April 17, 1956 A. MAGNANI 2,741,955

APPARATUS FOR FEEDING REINFORCING ELEMENTS FOR INCORPORATION INTO CEMENTITIOUS SHEETS

Filed June 22, 1954 3 Sheets-Sheet 1

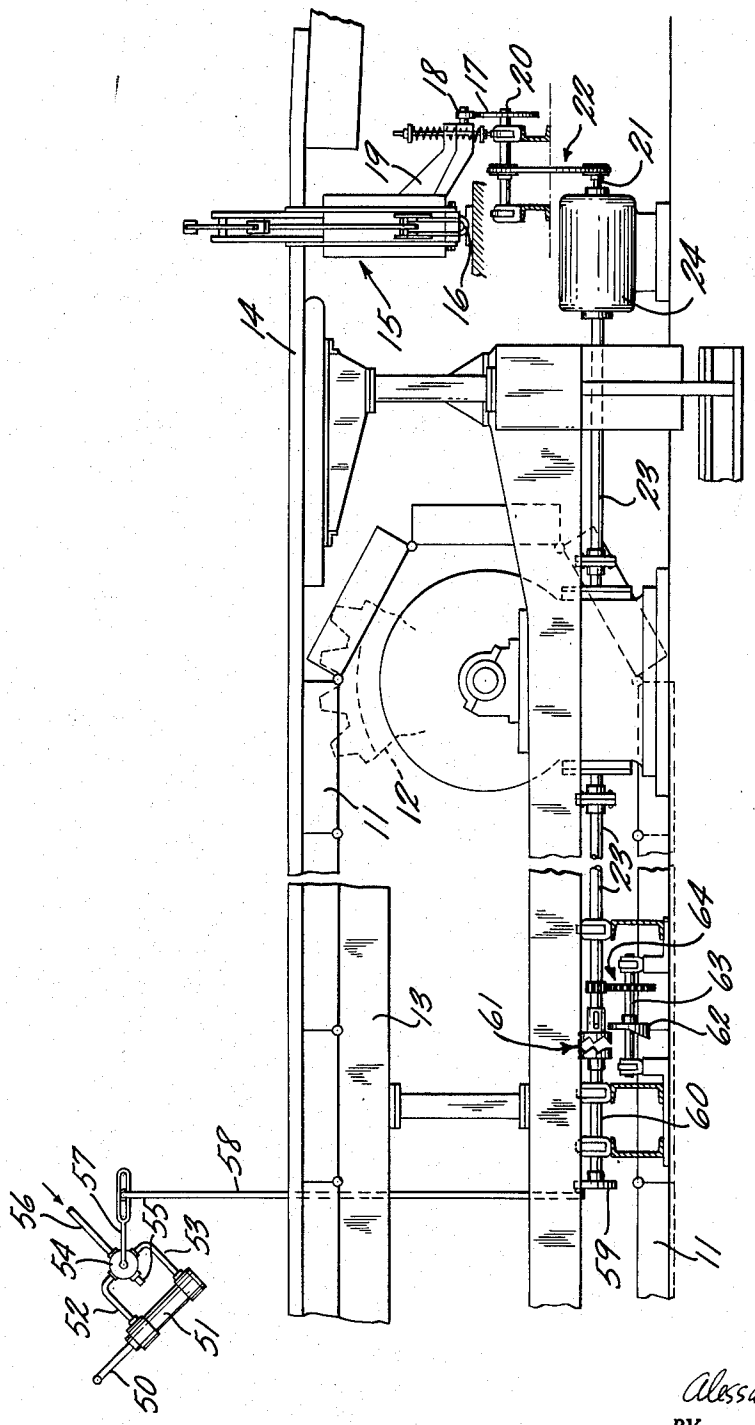

FIG. 1.

