

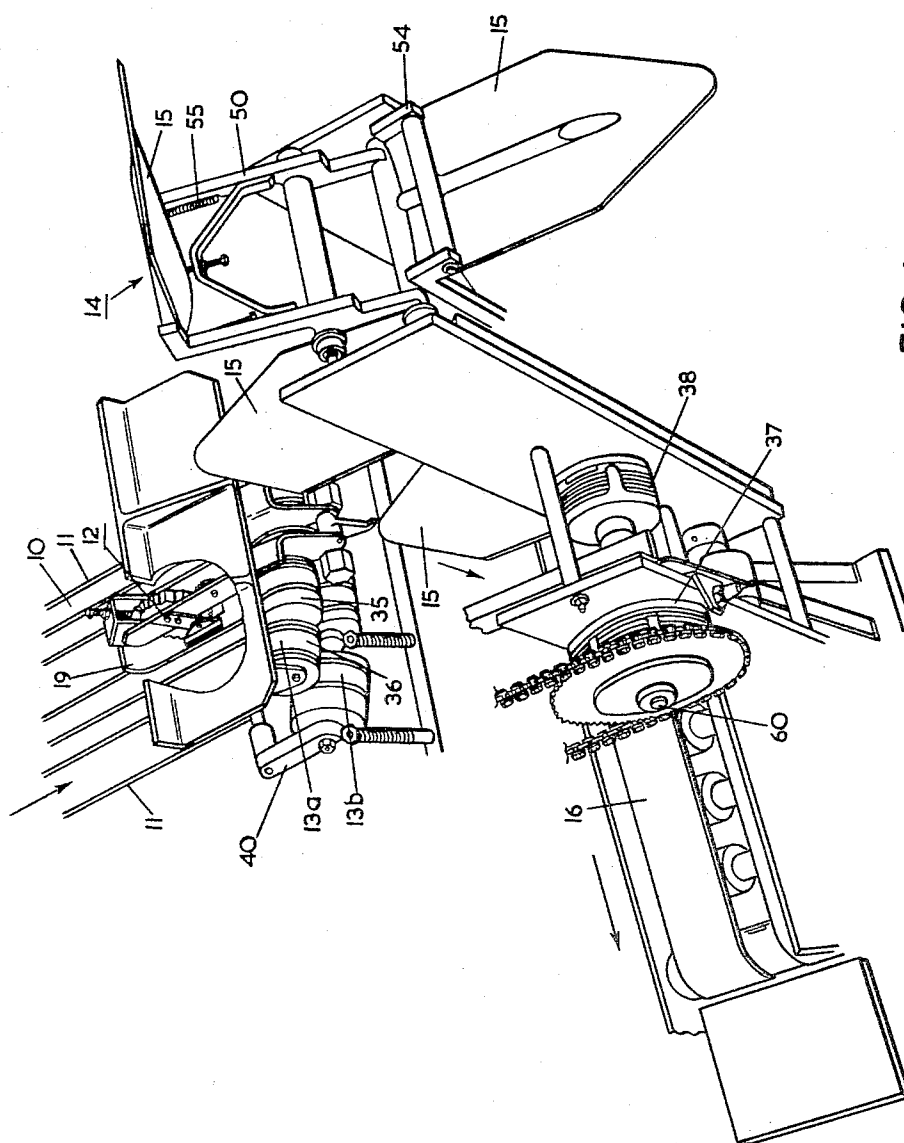
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D. B. ROBINSON
STACKING MACHINES

