June 3, 1969

W. T. FRASER

3,447,674

WINDING CORE

Filed July 14, 1967

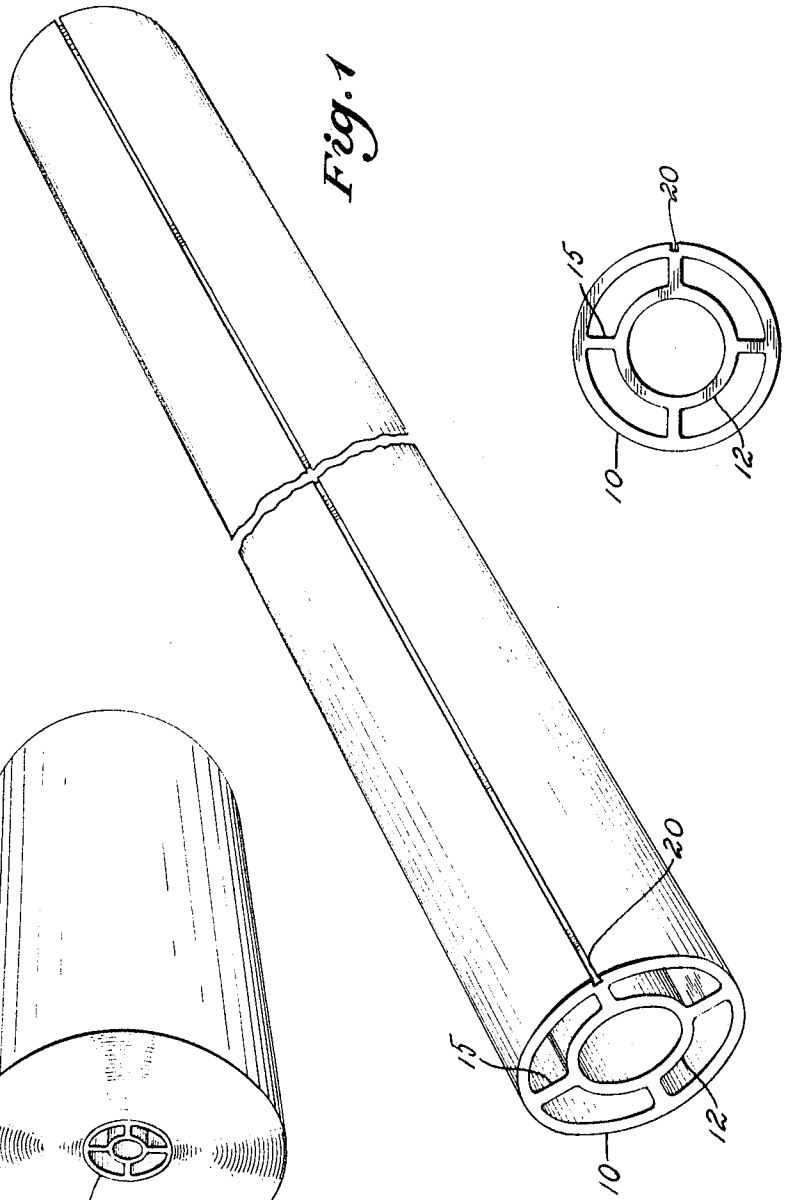


Fig. 1

Fig. 2

Fig. 3

United States Patent Office 3,447,674
Patented June 3, 1969

3,447,674

WINDING CORE

William T. Fraser, 24 Dartmouth Road,
Mountain Lakes, N.J. 07046

Filed July 14, 1967, Ser. No. 653,434
Int. Cl. B65h 75/00; B65 75/02; B65d 85/04
U.S. Cl. 206—59
11 Claims

ABSTRACT OF THE DISCLOSURE

A core for rolled sheet material which is an extrusion in the form of a pair of concentric continuously extruded cylinders joined by continuous longitudinal ribs.

This invention relates to winding cores of rigid plastic construction adapted for use in the manufacture of paper, plastic films, textiles or other flexible materials generally manufactured in web form.

It is the practice in the paper and film manufacturing process, and in the subsequent processes of their treatment or printing thereon, to wind these webs on cores having a width which is governed by the width of web being processed.

It is also the practice in the above processes to wind rolls of paper or film into rolls of the largest possible diameter and width. Both the diameter and width of these rolls are very often limited by limitations of diameter and strength of the winding core.

In practice, a core is usually of tubular shape, generally manufactured of paper composition or of steel, and is mounted in a winding or unwinding machine by means of core chucks or mandrels. Typically, paper or steel cores are used in widths usually not less than 3 feet nor more than 20 feet.

One of the problems with paper cores is that during the winding or unwinding of a web under tension, the core chucks will tear up the ends or the inside surfaces of the cores. These cores therefore cannot be re-used and must be discarded. The life of a paper core is usually one winding and unwinding process. It is then discarded as scrap.

