Sept. 29, 1953 F. H. FITZGERALD 2,653,429

METHOD AND MEANS FOR PACKAGING

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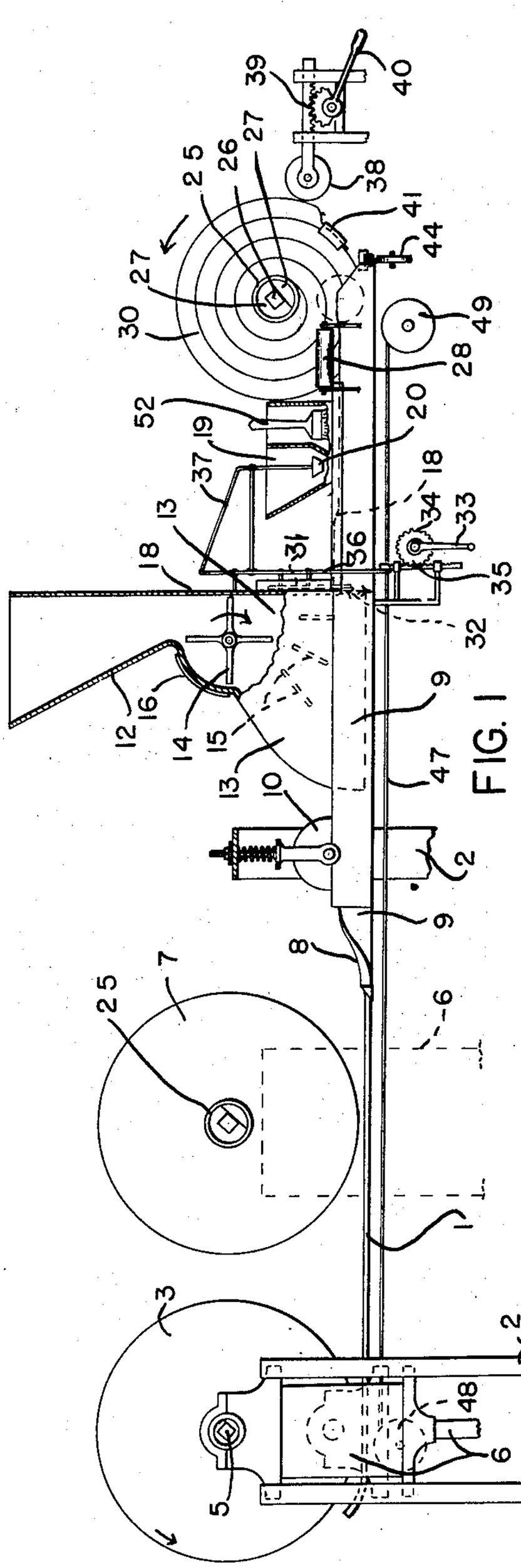