3,306,173

Filed Jan. 13, 1965

7 Sheets-Sheet 1



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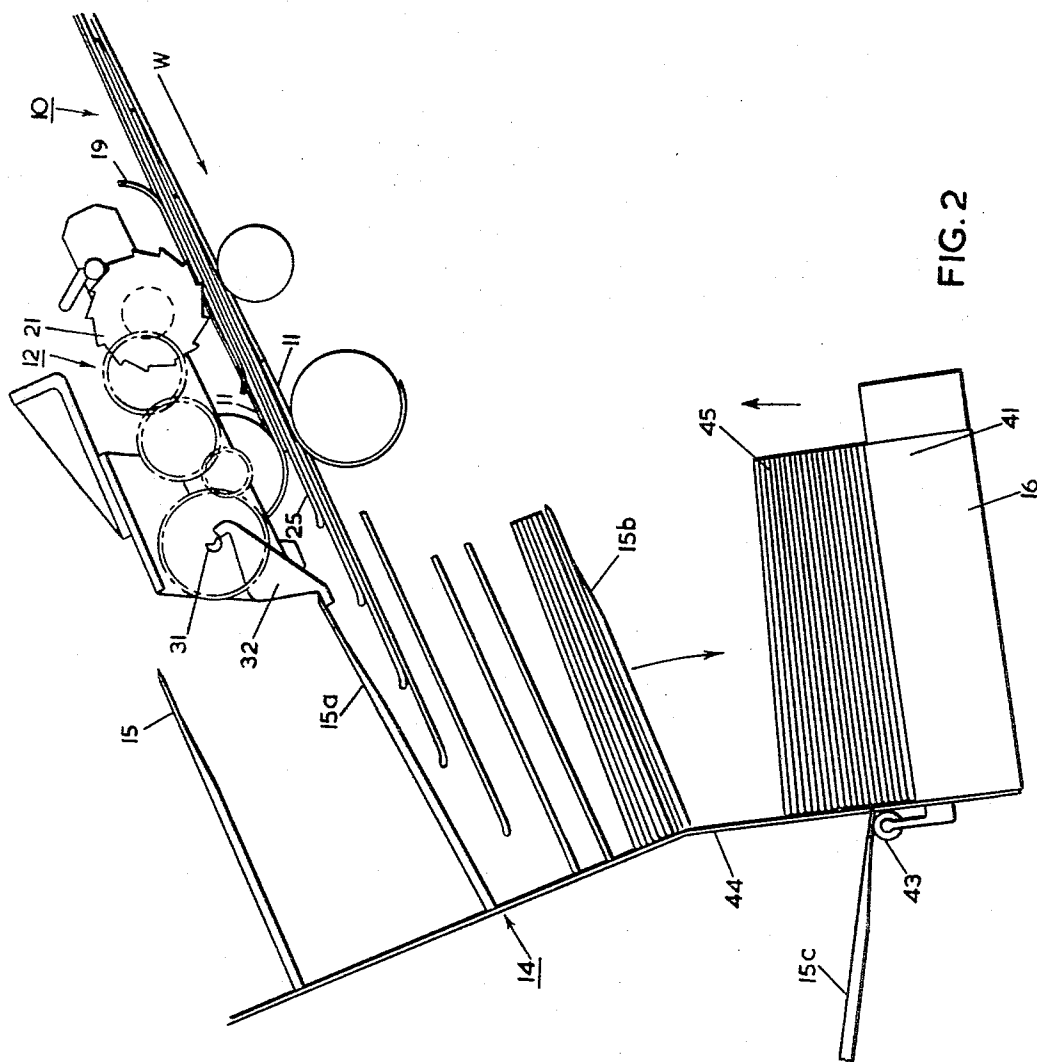