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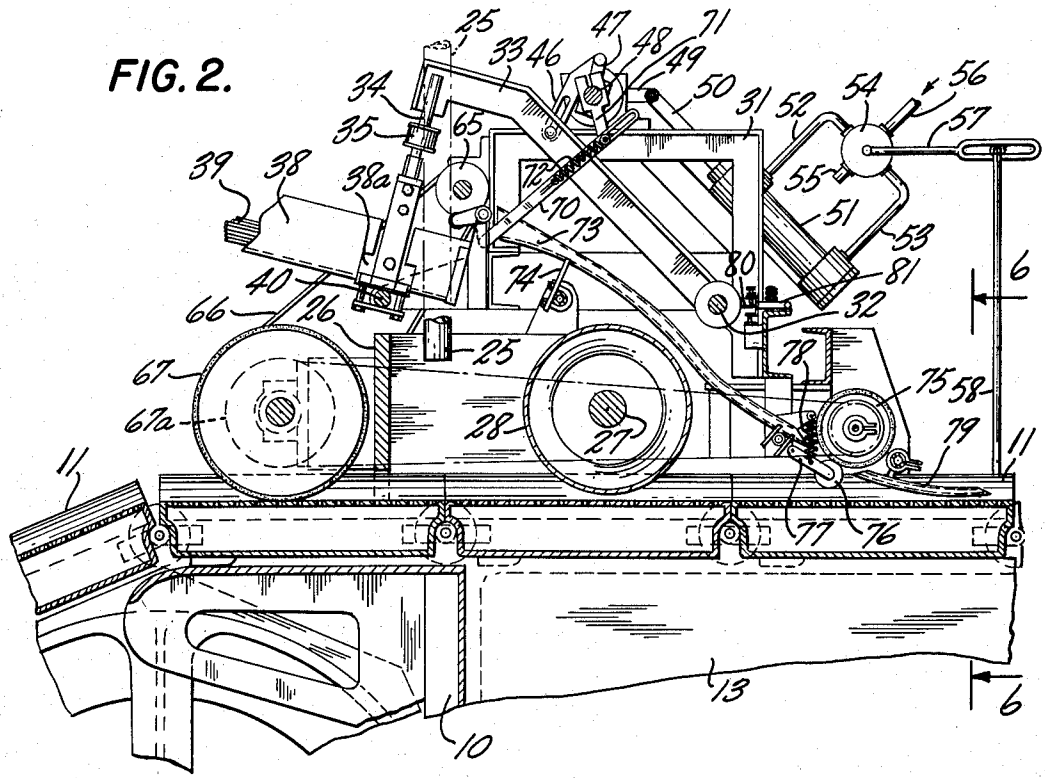
FIG. 2.



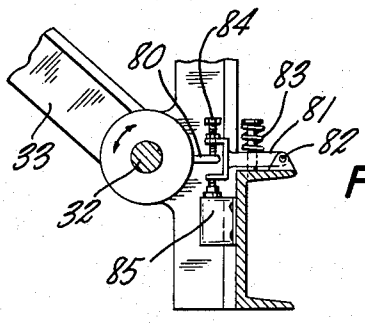
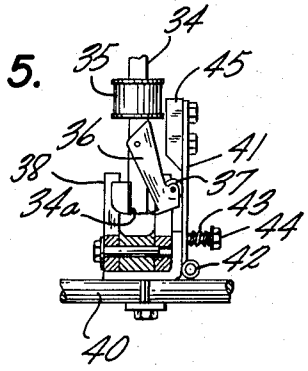


FIG. 2A.

FIG. 5.