FIG. 1

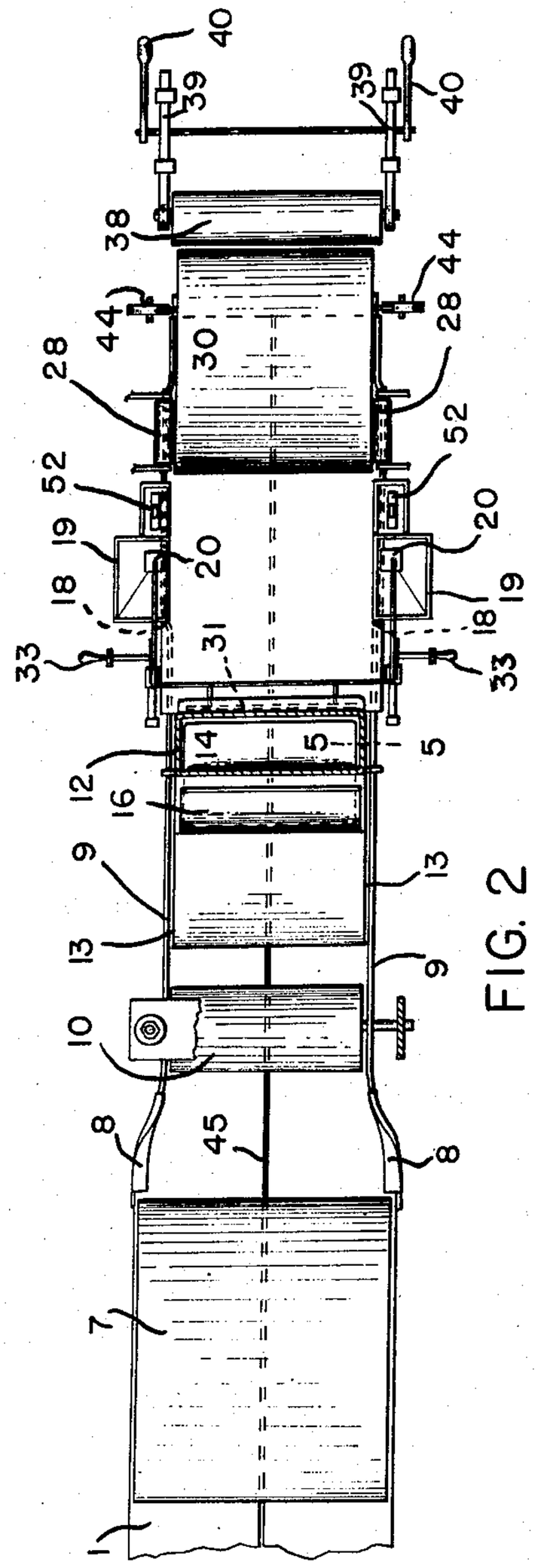

FIG. 2

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FIG. 4

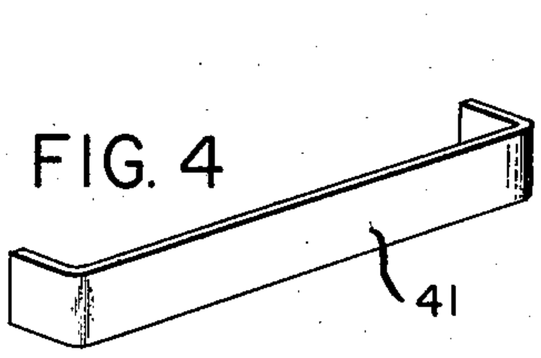
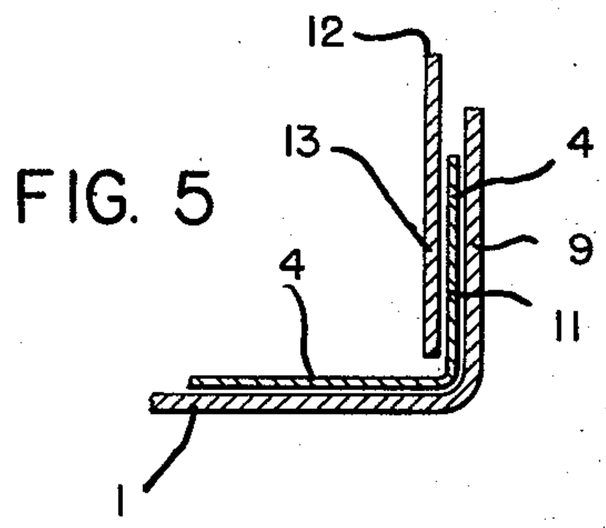