FIG. 2

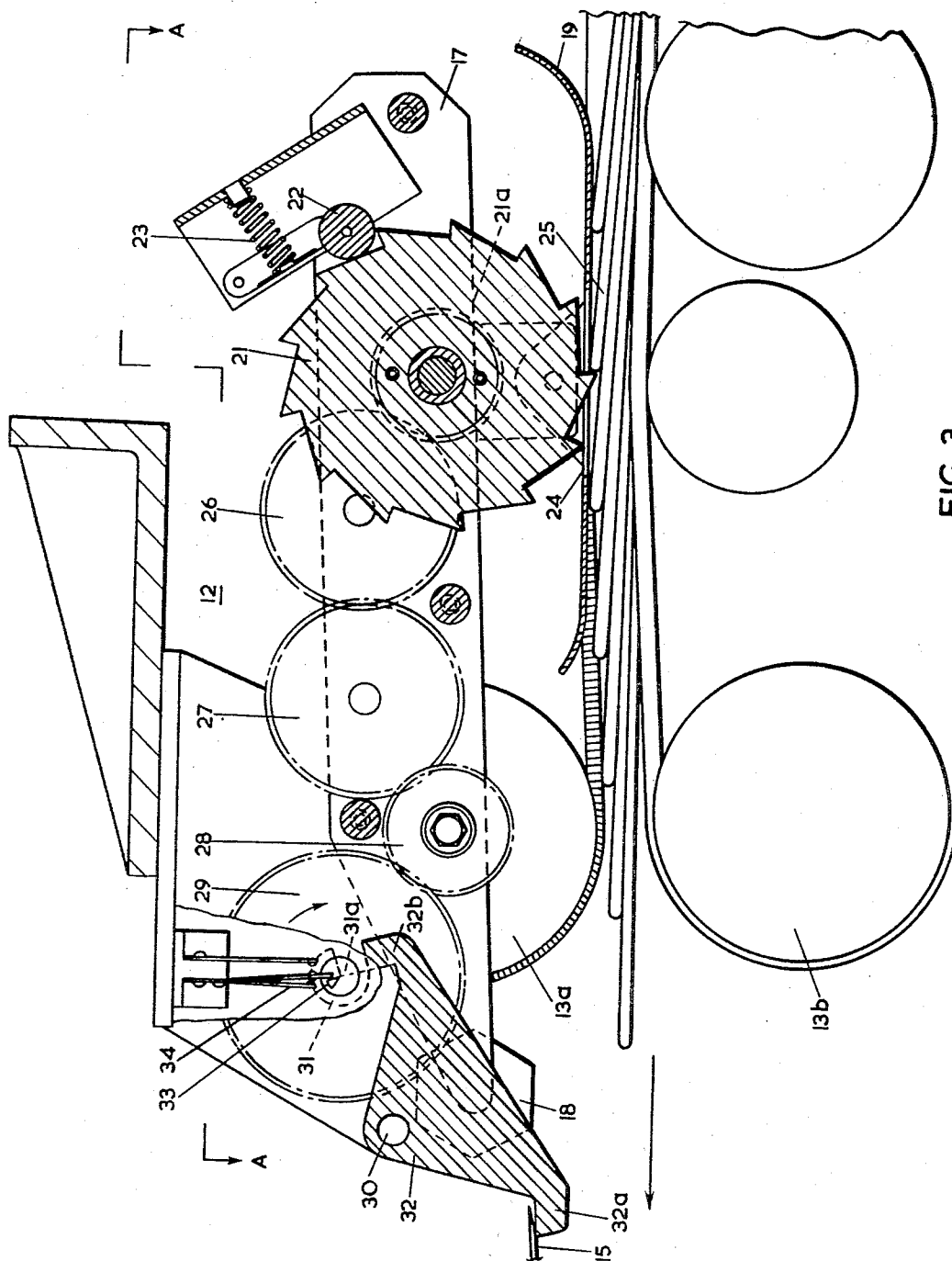
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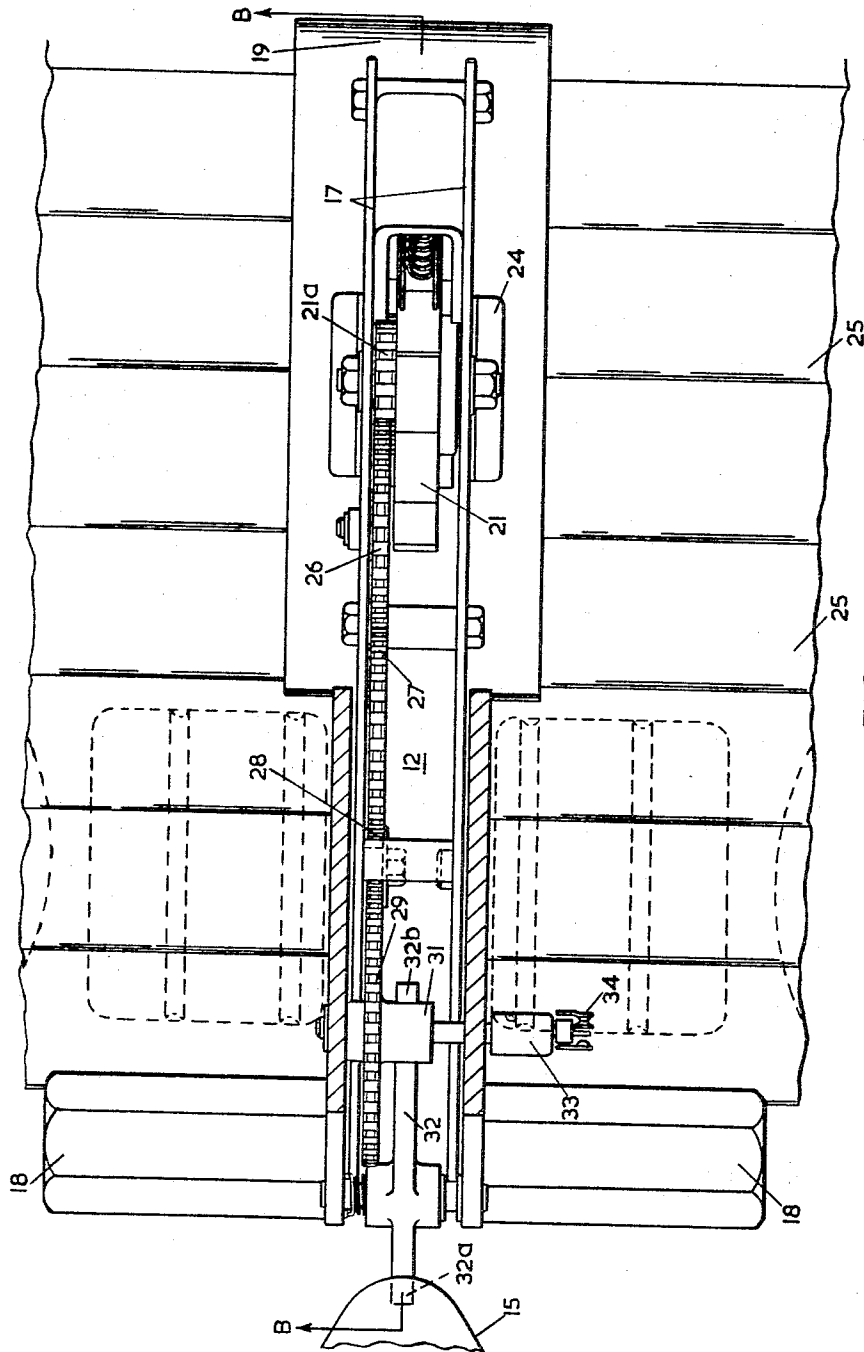