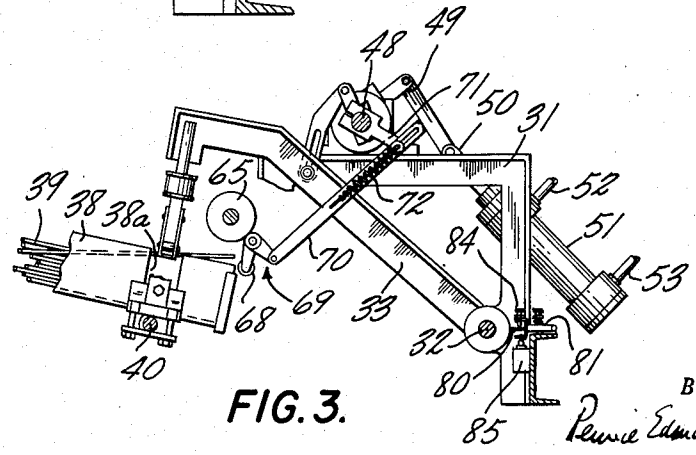


FIG. 3.

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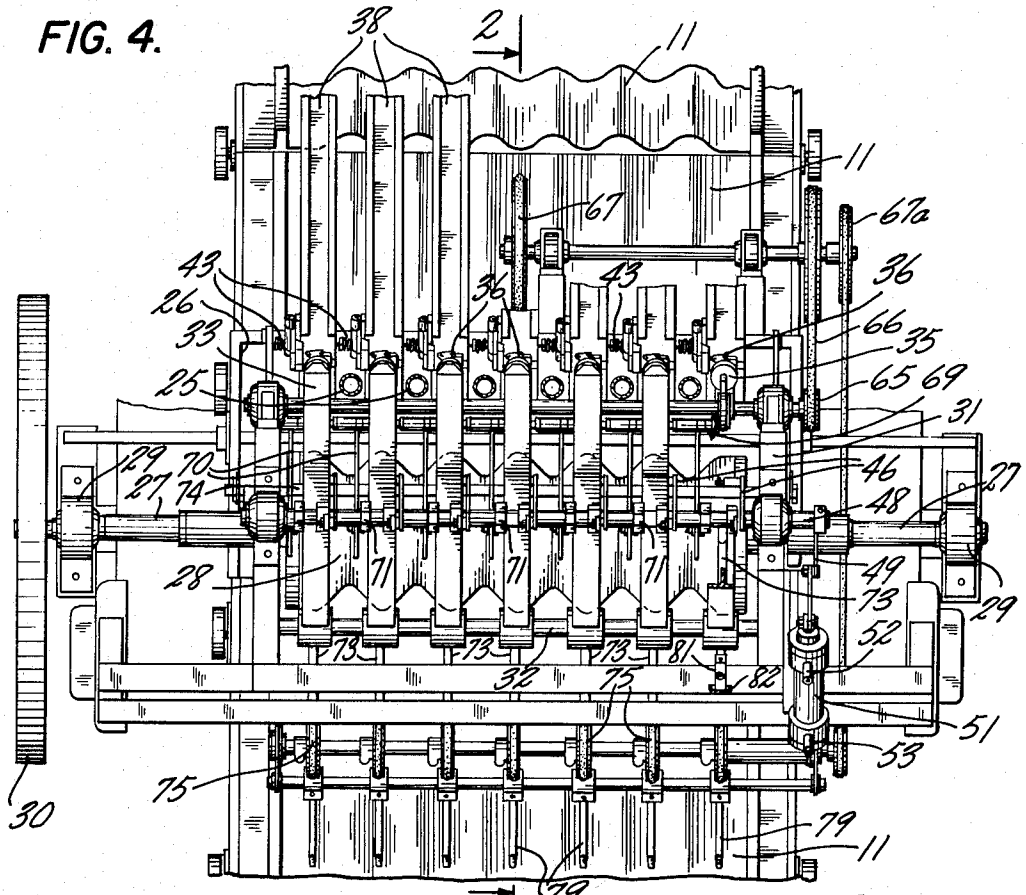
FIG. 4.