FIG. 5



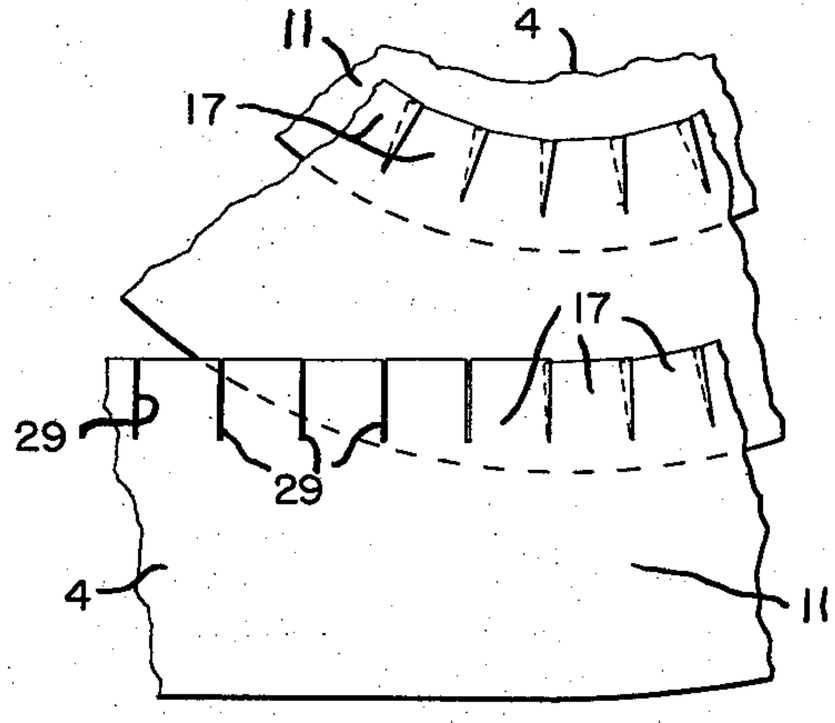


FIG. 3

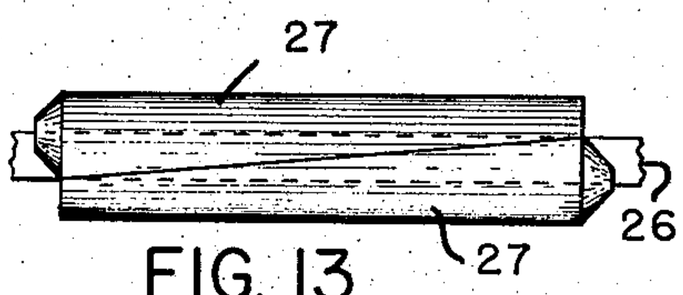


FIG. 13

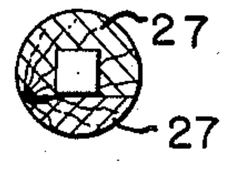


FIG. 14

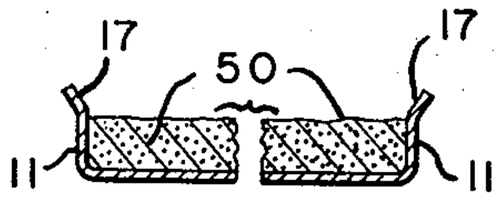


FIG. 6

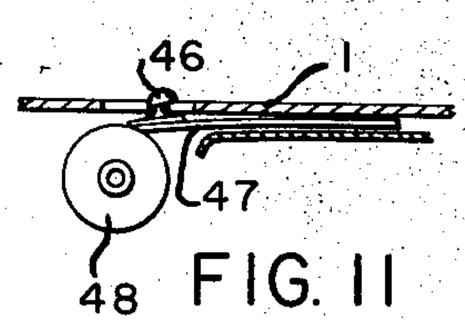


FIG. 11

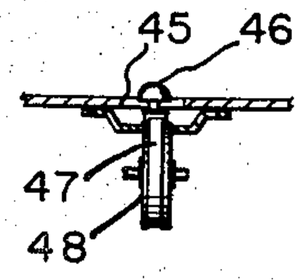


FIG. 12

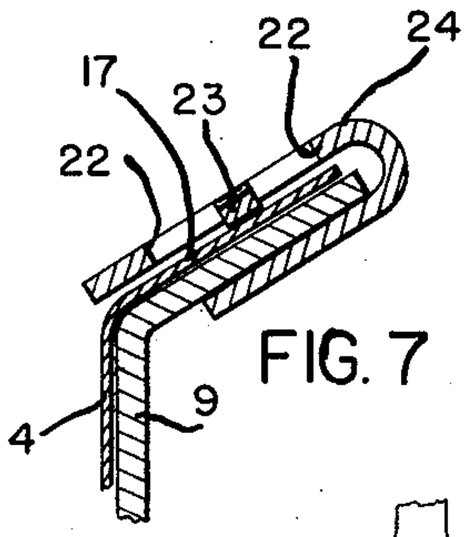


FIG. 7

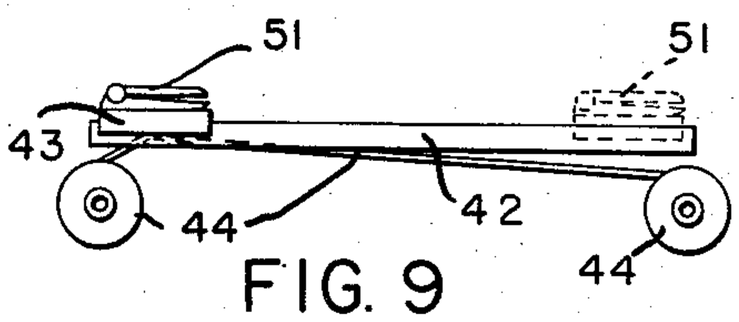


FIG. 9

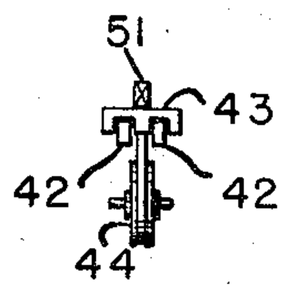


FIG. 10

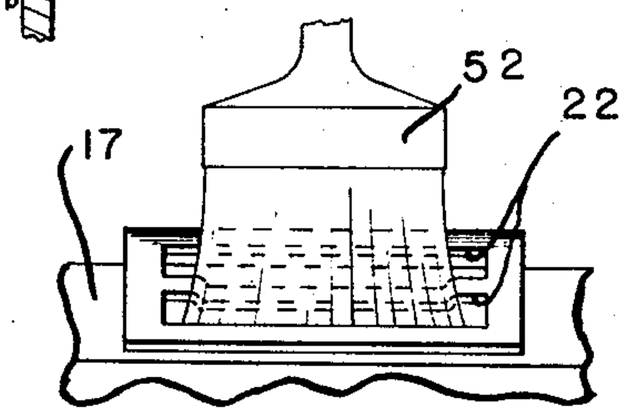


FIG. 8

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UNITED STATES PATENT OFFICE

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METHOD AND MEANS FOR PACKAGING

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Application September 24, 1951, Serial No. 248,075

4 Claims. (Cl. 53—9)

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This invention relates to a method and means of bulk packaging fine powdery, granular, or crystalline materials for storage and transportation.

My invention has particular utility in the mining industry; therefore I shall describe same as applied to this industry for purposes of illustration. However, it will be apparent that the invention will be useful in other industries as well.

In the mining industry, it has been found necessary to crush, grind and pulverize certain ores in order to separate the high-grade product from the low-grade materials which are incorporated therein. One of these ores is taconite. Taconite must be ground and pulverized to a very fine powder in order to free the minute high-grade particles from the wastes, and this procedure is being followed at the present time with reasonable success.

However, the powdering high-grade ores resulting after the separation process cannot be handled or transported to the blast furnaces conveniently or inexpensively due to their size and consistency; therefore, millions of dollars have been spent by various mining concerns in an effort to convert the powdery product into something which can be handled and shipped reasonably, conveniently and inexpensively. The common trend of thought is to sinter or agglomerate the powdered ones into solid pieces of suitable size for shipping. These sintering and agglomerating processes involve a great many steps in handling and treating the ores, they require a great deal of expensive equipment, and are expensive to run.