FIG. 4

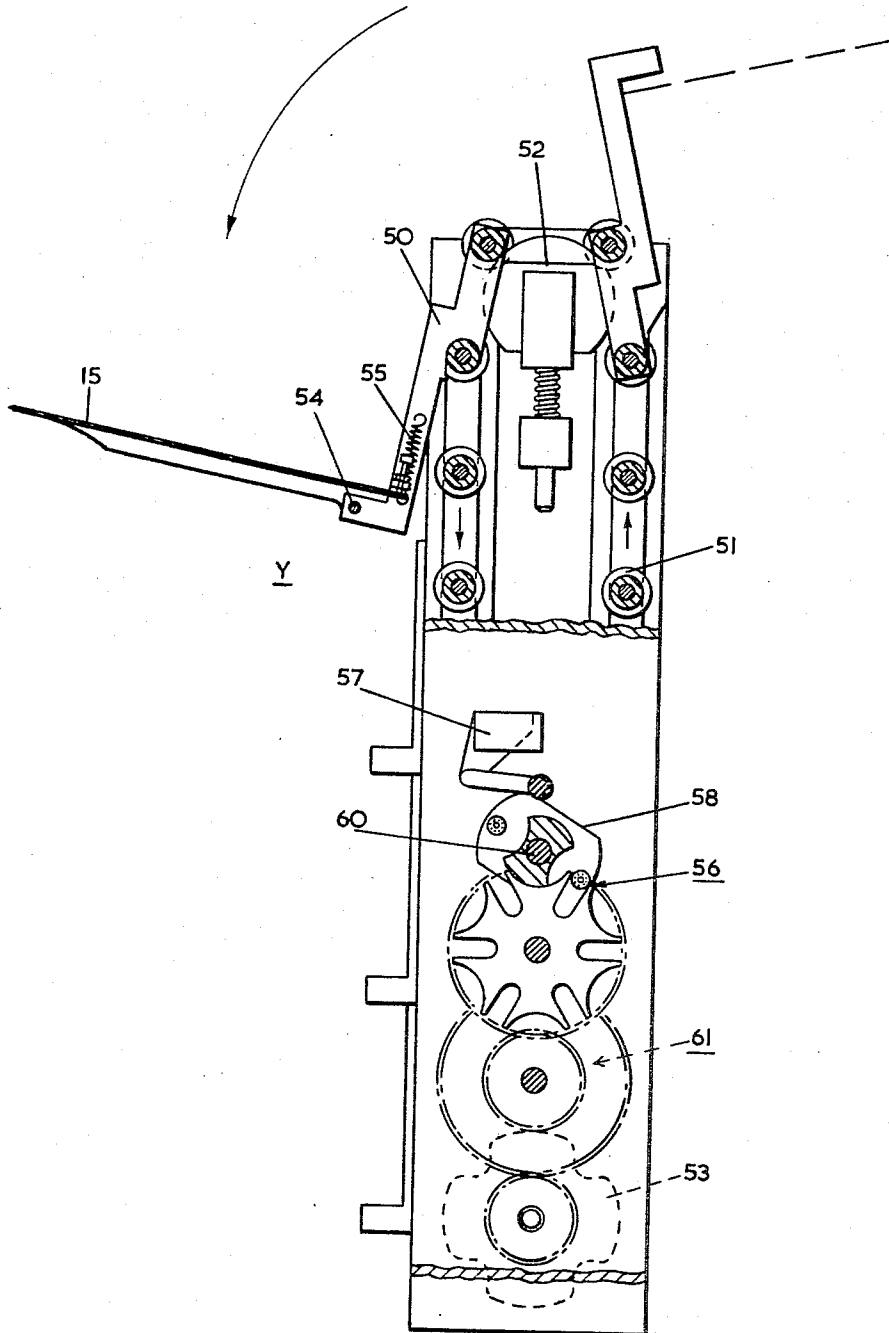
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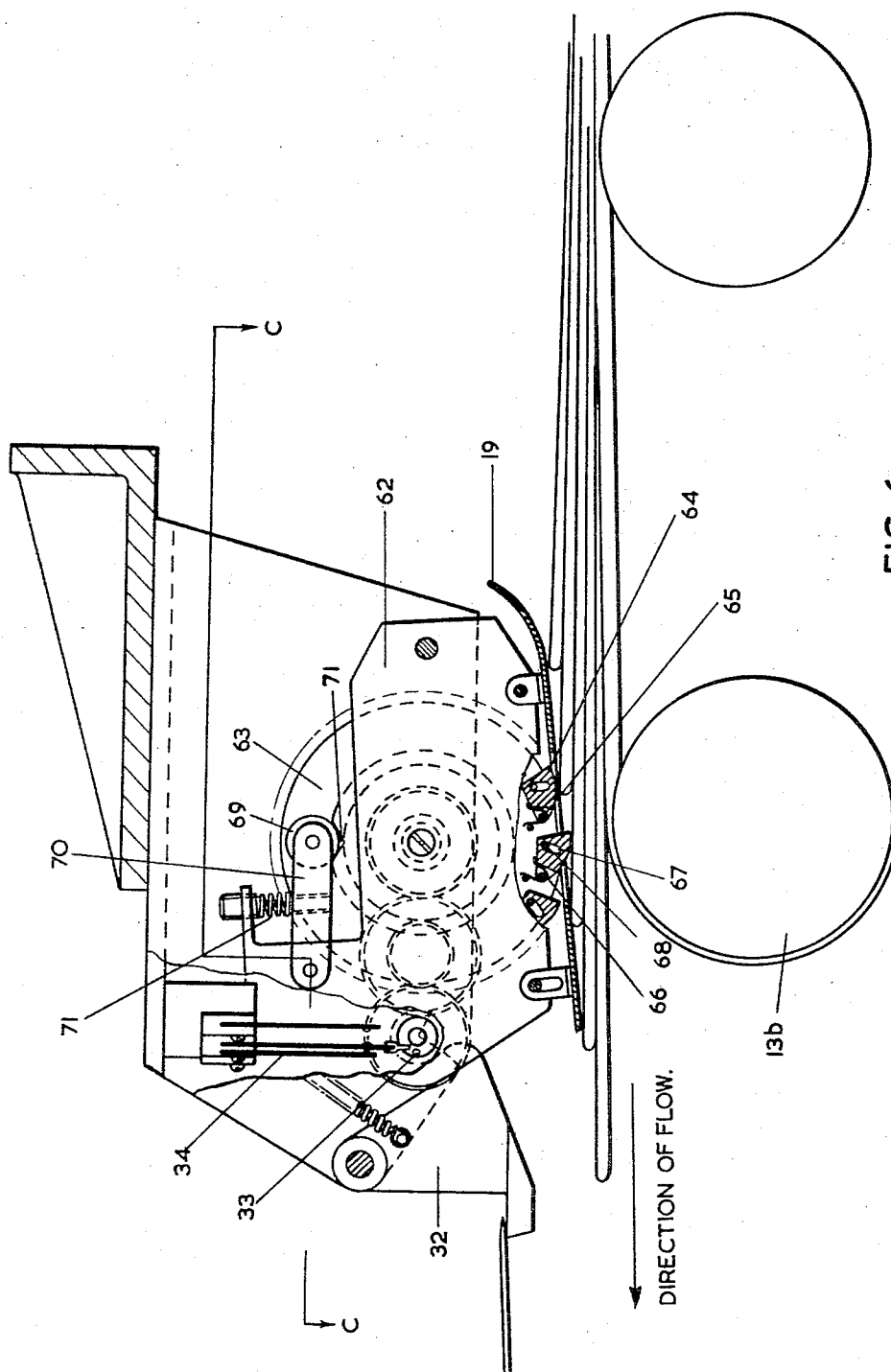