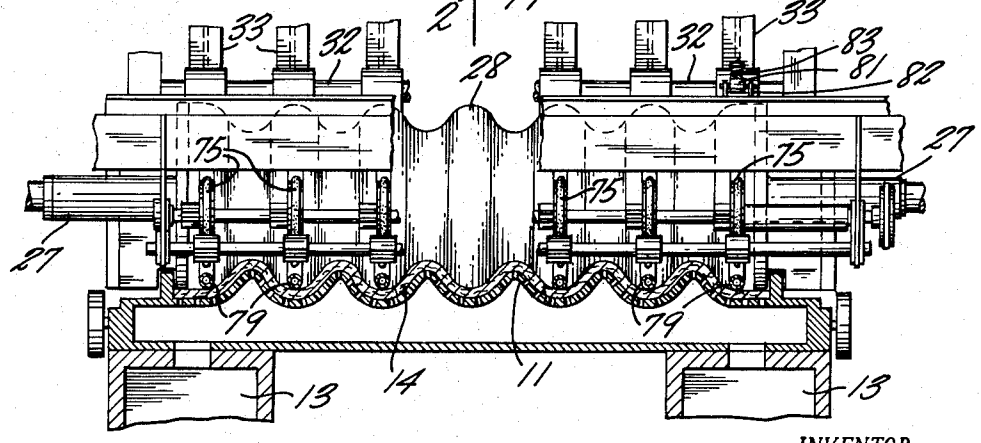


FIG. 6.

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2,741,955

APPARATUS FOR FEEDING REINFORCING ELEMENTS FOR INCORPORATION INTO CEMENTITIOUS SHEETS

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Application June 22, 1954, Serial No. 438,536

Claims priority, application Great Britain June 23, 1953

8 Claims. (Cl. 92—40)

This invention relates to the manufacture of reinforced fibrous cement sheets and is concerned more particularly with a novel apparatus for supplying pre-cut reinforcing elements for incorporation into a cementitious web, which is ultimately cut into unit sheets. The feeding apparatus of the invention may be employed on forming machines of various kinds and, as it may be used to especial advantage on a machine of the type shown in my patent 2,672,076, issued March 16, 1954, a form of the apparatus suitable for use with such a machine will be illustrated and described in detail for purposes of explanation.

The forming machine of the patent includes a traveling suction support, upon which the fibrous cementitious material in slurry form is deposited and formed into a web or sheet of indefinite length, which is cut into unit sheets by an intermittently operating severing mechanism. The combined depositing and forming operations are carried out at spaced locations along the travel of the suction support and, between these locations, the reinforcing elements are introduced into the web. The elements employed in one form of the machine of the patent are wires of indefinite length, which are drawn from a supply roll and, after introduction into the web, are severed at intervals corresponding to the length of the final unit sheets. While the mechanism disclosed in the patent for feeding the wires, introducing them into the web, and severing them is generally satisfactory, it may be desirable in some cases to make use of reinforcing elements pre-cut to the desired length.

The present invention is directed to the provision of a novel apparatus for supplying pre-cut reinforcing elements for incorporation into a fibrous cementitious web during the formation of the latter. The apparatus of the invention includes means for supporting a supply of the elements and pick-up devices for removing respective individual elements from the supply and delivering them to feeding means, by which they are advanced and guided into position on the web. The pick-up devices are operated in synchronism with the cutting means, by which the web is severed into unit sheets, so that the reinforcing elements will lie within the boundaries of such unit sheets. The pick-up devices are preferably electromagnetic and so constructed and operated that each one supplies a single element at a time to the feeding devices, by which the element is advanced to the web.

For a better understanding of the invention, reference may be made to the accompanying drawings, in which

Fig. 1 is a partial side elevational view of a fibrous cement web forming machine, with which the apparatus of the invention may be used;

Fig. 2 is a view in vertical section on the line 2—2 of Fig. 4 of one form of the apparatus of the invention;

Fig. 2A is a sectional view on an enlarged scale of parts shown in Fig. 2;

Fig. 3 is a partial sectional view similar to Fig. 2 but showing the parts in different relative positions;

Fig. 4 is an elevational view of the delivery end of the apparatus;

Fig. 5 is a fragmentary sectional view showing a part of one of the pick-up devices; and

Fig. 6 is a sectional view on the line 6—6 of Fig. 2.