It is, therefore, one of my principal objects to provide a new method and means for packaging powdery materials, or the like, for handling and shipping which will be less expensive to the industry.

Another object is to provide such a method and means which requires the least possible movement and handling of the product after the high-grade concentrate is once assembled from the separating device.

Another object is to provide a machine for use in packaging the concentrate.

Another, more specific, object of my invention is to move a sheet or strip of thin material formed to a trough-like shape under a dispensing device which will deposit a layer of ore concentrate or material on the strip, and then wind the strip and its concentrate material into a spiral roll and simultaneously seal the side edges of the strip to form closures for the

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ends of the rolls, thereby providing a package having unusual strength and durability for the fine ore concentrates which may be moved and handled conveniently.

These and other objects and advantages of my invention will become more apparent as the description proceeds.

In the accompanying drawing forming a part of this application:

Figure 1 is a fragmental, broken, side elevational view of a machine for use in packaging ore concentrates or fines in accordance with my invention.

Figure 2 is a broken top plan view of Figure 1.

Figure 3 is an enlarged, fragmental, side elevational view showing the details of the forming and formation of a roll or package of material.

Figure 4 is a perspective view of a device for sealing the transversely disposed, cut-off end of the rolls.

Figure 5 is an enlarged fragmental sectional view on the line 5—5, Figure 2.

Figure 6 is a broken, vertical sectional view transversely of the troughed sheet of wrapping material showing the level to which fine ores would be deposited in and on the sheet.

Figure 7 is an enlarged fragmental sectional view illustrating the construction of the forming trough where the adhesive is applied to the edges of the wrapping strip.

Figure 8 is a reduced side view of Figure 7 showing the adhesive spreading brush in position.