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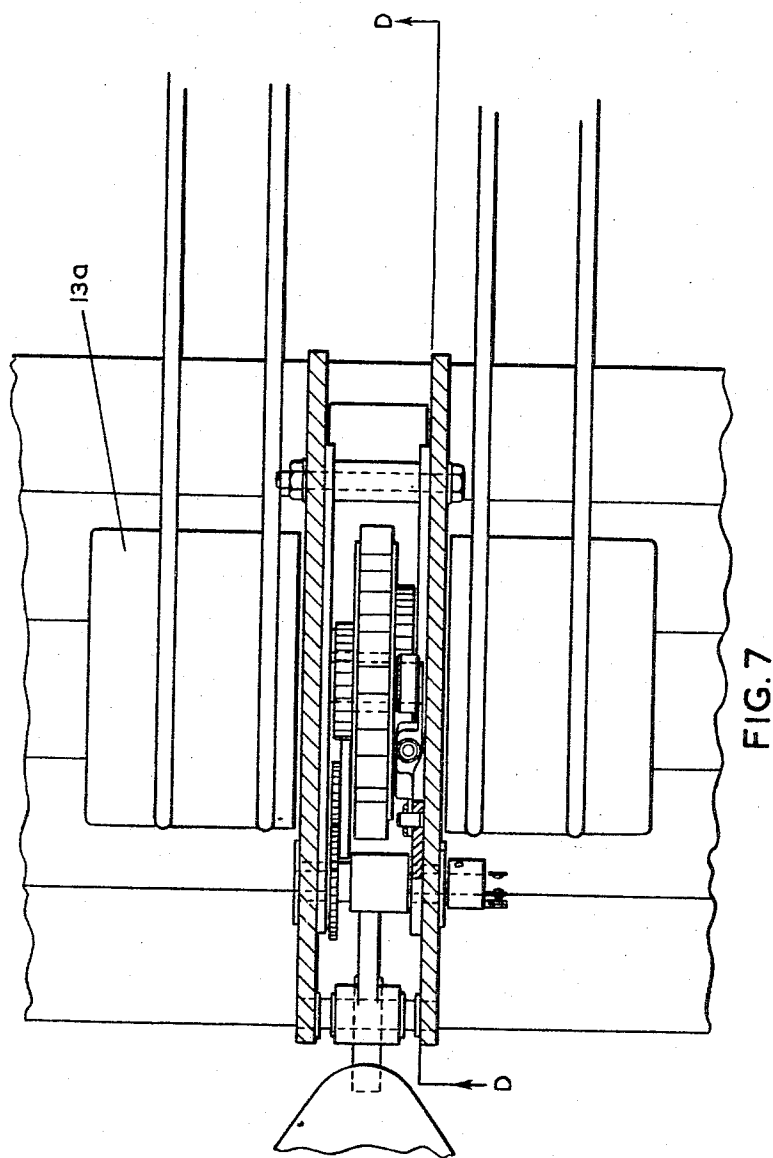
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STACKING MACHINES