In the drawings, the apparatus of the invention is shown mounted above an asbestos cement sheet forming machine, which is of the type disclosed in my Patent 2,672,076 but is shown somewhat diagrammatically and with various parts omitted. As illustrated, the machine includes a frame **10** and a suction support comprising an endless series of hollow boxes **11** having perforated tops of the contour, which the lower faces of the sheets are to have. The machine shown is for the purpose of making corrugated sheets and the boxes have corrugated top surfaces. The series of boxes is trained about toothed wheels, one of which is indicated at **12**, and one or both of the wheels are driven to advance the boxes at the desired rate. The boxes in the upper horizontal stretch of the series rest upon and are in communication with suction chamber **13**, through which the boxes are evacuated to dewater the web. Ordinarily, the suction support includes a fabric belt (not shown), which encloses the series of boxes and lies in contact with the tops of the boxes in the upper horizontal stretch of the series.

The web **14** of fibrous cementitious material formed on the machine is cut into unit sheets of the desired length by a cutting mechanism **15**, which includes a frame pivoted at **16** to reciprocate along the path of travel of the web. The frame carries cutting elements, between which the web passes, and the frame is moved back and forth by the action of a cam **17** acting on a roller **18** on an arm **19** attached to the frame. The cutting elements act to sever the web, while the frame is moving with the web, and remain separated during the return of the frame. The cam **17** is mounted on a shaft **20** driven by a shaft **21** through a chain and sprocket wheel connection indicated generally at **22**. Shaft **21** is driven from a main drive shaft **23** of the machine through a device **24**, such as that shown in my co-pending application, Serial No. 415,476, filed March 11, 1954, by which shaft **20** and cam **17** are caused to make a single revolution and the frame is caused to make a single reciprocation at intervals corresponding to the length of the sheets desired.

In the machine illustrated, the cementitious material is discharged through a plurality of pipes **25** upon the upper surfaces of boxes **11** in the top horizontal stretch of the series. The material is deposited within a frame **26**, through the side walls of which extends a shaft **27** carrying a roller **28** formed with corrugations corresponding to those of the tops of the boxes. The shaft **27** is mounted in suitable bearings **29** supported on appropriate standards and the shaft is driven by a pulley **30** from any desired source of power. As the cementitious material is discharged through the pipes **25** upon the top surfaces of the boxes **11** within the frame **26**, the material is formed by the roller **28** into the web, as the boxes move along.

A framework **31** is mounted above and across the suction support and overlies part of the frame **26**, within which the cementitious material is deposited. The framework carries a shaft **32** in suitable bearings and a plurality of arms **33** are mounted at one end upon the shaft and extend rearwardly therefrom. At its rear end, each arm carries the core **34** of an electromagnet **35** and the core extends downwardly from the arm and is formed at its lower end with a notch **34***a*. A scraping element **36** is pivotally mounted on each core **34** below the coil **35** of the electromagnet and the element **36** has a roller **37**, by which the element may be caused to swing across the lower end of the core.

A plurality of receptacles **38** for the reinforcing elements **39** are mounted above the suction support to extend in the direction of travel of the latter. The receptacles

are supported at their forward end on a cross-bar 40 secured to a suitable part of the machine framework and the side walls of each receptacle are cut away near its forward end, as indicated at 38*a*. A lever 41 is pivotally mounted at 42 on each receptacle at one side of the opening 38*a* therein and the lever is urged toward erect position by a spring 43 on a bolt 44 extending through the lever and into the receptacle wall. The lever has a cam 45 on its inner face in position to be engaged by roller 37 on the scraper element 36 of the core of the electromagnet associated with the receptacle.