Figure 9 is a diagrammatic view showing the device for cutting off the wrapping strip when desired.

Figure 10 is an end view of Figure 9.

Figure 11 is a fragmental sectional view showing a means for threading the wrapping strip through the machine.

Figure 12 is an end view of Figure 11.

Figure 13 is a side view of a split roller to facilitate the installation and removal of rolls with respect to the roll axles and cores.

Figure 14 is a vertical sectional view through the roller shown in Figure 13.

In the drawing, the reference numeral 1 indicates a table or bed which is a part of my machine and on which my packaging process takes place. The table 1 may be supported in any suitable manner, as by legs 2, or otherwise, of course.

At one end of the table, I provide a suitable means to support a large supply roll 3 of flexible wrapping material 4, which material may be

plastic, paper, or any other suitable material for the purpose intended. I prefer to mount the roll on an axle 5 whereby the roll may be driven, as by suitable means not shown, to unwind the wrapping material at a predetermined rate, and also to mount the roll on suitable hydraulic mechanism 6 whereby the roll will readily be lowered as it decreases in size to keep the wrapping material discharge close to the bed of the table 1 (see dotted lines Figure 1).

If desired, an auxiliary supply roll 7 of wrapping material may be mounted above the table 1 on a similar hydraulic mechanism indicated in dotted lines whereby work stoppages may be kept at a minimum when it is necessary to change supply rolls.

Adjacent the wrapping material supply rolls, the table 1 is provided with upwardly and inwardly flared guides 8 which cause the marginal edges of the wrapper strip 4 to be disposed in a vertical relation to the central portion of the strip as the latter moves through the machine, and thus forming the wrapping strip into a trough, as shown in Figure 6. The bed or table 1 is also formed to a trough shape from the guides 8 to the tail end thereof to guide and support the wrapper, the bed having its marginal edges 9 bent upwardly at substantially right angles to the control portion of the bed, as shown, to form side walls for the trough bed.

I prefer to mount a roller 10 over the bed and between the side walls 9, the roller being of substantially the same width as the distance between the side walls whereby the wrapping strip is forced to form its desired trough shape as it passes through the machine, the side walls 11 of the wrapper trough passing between the ends of the roller 10 and the side walls 9 of the bed or table.

A feed hopper 12 is mounted over the table 1 adjacent the roller 10, the hopper preferably having side walls 13 which extend into the trough of the table 1 and in slightly spaced relation to the side walls 9—9 of the table, whereby the side walls 11 of the wrapper may pass between the hopper walls 13 and the side walls 9, as shown in Figure 5.

The hopper is provided to hold a quantity of fine ore concentrates 50 and may be filled by any suitable means, not shown, such as a conveyor or spout discharge from the ore separating devices which may be used to assemble the concentrates. Within the hopper 12 I provide an impeller 14 which may be rotated to move a predetermined quantity of concentrates, or other material from the hopper, at a predetermined rate to be discharged or deposited on the wrapping strip as the latter moves under the hopper at a predetermined rate of speed, which will become apparent. Also within the hopper are a plurality of baffles 15 which cause the materials to be deposited in an even layer on the wrapper, as is deemed obvious. A door 16 may be provided on the hopper to permit the inspection of the loading or depositing of the material on the wrapper through a suitable opening, not shown.

It will readily be seen, from the above, that a quantity of material will be continually deposited on the wrapper strip as the latter is moved through the machine by means which will be described. The depth of material deposited is readily controllable with the impeller, and also by the upper limit of the opening 32 through the wall 18 of the hopper through which the material is carried on the wrapper to bring it from the

hopper, whereby a uniformly deep layer or load of concentrates is applied along the wrapping strip.

As shown in Figure 6, the depth of material in the troughed wrapper strip is preferably substantially less than the height of the side walls, or marginal edges, 11 of the strip whereby a bonding strip 17 is provided and maintained on each side along the entire length of the strip, the purpose of which will become apparent.

As the loaded strip proceeds through the machine, the bonding strips are bent outwardly away from the vertical side walls 11 at an angle, as shown in Figure 6. The strip 11 is threaded through the machine initially with the edges of the strip, or strip 17, engaging arcuately shaped guides 18 formed in or attached to each of the side walls 9 of the table 1 and continues through the machine in its angular position, as shown in Fig. 7. After being thus bent or folded, the bonding strips travel under an adhesive dispensing hopper 19, one on each side of the machine, which has a plug or stopper 20 or the like to open and/or close the opening, not shown, in the bottom thereof, through which adhesive is passed to engage and adhere to the bonding strip 17.