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14 Claims. (Cl. 93—93)

The present invention relates to stacking machines for articles, such as newspapers, being conveyed in a stream.

In the case of newspapers, the present practice is for the newspapers to be conveyed in an overlapping stream from the printing press to a delivery table where the paper are manually stacked into bundles. To assist in collecting the correct number of papers in each bundle, one paper in each quire in the stream is displayed so that a corner projects to act as a marker, or "kick" copy.

A primary object of the present invention is to provide a stacking machine for stacking such bundles of newspapers, without the need for a "kick copy."

According to the invention there is provided a stacking machine for articles being conveyed in a stream, comprising a series of stacking members and means for moving successive stacking members into the path of the articles so as to form an individual stack of articles on each stacking member.

The various features of the invention will become apparent from the following description of one embodiment and a modification thereof, given by way of example only, taken in conjunction with the drawings accompanying the provisional specification, wherein,

FIGURE 1 shows a perspective view of parts of a newspaper-stacking machine embodying the invention;

FIGURE 2 shows a schematic side view of part of the machine of FIGURE 1, showing how newspapers are stacked into bundles;

FIGURES 3 and 4 show details of the counting unit of the machine shown in FIGURE 1; FIGURE 3 being a sectional elevation on the line B—B of FIGURE 4 and FIGURE 4 being a plan view on the line A—A of FIGURE 3; and

FIGURE 5 shows a section through the stacking unit of the machine, as viewed in the direction of arrow X in FIGURE 1, and with reference to the accompanying drawing, wherein:

FIGURES 6 and 7 show an alternative counting unit to that of FIGURES 3 and 4 for a modification of the newspaper-stacking machine of FIGURES 1, 2 and 5, FIGURE 6 being a section along the line D—D in FIGURE 7 and FIGURE 7 being a section along the line C—C in FIGURE 6.

The machine shown in the FIGURES 1 to 5 of the drawings is designed to make up bundles of newspapers automatically from a stream of papers, each bundle containing the correct required number of papers, without the aid of displaced or "kick" copies in the stream. The machine will accept newspapers or magazines which must be flexible, in half-fold broadsheet or tabloid forms, the papers being conveyed to the machine in the manner known as "direct delivery" and with the folded edges leading and lapped over the preceding paper.

Referring to FIGURES 1 and 2, the stream of papers is fed to the machine from a conveyor (not shown) and enters an input conveyor 10, comprising upper and lower spring wires 11 carried around pinch rollers 13a and 13b, the wires holding the papers firmly between them. This conveyor is directed downwardly at an angle of about 25° from the horizontal, as seen from FIGURE 2. The papers then pass under a counting unit 12 and between the pinch rollers 13a and 13b which shape the papers for ejection into a stacking unit 14. The papers are

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ejected on to collector plates 15, in the stacking unit and bundles of stacked papers are fed to an output conveyor 16 mounted at right angles to the incoming conveyor 10.

The counting and stacking units will now be described in detail.

The counting unit 12 is detailed in FIGURES 3 and 4 and is contained between two side plates 17. The unit is pivotally supported centrally of the top pinch roller 13a, so as to pivot about the roller axis, and has counter-balance weights 18 so that the unit bears lightly against the newspaper stream through a skid 19. A toothed counter wheel 21 is mounted for rotation between the two side plates and its rotation is restrained by a roller 22 held against the wheel by a spring 23. The wheel projects through a slot 24, in the skid 19 so that the teeth of the wheel engage the leading edges of successive newspapers 25 in the stream below. The forward motion of the newspapers rotates the wheel by one step for each newspaper passing underneath. The roller 22 restrains the wheel so that it will not rotate by mere friction against the newspapers but only when driven by the leading edge of a newspaper.

The wheel 21 is fast with a cog wheel 21a which drives a series of gear wheels 26, 27, 28 and 29. The final gear wheel 29 carries a cam 31 which engages a catch lever 32.

Gear wheels 26 and 27 are mounted on the pivotable counting unit whilst gear wheel 29 and the catch lever 32 are mounted on a fixed part of the machine. However, the axis of gear wheel 28 coincides with the pivotal axis of the counting unit and thus engages gear wheels 27 and 29 at all times. The lever 32 is pivoted at 30 and is formed at one end 32a normally to support the free end of successive collector plates 15. The other end 32b is formed as a cam follower for the cam 31, the latter being circular except for a removed sector 31a. The catch lever is shown in the condition in which the end 32b is just about to drop into the cam sector 31a, thereby releasing a held collector plate 15. The lever will then be moved back to the position shown ready to catch and hold the next collector plate.

The counting unit is arranged to count in batches of twenty-six newspapers. The wheel 21 has thirteen teeth and the series of gear wheels has a 1:2 ratio so that the catch lever 32 is released by the cam 31 once for every twenty-six steps, i.e. two complete rotations, of the wheel 21. The gear wheel 29 also drives a cam 33 which operates a changeover switch 34, the function of which will be described in connection with the stacking unit.

The pinch rollers 13a and 13b are arranged as shown in FIGURE 1 to form the newspapers into a suitable correct shape for ejection into the stacking unit 14. The top roller 13a is mounted on fixed pivots and consists of a centre horizontal roller 35 with a short roller 36 at each side having its axis sloping upwards and outwards, so that the three rollers form a trough shape. The lower roller 13b is similarly constituted and shaped and is independently supported on arms such as 40 pivoting on the structure. The lower roller is sprung upwardly so that the rollers can accept newspapers of different thicknesses between them and also grip the newspapers firmly.

As each newspaper passes between the pinch rollers, it is formed into a trough shape so that it remains sufficiently rigid to fall correctly on to a collector plate 15, whilst the centre portion of the newspaper is sufficiently flexible for interception by a following collector plate, as will be described.