Each arm 33 is connected by a link 46 to an arm 47 on a shaft 48 mounted in suitable bearings on the framework and the shaft has an operating arm 49 connected by a connecting rod 50 to a piston within a pneumatic cylinder 51. Lines 52, 53 lead to opposite ends of the cylinder from a four-way valve 54 having an exhaust line 55 and a supply line 56 connected to a source of air under pressure. The valve 54 is operated in synchronism with the severing device 15 by any suitable means. In the construction shown, the valve has an operating arm 57 connected by a link 58 to an eccentric pin on a disc 59 on a shaft 60 connectable by a clutch indicated at 61 to shaft 23. The clutch is normally urged to open position by a spring and is closable by a cam 62 on a shaft 63 driven from shaft 23 by a pinion-gear combination 64. The construction is such that shaft 63 makes one revolution for each revolution of shaft 20 and cam 17 and for each complete reciprocation of the frame 15 of the cutting mechanism and each cutting operation. Upon each revolution of shaft 63, cam 62 throws in clutch 61, so that shafts 60 and 23 are connected, and valve 54 is thus operated through a cycle, in which supply line 56 is first connected to line 53, while line 52 is connected to the exhaust 55, after which line 56 is connected to line 52, while line 53 is connected to the exhaust. Accordingly, in each cycle of operation of valve 54, the piston in the cylinder is moved to rock shaft 48, first, counter-clockwise, and then, clockwise.

A roller 65 is mounted for rotation at the rear end of the framework 31 above the receptacles 38 and is continuously driven through a belt or chain 66 by a roller 67, which rests upon the suction support and is driven by its frictional contact therewith. A plurality of rollers 68 are mounted to bear against roller 65 in line with each pick-up device and each roller 68 is supported in arms of a pair of pivotally mounted bell crank levers 69 operable by links 70 connected to arms fast on shaft 48. Arms 71 are connected to links 70 by slot and pin connections and a spring 72 connects each link to its pin and thus forms a yielding connection between the link and arm 71.

A plurality of guide tubes 73, one for each of the pick-up devices, are mounted on a cross-bar 74 of framework 31 and extend downwardly and forwardly over the top of roller 28. At its forward end, each tube terminates close to the bight of a pair of rollers, of which roller 75 is continuously driven through a belt from a pulley 67*a* on the shaft of roller 67. The second roller 76 of each pair is mounted in arms 77 acted on by springs 78 to cause roller 76 to press against the surface of roller 75. Beyond rollers 75, 76 are mounted a plurality of guide tubes 79, which terminate close to the top of the suction support.

The shaft 32 carries a projecting pin 80, which lies between the legs of a yoke, which is pivoted at 82 on a part of the framework and is urged to swing counter-clockwise by a spring 83. The upper leg of the yoke is provided with an adjustment screw 84 and the lower leg is engageable with the operating button of a switch 85. The switch is in a circuit for controlling the electromagnets 35 and, when shaft 32 is moved counter-clockwise to lower the free ends of the arms 33, the pin 80 engages the adjustment screw 84 and swings the yoke, so that its lower leg is freed from the button of switch 85. This completes the circuit through the electromagnets to energize them. When the shaft 32 is swung clockwise and the pin 80 moves down, the spring 83 swings the yoke, so that its lower leg presses down upon the button of switch 85 and breaks the circuit through the electromagnets.

In the operation of the new apparatus, the valve 54 is operated in cycles in timed relation to the severing device 15 and, during each such cycle, the cylinder operates to rock shaft 48 first counter-clockwise and then clockwise. When shaft 48 is moved counter-clockwise, the arms 33 are allowed to swing downwardly and the cores of the electromagnets enter the receptacles and come into contact with the reinforcing elements therein. At this time, the switch 85 is closed, so that the electromagnets are energized and a number of reinforcing elements adhere to the lower end of each core. The rocking of shaft 48 has caused the bell crank levers 69 to swing rollers 68 away from roller 65, as shown in Fig. 4, and, shortly after the reinforcing elements have been attracted to the cores, the valve 54 is reversed, so that cylinder 51 causes shaft 48 to move clockwise and swing the arms 33 upwardly.