As the loaded strip passes further through the machine, the adhesive is spread evenly on the bonding strip by means of a brush 52 held in position over the strip 17 on each side of the machine, the brush preferably having its bristles extending through suitable openings 22 between a pressure foot 23 formed in a guide plate 24 which is secured to the side walls 9, the pressure foot 23 serving to hold the strip in place for the spreading of the adhesive.

The loaded strip is now ready for assembly into a transportable package. This is accomplished by winding the wrapper strip 4 on a cylindrical core 25, preferably of cardboard or the like. The core 25 is preferably carried on an axle 26 extending transversely of the table 1 by means of a shaft support mechanism, not shown, but similar to the support mechanism for the shaft 5, except that the hydraulic cylinder, not shown, would be employed to raise the axle above the table 1 progressively as the roll carried by the axle builds up or increases in size.

The core 25 is preferably mounted on the shaft 26 by means of a pair of wedges 27—27 which have a cylindrical shape, when assembled as shown, and a square bore to receive the axle 25. These wedges facilitate the mounting of the core on the axle so that a tight fit is obtained whereby the core will be rotated with the axle by any suitable drive means, not shown, connected to the axle to wind the wrapper strip and its load in a spiral coil around the core. In addition, the wedges 27—27 make it an easy matter to dismount the core from the axle when desired merely by driving the wedges apart from their smaller ends, as is readily apparent.

The strip 4 and its load are wound on the cylindrical core 25 by first securing the strip to the core in any suitable manner, with the bonding strips 17 overlapping and secured to the sides of the core. An adhesive, staples, or the like, may be used as securing means. Of course, the end of the strip started on the core 25 should be empty or without any concentrates on it so that it will be sealed and may be handled conveniently and secured properly in position; however, the concentrates may be started in a location relatively close to the end of the strip 4 which is secured to the core.

As may readily be seen from the drawings, the driving or rotating of the axle or shaft **26** will wind the wrapper strip and its contents on the core **25**, forming a roll **30**, and, because the driving or rotating of the axle **26** accomplishes the winding of the strip and its contents, a tight winding of the roll **30** will be obtained because the said driving of the axle also provides the means for drawing the wrapping strip through the machine and this is, obviously, a drag on the drive. Because the roll is tightly wound, the bonding strips **17** project inwardly of or overlap and are secured to the side walls of the core, initially before loading or filling of the strip begins, and, as the loaded strip is wound on the core the bonding strips **17** project inwardly or overlap and are secured to the preceding portions of the side walls **11** of the wrapping strip which have been wound on the core, see Figure 3, and the adhesive which was applied thereto will securely fasten the bonding strips to the edges of the roll, a pair of rollers **28—28**, one on each side of the machine, serving to apply pressure against the bonding strips to securely fasten same in place.

It is to be noted that the bonding strips **17** are preferably provided with substantially evenly spaced slits or cuts **29** substantially at right angles to and along their outer edges. The slits extend inwardly a distance less than the width of the bonding strips, see Figure 3, and provide for better assembly and securing of the bonding strips **17** on the roll as the segments formed between the slits will overlap, as shown, and provide a neater, more secure package. The slits **29**, obviously, may be made on the wrapping during its manufacture and winding on the rolls **3** and **7**, or they may be cut by a suitable device, not shown, attached to the machine here shown.

When the roll **30** has been wound to the desired size, the supply of concentrates to the wrapping strip may be interrupted by stopping the impeller **14** and dropping the gate **31** to close the opening **32**. This is accomplished by operating the crank **33**, from either side of the machine, which rotates the gear **34** and reciprocates the rack **35** which is connected to the gate **31** as by arms **36**. Simultaneously the stopper **20** closes the opening in the adhesive supply hopper to stop the flow of adhesive to the bonding strips, the arm **37** being connected to and operated with the arm **36**.

As the supply of material to the wrapper is cut off, an attendant preferably slows the speed and maintains the tightness of the roll **30** by forcing the idler roller **38** against the roll **30** as by a rack and pinion device **39** having an operating handle **40**.