The stacking unit 14 is shown in FIGURES 1, 2 and 5. The collector plates 15 (only one of which is shown in detail in FIGURE 5) are carried by arm structures 50 attached at equal intervals to a continuous chain 51. This chain runs around a chain wheel 52 and a tensioning disc 53 arranged so that a line between the centres

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of the wheels is at right angles to the leading edge of the newspaper stream. The chain is closely guided along the runs between the wheels. The collector plates are hingedly attached at 54 to the arm structures, the hinges being arranged so that on the side facing the newspaper stream (marked Y in FIGURE 5) the collector plates cannot fall beyond a position at right angles to the chain. Springs 55 restrain the collector plates so that if the free end of a plate is lifted (i.e. moved against the direction of the chain), it snaps rapidly back to its position at right angles to the chain. The chain is driven by the chain wheel 53, from a drive shaft 60 connected through a Geneva mechanism 56 and a gear train 61, to move the collector plates round in a stepping motion and is so arranged that in a neutral position of the Geneva mechanism, a collector plate is exactly opposite the newspaper stream so the tip of the plate, when in its lowermost position (after release by the catch lever 32) will be inserted between the newspapers. The drive to the Geneva mechanism is controlled electrically by means of the change-over switch 34 (FIGURE 3), a magnetic clutch 37 and a magnetic brake 38 (FIGURE 1) on the drive shaft 60, and a limit switch 57 (FIGURE 5) operated through a cam 58 also on the drive shaft.

The operation of the machine is as follows. Referring to FIGURE 2, the stream of newspapers flows in the direction of the arrow W towards the collector plates. The tip of a collector plate referenced 15a, just above the stream of newspapers, is restrained and sprung upwardly against its springs 55 by the catch lever 32 on the counting unit. The counter wheel 21 is stepped round with the motion of the newspapers, the pinch rollers form the stream for collection and (as shown) a bundle of newspapers is collected on the collector plate next below (referenced 15b). When the counter wheel has completed two revolutions, the catch lever 32 is released by the cam 31, allowing the collector plate 15a to fall about its hinge, due partly to gravity and partly to the action of its springs 55. When the tip of collector plate 15a falls into the stream of ejected newspapers, the stream is separated or intercepted so that the newspapers already under this plate continue to be collected on the plate 15b below whilst the following newspapers are collected on the intercepting plate 15a.

The next operation, movement of the collector plates to the next rest position, is controlled electrically. In a rest position of the collector plates (i.e. as shown in FIGURE 2), the driving mechanism is held by the magnetic brake 38 which is energised through the normally closed contacts of the switch 34 on the counting unit and through the limit switch 57. The cam 33 operating the switch 34 is arranged to actuate the switch at approximately five steps of the counter wheel after release of the catch lever 32. This action de-energises the brake 38 and energises the clutch 37, which drives the Geneva mechanism 56. Once the motion of the collector plates has started the limit switch 57 takes over the control of the clutch and maintains the electrical supply to the clutch until the completion of the operation. The delay between the interception of the newspaper stream and the start of the movement of the collector plates is to allow for the newspapers under the intercepting collectors plate to settle into the bundle below. At the end of the operation, the stacking unit is again in the condition shown in FIGURE 2 awaiting completion of the next count.

The output conveyor 16 is of the ordinary belt type, except that the belt extends only about one third of the way under the bundle being lowered. The remainder of the conveyor consists of free running rollers such as 41 (FIGURE 2). The conveyor belt is driven continuously at a speed sufficient to ensure that one bundle is kept separated from the next.

The collector plate 15b carrying the completed bundle lowers during this operation until it is immediately above and roughly parallel to the output conveyor 16. At this

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point it strikes a fixed roller 43 and with continued movement of the chain 51 around the lower chain wheel 53 (FIGURE 5) hinges and runs out on the roller 43. The bundle of newspapers is supported by an abutment plate 44 so that the final movement of the collector plate is to slide out from under the bundle. A collector plate 15c is shown in FIGURE 2 having just completed this movement, depositing its bundle 45 on the output conveyor 16. When a bundle is deposited on the output conveyor the leading edges of the bundle rest on the driven belt so that the bundle is moved away, the partial contact with the belt producing an initial slip of the belt against the papers thereby preventing a high acceleration of the bundle and consequent disturbance of its shape.

The stacking unit is normally driven from the drive to the input conveyor 10 which in turn would be driven by a printing press (not shown). However, as the newspapers will not stack if the drive speed is too low, a small auxiliary driving motor (not shown) is provided to drive the unit at a minimum speed. The conveyor drive and the auxiliary motor drive are connected to the unit through two uni-directional driving couplings (not shown) so that whichever drive is the faster does not drive the slower.

It will be understood that the stacking machine described may accept articles other than newspapers and the counting unit may be modified to effect operation at different periods than that mentioned.

The alternative counting unit shown in FIGURES 6 and 7 comprises two stationary, but adjustable spaced side plates 62, between which a toothed counter wheel 63 is rotatably mounted. This counter wheel is provided with a specified number of retractable teeth 64 pivoted on pins 65, and urged outwardly by springs 66. The teeth 64 have elongated holes 67 through which project pins 68, to limit the movement of the teeth.

The rotation of the counterwheel 63 is restrained by a roller 69 which is mounted on a lever 70, and urged by a spring 71 into indents 72 (only one of which is shown), situated on one side of the counter wheel 63. There are the same number of indents 72 as teeth 64.

The remainder of the counting unit is substantially the same construction as that already illustrated in FIGURES 3 and 4, and like reference numerals have been used to indicate like parts.