During the upward movement of the arms 33, the scraping elements 36 engage the cams 45 and the scrapers swing across the ends of the cores 34 to remove all the reinforcing elements, except those in the notches 34*a* in the ends of the cores. As the arms continue to rise, the single reinforcing element carried by each core is raised, so that its end approaches roller 65. At this time, the clockwise movement of shaft 48 and arms 71 has not transmitted sufficient force through springs 72 to cause the bell cranks 69 to swing their rollers 68 against roller 65, but, as the springs 72 are compressed, the bell cranks ultimately swing rollers 68 against roller 65 and the ends of the reinforcing elements picked up by the electromagnets are gripped between rollers 65 and 68. The elements thus fed to rollers 65 and 68 are now released from the electromagnets by the de-energization of the coils thereof and the elements are fed by the action of the rollers into the guide tubes 73. The elements advance through the tubes until their ends project from the lower ends of the tubes and pass between the driven roller 75 and the rollers 76 pressed against it by springs 78. As the elements issue from rollers 75, 76, they enter tubes 79 and are laid upon the surface of the web of cementitious material formed by roller 28. The machine includes a second depositing and sheet forming means (not shown), which forms another layer of the material above the elements, and the elements issuing from the tubes 79 travel along on the first layer of the web to be enclosed between the two layers of the material making up the web. As the web passes through the severing mechanism and is cut into sheets, the lines of cut lie between successive sets of the reinforcing elements, so that the elements in each set are wholly enclosed within a unit sheet of the fibrous cementitious material.

I claim:

1. In a machine for producing reinforced fibrous cementitioous sheets and having a traveling suction support, means for depositing cementitious material upon the support and forming the material into a web, and means for severing the web transversely into successive unit sheets, the combination of means for supporting a supply of reinforcing elements shorter than the length of the sheets, a plurality of electromagnetic pick-up devices mounted for movement in unison, means for moving the devices toward and away from the supply of elements and operating the devices to remove elements from the supply, guides for directing elements upon the web of material on the traveling suction support, feeding means operable to receive elements from the pick-up devices and to advance the elements through the guides to the web, and means operated in timed relation to the web severing means for actuating the means for moving and operating the pick-up devices in cycles, during which the devices pick up ele-

ments from the supply and deliver them to the feeding means.

2. In a machine for producing reinforced fibrous cementitious sheets and having a traveling suction support, means for depositing cementitious material upon the support and forming the material into a web, and means for severing the web transversely into successive unit sheets, the combination of means for supporting a supply of reinforcing elements shorter than the length of the sheets, a plurality of electromagnetic pick-up devices mounted for movement in unison, means for moving the devices toward and away from the supply of elements and operating the devices to remove respective individual elements from the supply, guides for directing individual elements upon the web of material on the traveling suction support, feeding means operable to receive elements from the pick-up devices and to advance the elements through the guides to the web, and means operated in timed relation to the web severing means for actuating the means for moving and operating the pick-up devices in cycles, during which the devices pick up elements from the supply and deliver them to the feeding means.

3. In a machine for producing reinforced fibrous cementitioous sheets and having a traveling suction support, means for depositing cementitious material upon the support and forming the material into a web, and means for severing the web transversely into successive unit sheets, the combination of means for supporting a supply of reinforcing elements shorter than the length of the sheets, a plurality of arms mounted for movement in unison, an electromagnet on each arm having a core movable with the arm toward and away from the supply of elements, guides for directing individual elements upon the web of material on the suction support, feeding means for advancing elements through the guides, and means operated in timed relation to the web severing means for moving the arms and energizing the electromagnets in cycles, during which the cores pick up elements from the supply and deliver them to the feeding means.