The wrapping strip **4** is then cut off, and the end thereof secured in place on the roll **30**. As means for securing the end of the strip **4** in place, I have provided an elongated clamp **41** of spring material which overlaps the end of the strip **4** and embraces and grips the side edges of the roll, as shown.

As means to facilitate the cutting of the strip **4** at the desired point, I prefer to mount a pair of shuttle bars **42—42** transversely of the table and below the roll **30**, on which a carriage **43** is reciprocably mounted. A shear having a fixed cutter is mounted on the carriage to engage and cut the strip **4**. The clamp **41** may be applied either before or, preferably, after the cutting of the strip. A conventional spring balance device **44** may be used to operate the shear if desired.

The completed package, or roll **30**, may then be lifted from its mountings and directly on to a transporting vehicle or the like, or placed in any desired place, inside or outside, for storage, after the shaft **26** and wedges **27—27** are removed to be used again to form a similar roll or package.

When the shaft **26**, wedges **27—27**, and new core **25** are installed on the machine, the packaging process may be repeated.

As an added feature of my invention, I have shown a simple means for "threading" the wrapping strip **4** through the machine when a new supply roll is installed. A slot **45** is provided longitudinally of the table **1**, and a hook **46** is mounted on a belt or strand **47** which is carried on a pulley **48** at the strip supply end of the machine. The belt extends the length of the machine and is wound on a second pulley **49** at the opposite end of the machine. The pulleys may be spring loaded, of course. A hole may be provided in, or punctured in, the strip **4** and the hook **46** inserted therethrough. Then, the activation of the pulley **49** will pull the wrapping strip through the machine.

As may readily be seen from the above, the instant method of packaging fine materials, such as fine ore concentrates, reduces the amount of processing which is required in the present sintering and agglomerating plants; it reduces the amount of machinery and equipment necessary to prepare the product for shipping; it reduces materially the number of operations and handlings given the product before it reaches its ultimate destination, in the case of ore concentrates, the blast furnace; it requires no skilled labor and very little power; there is no loss of material in the process due to handling, oxidation, spillage, and the like; there is little space required in which to practice the invention; and there is less financial expenditure in the instant process for machines, buildings, labor, and the like.

It is deemed apparent that the thickness of the spiral roll, as well as the diameter thereof, can be reduced or widened to accommodate shipping conditions, nature of material packaged, type of transporting vehicle used, and the type of facilities for loading and unloading which are available, all within the scope of my invention.

It is to be understood that I have herein shown and described one specific embodiment of my invention, and that my appended claims are not necessarily limited specifically thereto.

Having thus described my invention, what I claim is:

1. The method of packaging fine materials which comprises forming a strip of wrapping material to a continuous trough shape, filling said trough to a predetermined depth with said material, rolling said strip and material together in a spiral coil whereby the portions of said strip already wound on said coil act as a cover for the portions being wound on said coil, and sealing the otherwise open end and edges of said coil.

2. The method of packaging fine materials which comprises forming a strip of wrapping material to substantially a continuous trough shape, filling said trough to a predetermined level throughout substantially its entire length leaving the marginal edge on each side of said strip free, rolling said strip and material into a spiral coil with said wrapping material on the outer side of said coil, and simultaneously with said rolling sealing said marginal edges of said strip to the adjacent portions of said wrapper forming

said coil to provide closures for the ends of said coil.

3. A machine for packaging fine materials comprising a table, an elongated wrapping strip carried on said table and movable longitudinally thereon, means on said table to form said strip to a trough shape as it moves along same, a hopper over said table to supply material to said troughed strip to a predetermined depth leaving a marginal edge on each side of said trough free of said material, an axle carried over said table, said axle being rotatable, a core removably carried on said axle to receive one end of said strip whereby the latter may be wound in a spiral coil with said free marginal edges overlapping the adjacent portions of said core and said strip, and means for securing said marginal edges to said adjacent portions of said core and said strip.

4. A machine for packaging fine materials comprising a table, an elongated wrapping strip carried on said table and movable longitudinally thereon, means on said table to form said strip to a trough shape as it moves along same, a hopper over said table to supply material to said troughed strip to a predetermined depth leaving a marginal edge on each side of said trough free of said material, an axle carried over said table, said axle being rotatable, a core on said axle to receive one end of said strip whereby the latter may be wound in a spiral coil with said free marginal edges overlapping the adjacent portions of said core and said strip, and means for sealing said free marginal edges in place against said adjacent portions of said core and said wrapper.

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