following detailed description taken in conjunction with the accompanying drawings in which:

FIG. **1** is a plan view of a machine constructed according to the invention and which shows the parts schematically;

FIG. **2** is a profile or front view of the arrangement shown in FIG. **1**;

FIG. **3** is an enlarged plan view of a portion of the machine depicted in FIG. **1** but with certain parts removed or broken away for clarity;

FIG. **4** is a sectional view taken along the line designated **4—4** in FIG. **3**;

FIG. **5** is a plan view similar to FIG. **1** but which shows some of the primary packages in the process of being handled in accordance with the invention;

FIG. **6** is an enlarged view of a portion of FIG. **5** and which shows in more detail some of the features of conveyor means arranged according to the invention;

FIG. **7** is a profile or front view of the arrangement shown in FIG. **6** and in which

FIG. **8** is a side view of a composite package used to illustrate the operation of a machine constructed according to this invention.

In the drawings and particularly with reference to FIGS. **1** and **2**, the numeral **1** generally designates a plurality of infeed conveyor means while the numeral **2** generally designates metering means constructed according to the invention. The numeral **3** generally designates the elements of the machine which constitute accelerating means and the numeral **4** generally designates the location of converger means and of the outfeed conveyor means arranged according to this invention.

As is best shown in FIGS. **1, 3** and **6** the infeed conveyor means comprises a plurality of infeed conveyors designated by the numerals **5–11**. In FIG. **1** these infeed conveyors are shown schematically. It will be understood that these conveyors ordinarily constitute flexible endless elements which are trained about two or more rollers one of which is a driven element and one of which is an idler element, one such element being shown in FIG. **7** and being designated by the numeral **12.** Of course the element **12** is rotatably mounted on a horizontal shaft **13** supported by the frame of the machine which in the drawings is generally designated by the numeral **13.**

Articles to be handled move from left to right as indicated by the arrows **14** so that the right hand end of conveyors **5–11** inclusive constitutes the outfeed end of such conveyors. As is apparent from figures such as **1, 3, 5** and **6,** the outfeed ends **5A, 7A, 9A** and **11A** of conveyors **5, 7, 9** and **11** are disposed downstream from the outfeed ends **6A, 8A,** and **10A** of conveyors **6, 8** and **10.** By this arrangement space is provided immediately downstream from the outfeed end of conveyors **6A, 8A** and **10A** for mounting the metering means according to a feature of this invention. More specifically metering means combined with positioning means is designated by the numeral **15** and is disposed downstream from the outfeed end **6A** of conveyor **6** while combination metering and positioning means **16** is disposed downstream from the outfeed end **8A** of conveyor **8** and combination metering means and positioning means **17** is disposed downstream from the outfeed end **10A** of conveyor **10.**

As is apparent from FIGS. **3** and **6,** article **A1** is conveyed by conveyors **10** and **11** until the outfeed end **10A** of conveyor **10** is reached at which time article **A1** is supported and conveyed by conveyor **11** only and the article **A1** is supported partially by support means **18.** In like fashion article **A2** is conveyed by conveyors **10** and **9** until the outfeed end **10A** of conveyor **10** is reached at which time article **A2** is conveyed by conveyor **9** and is slidably supported by guide **18.** Similarly article **A3** is conveyed by conveyors **9** and **8** until the outfeed end **8A** of conveyor **8** is reached at which point article **A3** is conveyed by conveyor **9** and is supported by support means **20** which is broken away to expose the metering mechanism therebelow. In like fashion articles **A4, A5** and **A6** are conveyed by pairs of conveyors as will be obvious from the preceding description respecting articles **A1, A2** and **A3** and in view of the drawings. With article **A1** resting in part on conveyor **11** and supported in part by support means **18** metering means **17** is positioned to engage the trailing end of article **A1** and to impart controlled and regulated movement to article **A1** from left to right.

Metering means combined with positioning means is best shown in FIG. **7** and comprises a metering chain **21** which is trained about a driving element **22** rotatable about a shaft **23** mounted in known manner to the frame of the machine. Metering chain **21** is also trained along fixed guide **24** secured in known manner to the frame of the machine, the guide **24** having an inclined guide surface **25.** Metering chain **21** is also trained about a sprocket **26** rotatable about a shaft **27** which in turn imparts rotary movement to positioning means **28** which is secured to shaft **27** and which is provided with a plurality of radially extending positioning elements **29, 30** and **31.**

As is apparent in FIGS. **2, 3, 4, 6** and **7,** metering chain **21** is provided with a plurality of laterally extending metering lugs collectively designated by the numeral **32.**

The primary packages are of a dual nature as is apparent from FIGS. **6, 7** and **8** and constitute two elements such as B and C having a common cover or lid portion D.