Another problem with paper cores is that large diameter rolls of web are usually wound on large diameter cores. These large cores must make use of steel endplates or inserts in order to be used on machines designed with small diameter core chucks.

One of the problems with steel cores, which generally are not used for cores of less than 5 inches internal diameter, is their heavy weight. These cores require hoists or cranes to lift and position them in a machine. This operation must be done very carefully to prevent damaging the machine or the surface of the core. A burr created on the surface of a steel core by accidental impact will damage the bottom layers of a roll of paper or plastic film.

Another problem with steel cores is the high cost of transportation of heavy steel tubing which is used for cores, and which adds to the cost of the paper or plastic film.

Five-inch internal diameter steel cores, or larger, are so heavy and awkward to handle that their surfaces and ends are easily damaged, particularly when they are kept for re-use. The life of a steel core is generally not more than three winding and unwinding processes before requiring refinishing.

Another disadvantage of both paper and steel cores is the limitation of the machinery in the smaller converting plants. Many of these smaller converters would prefer to use large diameter cores but their machines are built with 3-inch diameter core chucks and are therefore

restricted to 3-inch diameter cores. The cost of converting the machinery is usually too high.

It has now been discovered that it is possible to prepare cores for rolled sheet material which cores are sufficiently light in weight to permit manual handling in all sizes presently in common use. These cores are characterized by a substantial void space, and are prepared from a material with a specific gravity substantially less than that of steel. In addition, the instant cores are readily prepared by continuous extrusion whereby they are characterized by close tolerances and regular shape and size, which lead to freedom from eccentricity and excellent static and dynamic balance characteristics. The instant cores are easily cut to shorter lengths if the ends become damaged by the mandrels on which they are mounted during use.

A major advantage of the cores of this invention over the cores presently in use in process industries that wind webs of wide widths, generally wider than 3 feet, is that the instant cores are so light in weight that a machine fitted with small diameter core chucks can accommodate them even though their external diameter may be double that of their internal diameter.

Other major advantages of this invention are that one overage man can lift a 10-inch x 15-inch core x 8 feet wide and place it in position in a winding machine without necessitating the use of a hoist, that accidental impact between the core and a machine will not damage either the core or the machine, that the high tensile and flexural strength of the plastic material, combined with its high impact resistance, allows the cores to be mishandled without damage to the structure or its outer surface, thus providing a long reuseable lift, and that when a core does become damaged beyond repair or use, the core may, by virtue of its thermoplastic nature, be granulated in relatively inexpensive, commercially available granulators. The small bulk, light weight plastic may be re-shipped back to the core manufacturer for re-processing into new cores. This advantage offers a cost reduction to industries that use cores.

In accordance with the present invention, a rigid core for rolled sheet material comprises an outer cylindrical shell and an inner cylindrical shell disposed concentrically within said outer shell by a plurality of uniformly circumferentially spaced axially continuous longitudinal ribs, said outer shell, inner shell and ribs being an integral unitary extrusion of an organic thermoplastic polymeric resin. The invention also contemplates a package of film material wound on such a core, and the process by which the core is made.

The invention will be further described in conjunction with the accompanying drawings which are to be considered as exemplary of a preferred embodiment of the invention and which do not constitute a limitation thereof.

In the drawings:

FIG. 1 is a view in perspective of an extruded plastic core in accordance with the instant invention;

FIG. 2 is a view in cross-section taken anywhere along the length of FIG. 1; and

FIG. 3 is a view in perspective of a core in accordance with the present invention carrying sheet material wound thereon.

The plastic core of FIGS. 1 and 2 is of a length at least ten times its diameter. It comprises an outer cylindrical shell **10** within which is disposed an inner cylindrical shell **12**. The shells are concentrically arranged and are spaced and held in position by four ribs **15**. The concentric cylindrical shells and the ribs are extruded as an integral unitary structure through a die from rigid, unplasticized polyvinyl chloride resin.

The outer peripheral surface of the outer cylinder is

completely smooth and is devoid of any projection or burrs of any kind. However, this surface may contain depressions or recesses therein such as an adaxial re-entrant groove **20** which extends axially lengthwise of the core for the entire length thereof. As illustrated, this groove is preferably of dovetail shape, thus providing a recess for the insertion of the end of film material which is to be wound on the core (so as to assist the film in grasping the core without slipping therefrom under the tension normally applied to film when it is wound on such cores). The disposition of the groove **20** in a plane with two of the ribs **15** facilitates appropriate design of the shape of the extrusion plate through which the polyvinyl chloride resin is extruded to form the instant core such that the resin is so disposed throughout the cross-section of the core that the core is balanced both statically and dynamically about its longitudinal axis.

The core of FIGS. 1 and 2 contains approximately 50 percent void space, a void space of from about 20 to 70 percent being preferred for the instant cores. The polyvinyl chloride resin used in the core of FIGS. 1 and 2 has a specific gravity of about 1.3. This polyvinyl chloride is unplasticized, and is characterized by an average molecular weight on the order of about 60,000, a tensile strength at room temperature of 7,500 pounds per square inch, a flexural strength of about 12,000 p.s.i., and a compressive strength of about 9,000 p.s.i.