4. In a machine for producing reinforced fibrous cementitious sheets and having a traveling suction support, means for depositing cementitious material upon the support and forming the material into a web, and means for severing the web transversely into successive unit sheets, the combination of a plurality of receptacles for reinforcing elements shorter than the length of the sheets, a plurality of arms movable in unison, a pick-up device on each arm, the device including an electromagnet with a core movable with the arm into a receptacle and a scraper for removing unwanted elements held by the core, guides for directing elements upon the web on the support, feeding means for advancing elements through the guides, and means operated in timed relation to the web severing means for moving the arms and operating pick-up devices in cycles, during which each device picks up an element from its receptacle and delivers the element to the feeding means.

5. In a machine for producing reinforced fibrous cementitious sheets and having a traveling suction support, means for depositing cementitious material upon the support and forming the material into a web, and means for severing the web transversely into successive unit sheets, the combination of a plurality of receptacles for reinforcing elements shorter than the length of the sheets, a plurality of arms mounted to swing on a common axis, a pick-up device on each arm, the device including an electromagnet with a core movable by the arm into a receptacle and a scraper for removing unwanted elements held by the core, means on each receptacle for operating the scraper of the pick-up device for the receptacle, guides for directing the elements to the web on the support, feeding means operable to advance elements through the guides, and means operated in timed relation to the web severing means for moving the arms and operating the pick-up devices and feeding means in cycles, during which the arms are moved to cause the cores to enter the receptacles, the electromagnets are energized to cause the cores to hold elements, the arms are moved to withdraw the cores from the receptacles and to present to the feeding means the elements held by the cores, the feeding means are caused to grip and feed the elements, and the electromagnets are de-energized.

6. In a machine for producing reinforced fibrous cementitious sheets and having a traveling suction support, means for depositing cementitious material upon the support and forming the material into a web, and means for severing the web transversely into successive unit sheets, the combination of means for supporting a supply of reinforcing elements shorter than the length of the sheets, a plurality of electromagnetic pick-up devices mounted for movement in unison, means for moving the devices toward and away from the supply of elements and operating the devices to remove elements from the supply, guides for directing elements upon the web of material on the traveling suction support, feeding means operable to receive elements from the pick-up devices and to advance the elements through the guides to the web, means for actuating the means for moving and operating the pick-up devices in cycles, during which the devices pick up elements from the supply and deliver them to the feeding means, and means operating the actuating means in timed relation to the web severing means.

7. In a machine for producing reinforced fibrous cementitious sheets and having a traveling suction support, means for depositing cementitious material upon the support and forming the material into a web, and means for severing the web transversely into successive unit sheets, the combination of means for supporting a supply of reinforcing elements shorter than the length of the sheets, a plurality of arms mounted for movement in unison, an electromagnet on each arm having a core movable with the arm toward and away from the supply of elements, guides for directing individual elements upon the web of material on the suction support, feeding means for advancing elements through the guides, a rock shaft connected to the arms, a switch operable by movement of the rock shaft to control the energization of the electromagnets, fluid pressure means for oscillating the rock shaft, and means operated in timed relation to the web severing means for operating the fluid pressure means in cycles, during which the cores pick up elements from the supply and deliver them to the feeding means.

8. In a machine for producing reinforced fibrous cementitious sheets and having a traveling suction support, means for depositing cementitious material upon the support and forming the material into a web, and means for severing the web transversely into successive unit sheets, the combination of means for supporting a supply of reinforcing elements shorter than the length of the sheets, a plurality of arms mounted for movement in unison, an electromagnet on each arm having a core movable with the arm toward and away from the supply of elements, guides for directing individual elements upon the web of material on the suction support, feeding means for advancing elements through the guides, said means including a pair of rolls separable by action of the rock shaft to receive elements between them, a rock shaft connected to the arms, a switch operable by movement of the rock shaft to control the energization of the electromagnets, fluid pressure means for oscillating the rock shaft, and means operated in timed relation to the web severing means for operating the fluid pressure means in cycles, during which the cores pick up elements from the supply and deliver them to the feeding means.

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