Thus as is apparent from FIG. **7** rotation of driving element **22** in a clockwise direction as viewed in FIG. **7** causes a laterally projecting metering element such as **32A** to ride behind package **A1** and more specifically to engage the trailing surface of component B as the lug **32A** rides up and toward the right along inclined surface **25.** Since the velocity of movement of metering chain **21** is precisely controlled, the motion of primary package **A1** toward the right is securely and precisely regulated in synchronism and at a speed such that correct engagement with the trailing edge of component B by the accelerating lug **33** on accelerating chain **34** is effected. Chain **34** is an endless element which is trained about rotatable elements **35** and **36,** the rotatable elements **35** and **36** being supported by shafts **37** and **38** one of which is a driven element and which imparts movement to lug **33** which is faster than the movement imparted to the articles such as **A1** by the metering chain **21** and associated apparatus. Thus the effect of the accelerating chain **34** and of lug **33** is greatly to increase the space between one article from a succeeding article in the same row as is apparent from the position of article **A1A** which is in spaced relation to the position indicated at **A1B.**

In order to facilitate engagement of the accelerating lug **33** with the trailing edge of component B, it is necessary to elevate the trailing edge of component B as is depicted in FIG. **7.** Toward this end positioning means **28** is provided and conveniently is rotated by the metering chain **21** as is apparent in FIG. **7.** Positioning means **28** is arranged so that a particular one of its radial projections such as **29** engages the bottom surface of component B of one of the articles and elevates such component above the level of a succeeding article as is evident in FIG. **7** by comparison of the article **A1B** with the article **A1.** Projections **29** are transversely staggered so as to elevate the articles in different rows in a desired sequence. The radial projections **29, 30** and **31** are disposed on opposite sides of rotatable element **28** and are staggered so that the projections on one side of element **28** engage the articles in one row in sequence relative to engagement of the articles in an adjacent row by the radial projections on the other side of said rotatable element and in synchronism with said metering means. When so disposed, accelerating element or lug **33** clearly is arranged securely and precisely to engage article **A1B** in timed sequence and greatly to increase its velocity of movement.

As is apparent in FIG. **6,** metering chain **21** not only acts to meter the movement of articles **A1** but this chain also regulates in sequence the adjacent row of articles designated **A2.** Toward this end metering projections designated generally by the numeral **39** are mounted on the metering chain **21** and extend outwardly therefrom in a direction opposite from the direction in which the metering elements **32** extend. Of course it will be understood that metering means **16** is provided with oppositely disposed projections and thus may meter the movement of articles A3 and A4 while metering means **15** controls and regulates the movement of articles **A5** and **A6.**

While the metering elements **15, 16,** and **17** each controls the flow of two rows of articles on the infeed conveyor means **1,** separate accelerating chains are provided for each row of articles fed into the machine. Such accelerating chains are designated in the drawings by the numerals **40–44** and **34** respectively. Of course each accelerating chain is provided with an accelerating lug such as that designated by the numeral **33** in connection with accelerating chain **34.**

As the articles are accelerated such for example by accelerating chain **34** and its associated lug **33,** each article is arranged to slide along a pair of guides such as **46, 18** which control A1 and then slide downhill along downwardly inclined portions **47** of guides **46** and **18,** the support being by means of laterally extending flange portions constituting extensions of the cover D best shown in FIG. **8** of each article.

From the accelerating means, the articles are transferred to converger conveyors **48, 49** which are flexible endless elements having their working reaches moving toward the right as viewed for example in FIG. **7** and mounted on rotatable elements only one of which designated by the numeral **50** is shown in FIG. **7.** Rotatable element **50** of course is mounted on horizontal shaft **51** supported by the frame of the machine.