The advantage of having retractable teeth instead of fixed teeth, is that there is less likelihood of false counts occurring, as the whole unit may be fixedly mounted, thus preventing bounce.

What is claimed is:

1. In an apparatus for conveying, counting and stacking articles being supplied in a stream, the combination with an input conveyor and a means for counting said articles being moved by said conveyor, of stacking means at the discharge end of said conveyor comprising an endless means carrying a plurality of devices for receiving and stacking said articles, said devices each being afforded limited movement relative to said endless means, means energizable to advance said endless means a predetermined distance, means actuable by said counting means each time the latter registers a predetermined count to energize said means for advancing said endless means a predetermined distance to move one of said devices into an article receiving and stacking position in relation to the discharge end of said conveyor, latch means engageable with a following device to hold that device against the direction of travel of said endless means to cause said device to move to a displaced position relative to said endless means, and means actuable by said counting means to cause said latch to release said device upon registration of a predetermined count to permit the latter to move out of said displaced position relative to said endless means to thereby separate the stream of articles and be positioned to receive following articles thereupon.

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2. The combination according to claim 1, together with a limit switch means provided to deenergize said means energizable each time said endless means advances said predetermined distance.

3. The combination according to claim 1, together with an output conveyor positioned below said article receiving and stacking position, said endless means extending between said article receiving and stacking position and said output conveyor, at least one advancement of said endless means a predetermined distance to move said device from said article receiving and stacking position to said output conveyor to cause said device to deposit its stack on said output conveyor.

4. The combination according to claim 1, wherein each of said devices for receiving and stacking said articles comprises a plurality of combination supporting and stack alining members and an article collecting member, said combination supporting and stack alining members being secured to said endless means for positive movement therewith, and said article collecting members being pivotally mounted to said combination supporting and stack alining members.

5. The combination according to claim 4, wherein said collecting members are pivotally mounted to said combination supporting and stack alining members at the inner ends of said collecting members so that the outer ends thereof are free to rotate about said pivots in a direction against the travel of said endless means, and said collecting members extend outwardly of and substantially perpendicular to said endless means.

6. The combination according to claim 5, wherein said latch engages the outer end of said collecting member of said following device during advancement of said endless means and before said endless means arrives at its predetermined position to cause said collection member to pivot to said displaced position.

7. The combination according to claim 6, together with spring means coacting between said combination supporting and stack alining members and said collecting members of said devices to bias said collecting members against displacement.

8. The combination according to claim 7, wherein mechanical means are provided on said counter coacting with said latch to cause said latch to release said pivotal collecting member in response to registration of a predetermined count.

9. The combination according to claim 8, wherein said counter comprises a toothed wheel having its teeth in engagement with the leading edges of said articles in said stream, and said means to release said latch is a cam driven by said toothed wheel.

10. In an apparatus for conveying, counting and stacking articles being supplied in overlapped relation in a stream, the combination with an input conveyor and a means for counting said articles being moved by said conveyor, of stacking means at the discharge end of said conveyor comprising a pair of endless chains carrying a plurality of devices for receiving and stacking said articles, said devices being afforded limited movement relative to said endless chains, drive means energizable to advance said endless chains a predetermined distance, switch means actuable by said counting means each time the latter registers a predetermined count to energize said drive means to advance said endless chains said predetermined distance to move one of said devices into an article receiving and stacking position below the discharge end of said conveyor, latch means engageable with a fol-

lowing device to hold that device against the direction of travel of said endless chains upon said advancement of the latter to cause said device to move to a displaced position relative to said endless chains, and means actuable by said counting means to cause said latch to release said device upon registration of a predetermined count to permit the latter to move out of said display position relative to said endless chains to thereby separate the stream of articles and be positioned to receive following articles thereupon.

11. The combination according to claim 10, wherein said devices for receiving and stacking said articles each comprise a pair of combination supporting and stack alining members and an article collecting member, said combination supporting and stack alining members being mounted upon each of said endless chains for positive movement therewith, said collecting members being pivotally mounted at one end to said combination supporting and stack alining members so that said collecting member extends outwardly of and substantially perpendicular to said endless chains, the outer ends of said collecting members being free to pivot upon said combination supporting and stack alining members in a direction against the travel of said endless chains.

12. The combination according to claim 11, wherein said latch engages the outer end of the collecting member of said following device when said drive means are energized for advancing said endless chains to move one of said devices into said article receiving and stacking position, said latch causing said collecting member to pivot to a displaced position, spring means coacting between said combination supporting and stacking alining members and said collecting member to bias the latter against displacement, and mechanical means on said counting means to release said latch upon registration of a predetermined count to permit said collecting member to move out of its displaced position, said mechanical means comprising a toothed counting wheel and a cam driven by said wheel.

13. The combination according to claim 12, wherein said drive means includes a Geneva gear mechanism to advance said endless chains said predetermined distance, and a limit switch to deenergize said drive means when said endless chains are advanced said predetermined distance.

14. The combination according to claim 13, together with an output conveyor positioned adjacent said endless chains and below said article receiving and stacking position so that advancement of said endless chains to move one of said devices into an article receiving and stacking position relative to said input conveyor also moves one of said devices into a stack depositing position relative to said output conveyor and causes said last mentioned one of said devices to deposit its stack upon said output conveyor.

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