FIG. 3 illustrates a core **50** having an external diameter approximately twice its internal diameter, on which a continuous plastic film **52** is wound to form a final package having a diameter of at least about six times the outer diameter of the core **50**.

The material preferred for use in the construction of this core is a high molecular weight vinyl chloride polymer of the suspension type. The number average molecular weights are on the order of 60,000, but may range from 10,000 to considerably more than 100,000.

The basic polyvinyl chloride resin, compounded with heat stabilizers, fillers, modifiers, lubricants and pigments, and extruded into the shape of this invention, results in a noncorrosive core of light weight, high strength, high impact resistance, and great rigidity.

Although polyvinyl chloride is the preferred polymer material for fabrication of the instant cores, other polymeric resins may be used provided they are characterized by a tensile strength at room temperature (i.e. 70° F.) of at least about 4,000 pounds per square inch, and a specific gravity at room temperature less than about 2.

An example of another suitable type of resin is the polycarbonate class.

The instant cores suitably may be prepared by fusing suitable resin and expressing it through a die such as to give the desired instant structure. These extrusion techniques are, in general, well known in the art. The continuous core so produced may be cut into lengths appropriate for use, which normally will be on the order of at least ten diameters, and, as referred to hereinabove, characteristically are highly rigid, maintain critical tolerances of dimension, concentricity, balance, surface smoothness and freedom from projections. They typically are of totally plastic, unitary integral construction, of continuously uniform transverse cross-section throughout their length, readily reclaimed and reprocessed by fusion and re-extrusion, and, by virtue of their significant void space and fabrication from a material of low specific gravity, suitable for manual handling in sizes presently requiring the use of hoists and other machinery.

It is to be understood that the "Abstract" given above is for the convenience of technical searchers and is not to be used for interpreting the scope of the invention, and various changes may be made in details of construction without departing from the true spirit of the invention. Thus, for example, although a rigid core having four ribs has been illustrated, it is quite possible to utilize three, six, eight or any other desired number of ribs within the scope of the invention.

What is claimed is:

1. A rigid core for rolled sheet material comprising an outer cylindrical shell, and an inner cylindrical shell disposed concentrically within said outer shell by a plurality of uniformly circumferentially spaced axially continuous longitudinal ribs, said outer shell, inner shell and ribs being an integral unitary extrusion of an organic thermoplastic polymeric resin and said core having a length axially at least ten times its maximum diameter.

2. A rigid core for rolled sheet material as set forth in claim **1** in which said organic thermoplastic polymeric resin has a tensile strength of at least about 4,000 pounds per square inch.

3. A rigid core for rolled sheet material as set forth in claim **1** in which said ribs, the inner surface of said outer shell, and the outer surface of said inner shell define a void space, said void space constituting at least about 20 percent of the cross-sectional area between the outer surface of said outer shell and the inner surface of said inner shell.

4. A rigid core for rolled sheet material as set forth in claim **1** in which said organic thermoplastic polymeric material has a specific gravity of less than about 2.

5. A rigid core for rolled sheet material as set forth in claim **1** in which the outer surface of said outer cylindrical shell carries an adaxial re-entrant groove which extends continuously lengthwise of the core.

6. A rigid core for rolled sheet material as set forth in claim **1** in which said outer peripheral surface is smooth and free of any projections or burrs.

7. A rigid core for rolled sheet material as set forth in claim **1** in which said thermoplastic polymeric resin is unplasticized polyvinyl chloride.

8. A rigid core for rolled sheet material as set forth in claim **1** in which there are four of said ribs.

9. A rigid core for rolled sheet material as set forth in claim **1** in which said axial length is at least three feet.

10. A rigid core for rolled sheet material as set forth in claim **5** in which said groove is located in a plane with two of said ribs and said resin is so disposed throughout the cross-section of said core that said core is balanced both statically and dynamically about its longitudinal axis.

11. A package of sheet material which comprises an inner cylindrical shell disposed concentrically within an outer cylindrical shell by a plurality of circumferentially spaced axially continuous longitudinal ribs, said inner shell, outer shell and ribs being an integral unitary extrusion of an organic thermoplastic polymeric resin and said core having a length axially at least ten times its maximum transverse diameter, and a web of sheet material rolled about said outer cylindrical shell, the width of the web substantially corresponding to said axial length of the core and said package having a diameter of at least about six times the outer diameter of said core.

References Cited

UNITED STATES PATENTS

2,659,543	11/1953	Guyer	242—68.5
2,693,918	11/1954	Bretson et al.	242—68.5
2,551,710	5/1951	Slaughter.	

JAMES B. MARBERT, *Primary Examiner.*

U.S. Cl. X.R.

242—68.5