With the articles moving from left to right on the converger conveyors such as **48** and **49,** it is necessary to impart transverse movement thereto and such movement is effected by converger transport devices generally designated by the numerals **52** and **53.** Each of these converger transport devices comprises an endless element such as **54** mounted on a pair of rotatable devices **55** and **56** one of which is a driven device arranged to impart clockwise rotation to belts **54.**

From FIG. **5** it is apparent that an article such as **A1** moving toward the right on converger conveyor **49** engages the working reach **54A** of belt **54** and is thus guided upwardly as viewed in FIG. **5** and toward the right to be deposited ultimately on outfeed conveyor **57.** In like fashion articles such as **A2** and **A3** are guided across converger conveyor **49** by means of converger transport device **53** and are thus caused to occupy an in-line relationship in a single row on conveyor **57** as shown in FIG. **5.** Thus articles **A1** and **A2** and **A3** which enter the machine on infeed conveyor means **1** are consolidated into a single row on outfeed conveyor **57** as is apparent in FIG. **5.** In like fashion articles **A4, A5** and **A6** entering the infeed conveyor section of the machine designated by the numeral **1** in three rows are consolidated into a single row and are fed out of the machine on outfeed conveyor **58** as is apparent in FIG. **5** due in part to the action of converger transport device **52.**

From the description thus far it is apparent that all six incoming rows of articles could be consolidated into a single row on a single conveyor if desired. In such case the conveyor such as **57** could be eliminated as would the converger transport device such as **52.** Furthermore the converger transport belt **53** would be made somewhat longer so as to insure that all of the articles coming out of the accelerator section of the machine would be transported onto outfeed conveyor **58** as is obvious.

Furthermore it is apparent that a greater number of rows of incoming items than six could be consolidated into any lesser number of rows by making obvious modifications in the elements as might be desired.

Since a machine constructed according to this invention not only is capable of consolidating a plurality of

rows of articles into a lesser number of rows of articles, the machine also can be utilized to intermingle in any desired sequence articles of different types so that miscellaneous articles may be accummulated on the outfeed conveyor in any desired sequence according to one facet of the invention.

It is also obvious that the rate of flow of incoming items supplied to the infeed portion **1** of the machine can be accommodated by simply controlling the velocity of movement of the other elements of the machine so that the items on outfeed conveyors **57** and **58** are fed out at a rate which is equal to the rate at which the total items are fed into the infeed portion **1** of the machine as might be desired.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. An article handling machine comprising a plurality of infeed conveyor means for a plurality of rows of articles respectively, metering means for engaging articles from said infeed conveyor means and for regulating the movement thereof in sequence in a predetermined manner, accelerating means for sequentially engaging articles from said metering means and for imparting substantially increased velocity of movement thereto thereby to increase the spacing therebetween, article positioning means disposed generally below said accelerating means and arranged to elevate the trailing edge of the articles in sequence in a plurality of rows, converger means sequentially engageable with articles from said accelerating means for imparting movement thereto in a direction which is different from the direction of movement of the articles when initially engaged by said converger means, and outfeed conveyor means arranged to receive the articles from said converger means in sequence and to convey the articles in a single row.

2. A machine according to claim **1** wherein said article positioning means comprises a rotatable element having staggered radial projections, the projections on one side of said element being disposed to engage the articles in one row and the projections on the opposite side thereof being disposed to engage the articles in an adjacent row.

3. A machine according to claim **2** wherein the projections on said rotatable element are arranged to engage the articles in each row in sequence and wherein engagement with an article in one row is subsequent to engagement with an adjacent article in the other row whereby said positioning means is synchronized with said metering means.

4. An article handling machine comprising a plurality of infeed conveyor means for a plurality of rows of articles respectively, each of said infeed conveyor means for each row of articles comprising a pair of conveyors whose working reaches are disposed in side-by-side substantially parallel relationship and the outfeed end of one of each pair of conveyors being disposed downstream relative to the outfeed end of the other of each pair of conveyors, metering means for engaging articles from said infeed conveyor means and for regulating the movement thereof in sequence in a predetermined manner, accelerating means for sequentially engaging articles from said metering means and for imparting substantially increased velocity of movement thereto thereby to increase the spacing therebetween, movable converger means sequentially engageable with articles from said accelerating means for imparting movement thereto in a direction which is different from the direction of movement of the articles when initially engaged by said converger means, and outfeed conveyor means arranged to receive the articles from said converger means in sequence and to convey the articles in a single row.

5. A machine according to claim **4** wherein article support means is disposed downstream from the outfeed end of each of said other conveyors and arranged to aid in supporting the articles fed therefrom.

6. A machine according to claim **4** wherein said metering means is disposed downstream from the outfeed end of each of said other conveyors.

7. A machine according to claim **6** wherein article positioning means is disposed adjacent said accelerating means and wherein said positioning means and said metering means are movable in synchronism.

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